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Determinants of Bank Profitability in Austria

A Micro-Macro Approach

Franz R. Hahn

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Preface

Since the beginning of financial liberalization thirty years ago, many forces of change have affected the business environment of the banking industry. As for EU banks, the Second Banking Co-ordination Directive of 1992 and the introduction of one single currency at the beginning of 1999 are among the most prominent events which are to give birth to an integrated, large and transparent European banking market. These developments, together with financial deregulation, technical advancement, entry of new types of financial intermediaries (i. e. pension funds, investment funds) and increasing importance of capital markets, have strongly boosted competition among banks as well as between banks and non-bank financial institutions. Thus, the efficiency of the banking industry has become a major topic both within and outside EU member countries.

These recent developments have been a particularly strong challenge to those banking industries which were used to primarily operating in highly protected, highly regulated domestic markets. This particularly holds for the Austrian banking system which, until the onset of international financial deregulation, was among the most protected in Europe. *Mooslechner* (1995) showed in a comprehensive study that profitability of Austrian banks ranked well below the OECD average in the early nineties of the last century as closer international integration of financial markets led to accelerated competition among Austrian banks. He stated that the core of the profitability problem of Austrian banks is a comparatively low degree of productive efficiency with factor inputs reflected in operating costs being rather badly converted into earnings. In addition, Mooslechner's analyses provide evidence that in Austria, in terms of earning capacity, smaller banks outperform by far larger banks, while in other countries such as Germany the opposite holds true. In a companion paper, *Mooslechner – Schnitzer* (1994) explored the profit-structure relationship in greater detail by using a then newly compiled micro-database for 956 Austrian banks covering the years 1988 and 1989. However, their results drawn from cross-section as well as pooled time-series estimates turned out to be somewhat inconclusive. Unfortunately, due to a lack of reliable local and regional data their treatment of market delineation – the construction of a relevant market area for each individual bank – had to remain rather limited.

This study is aimed to improve upon *Mooslechner* (1995) and *Mooslechner – Schnitzer* (1994), respectively, in three directions. First, the availability of a more comprehensive micro-database for Austrian universal banks covering 1995 to 2002 together with a wider base of local and regional data compiled by the Austrian Institute of Economic Research (WIFO) allows us to model more carefully the local markets environment of individual banks as well as those very forces which are at the center of the recent consolidation process in the Austrian banking sector. That is to say, due to the much improved database we are now capable of taking a much closer look at those forces that propel the ongoing structural adjustment and strategical re-orientation of the domestic banking industry. Second, due to the availability of

data which meet international standards in quality and quantity, it now appears much more promising to apply the state-of-the-art techniques of efficiency analysis such as the Stochastic Frontier Analysis (SFA) and the Data Envelopment Analysis (DEA) which have become quite common in this strand of research. In so doing, we hope to gain methodologically sound measures of productive (or technical) efficiency for the great majority of Austrian banks from 1995 to 2002. Third, an attempt will be made to control for macroeconomic or environmental forces which may affect both profitability and efficiency of the Austrian banking industry at the firm level.

The study is, in detail, organized as follows: In chapter 1 we give a short overview about the major international trends and developments in banking which have become critical since the breakdown of the Bretton Woods system in the early 1970s. Stylized facts and structural developments are presented in a non-technical fashion. Chapter 2 briefly discusses how and to what extent these trends and developments have affected the Austrian banking sector. The discussion centers on the changes which have taken place since the beginning of the 1990s. Chapter 3 deals with the core question of this study: what are the determinants of banking profitability in Austria? For that purpose we conduct a panel econometric analysis which allows for testing the hypotheses which have become the most prominent in the literature on bank profitability: the structure-conduct-performance hypothesis $(SCPH)$, the efficient-structure hypothesis (ESH) and the relative-market-power hypothesis $(RMPH)$. Further, we test whether Austrian banking markets are, on average, contestable. A newly compiled dataset covering more than 700 Austrian banks ranging over the period from 1995 to 2002 is used to carry out these econometric analyses. According to the theoretical underpinning of these hypotheses we also pay attention to environmental or external factors affecting the determinants of bank profitability. This aspect has so far been given little attention in the applied literature.

Since X-efficiency turns out to be one of the key drivers of banking profitability we review the most recent approaches measuring banks' productive efficiency. In chapter 4 we discuss the SFA and the DEA approach, both of which belong to the standard techniques of modern efficiency analysis. Efficiency analysis is primarily focused on measuring managerial efficiency. This presupposes that the influence of not-controllable (external or environmental) variables on overall productive efficiency is sufficiently identified and properly accounted for. Thus, in this chapter we also survey the most promising analytical methods suitable to distinguish between internal technical inefficiency (or X-efficiency) and inefficiency which is attributable to non-controllable, that is, external or environmental factors.

In chapter 5 the investigation of external and internal determinants of banking efficiency in Austria is given a thorough treatment. As mentioned above, the empirical analysis covers the years from 1995 to 2002. Methodologically, we apply both the parametric (that is, SFA) and the non-parametric approach (that is, DEA). First, the SFA approach using a cost function in the Fourier-flexible form is applied to approximate the underlying cost structure of the

Austrian banking sector. By using the stochastic frontier model proposed by *Battese – Coelli* (1995) we assume that environmental factors influence directly the degree of technical inefficiency and not the shape of the technology. Since less than 20 percent of the Austrian banks entertain operation units outside of the regional district of their head offices we assume that the very region (district) where the bank is located provide a good basis for the approximation of the home or local market condition of the banks under study. Thus, the model incorporates a cost function in which inefficiency is expressed as an explicit function of a vector of firm-specific external variables and a special random error term. As firm-specific external factors we primarily consider indicators which are likely to capture the structure and depth of the local markets of locally operating banks such as local per capita income, local growth rate and local unemployment rate. Second, the DEA-based approach applied is also aimed to assess the level of technical efficiency (or X-efficiency) of the Austrian banking system with the focus on environmental factors affecting banking efficiency. We apply a four-stage DEA methodology based on the approach advocated by *Fried – Schmidt – Yaisawarng* (1999). We employ a slacks-based DEA model (SBM) in combination with a censored regression approach to account for potential environmental and market influences on technical efficiency. In order to cope with the inherent dependency problem of DEA-based efficiency scores when incorporated into regression analysis a Bootstrap method is proposed as suggested by *Xue – Harker* (1999). In so doing the dependency problem which plagues the inference power of standard regression analysis based on DEA processed data is supposed to be overcome. Similarly to the SFA-based analysis, in the DEA-oriented analysis we also try to control for environmental factors which are assumed to be critical to determining local markets conditions.

In chapter 6, the profit model estimated in chapter 3 is re-estimated by using X-efficiency measures due to the SFA and DEA-based analyses, respectively which are adjusted for external differences in the banks' local markets.

Chapter 7 summarizes the major findings of the empirical investigation and discusses the policy implications of the study.

Acknowledgements

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1. Recent Changes and Trends in the Banking Industry[1])

Rising Competition through New Rivals

Banking and banks have been facing a sustained period of structural realignment and structural change. Increasing competition due to deregulation and liberalization in the financial services sector has triggered a race to improving banking efficiency and banking profitability in almost all countries. The driving force in this process has been the increased adaptation of market-dominated economic strategies and the liberalization and deregulation of capital markets worldwide allowing a much freer flow of capital at all levels.

The emergence of increased rivalry by non-bank financial intermediaries (for example, insurance companies, pension funds, investment firms) has imposed growing pressure on banks to enhance bank profitability and bank efficiency. This applies to both, retail and wholesale banking. Thus, the strategic priority in banking has changed over the recent decades with the emphasis on profitability, performance and 'value creation' rather than on growth and size. Internationally, a variety of policies has been adopted to achieve these goals, all of which aimed at consolidation, restructuring, and rationalization.

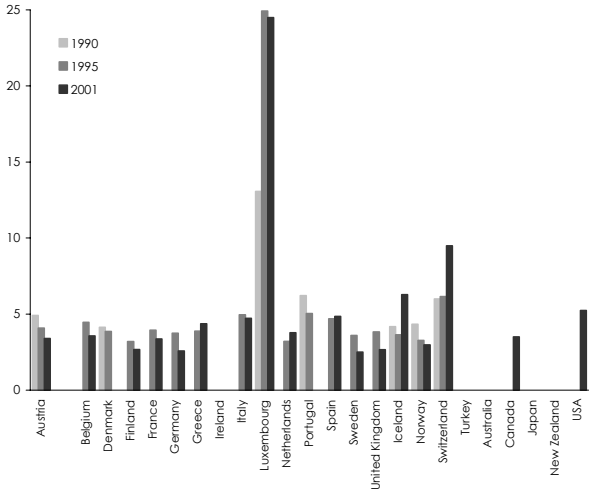
Lowering Employment by Sustaining High Value Creation

In most OECD countries, consolidation has mainly focused on a continuous decline of the number of both, banks and employees by simultaneously sustaining a high level of value creation (Figure 1.1). During the 1990s, the banking system contributed to an OECD economy's overall value added by a margin of 4 percent on average (with the exception of off-shore financial centers such as Luxembourg) while banking employment, with a share of approximately 2 percent in total employment, decreased on average. Thus, during this period of time value creation in banking was, on average, stronger than in most OECD economies on the whole.

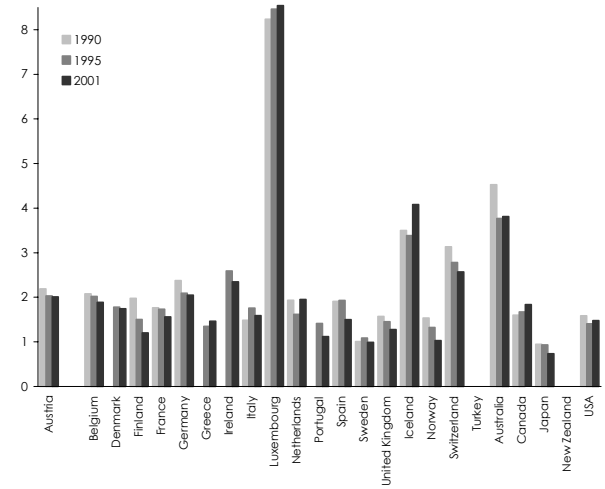
[1]) This chapter draws on *Goddard – Molyneux – Wilson* (2001), *Hahn* (2003), *Gardener – Molyneux – Moore* (2002), and *Hughes – MacDonald* (2002).

Figure 1.1:Value creation and employment in banking

Value added in banking as a percentage of total value added



Employment in banking as a percentage of total employment



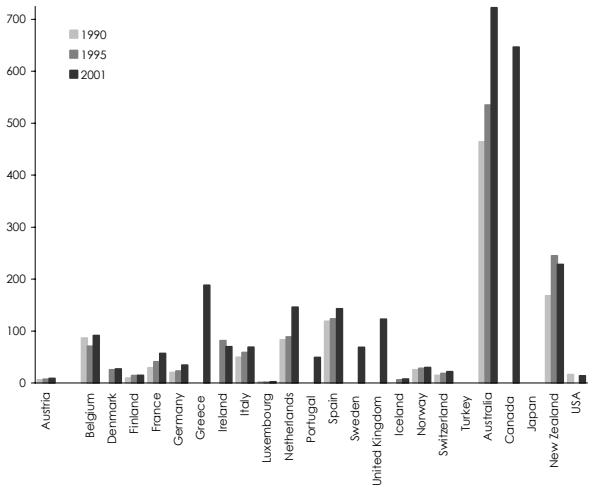
Source: BIS, EUROSTAT, OECD; national statistical offices.

Increasing Concentration through Domestic Mergers and Acquisitions

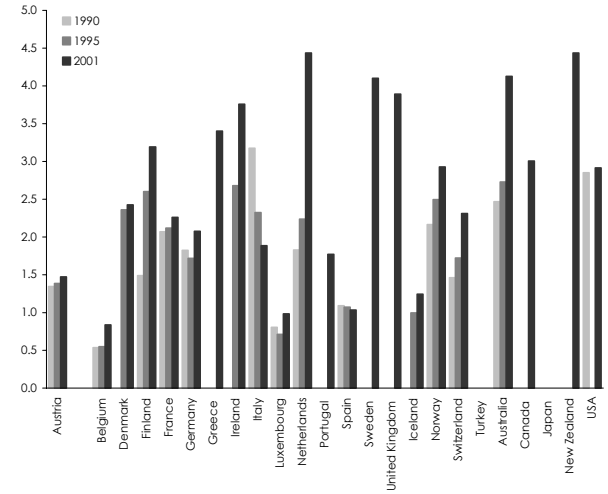
Though market concentration is increasing in most OECD countries, there is still a large number of small local and regional banks in the markets with substantial branch operations serving a wide range of banking customers. Higher concentration mirrors the endeavor in banking to close the gap between actual and optimal size in order to reap the gains provided by scale and scope economies.

Figure 1.2: Density in banking

1,000 residents per institution



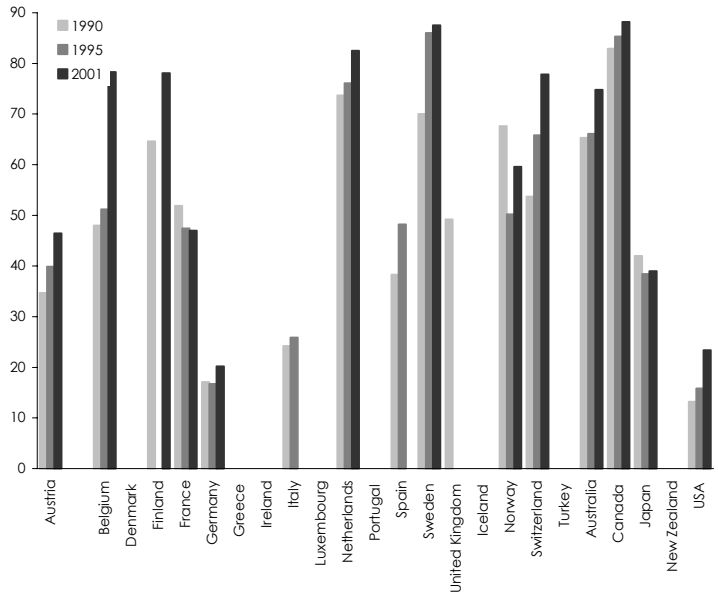
1,000 residents per institution and branch



Source: BIS, EUROSTAT, OECD.

In many countries consolidation, as far as the decline of numbers of banks is concerned, was primarily achieved by way of mergers. Though cross-border mergers are on the rise, most mergers between banks have been occurred between domestic partners. The defensive nature of the bank consolidation process via mergers and acquisitions (M&A) seems to be based on the conviction of the necessity of a strong home market before moving abroad, and perhaps a certain reluctance in some cases to see the control of domestic banks pass into the hands of foreigners (*Boot*, 1999). However, there is ample evidence that M&A activities have been much stronger in the banking sector than in insurance. *Goddard – Molyneux – Wilson* (2001) emphasize that mergers between two financial institutions of the same type (in-business) have been more common than mergers between different types of institutions (cross-business). They particularly refer to those banking systems which are strongly divided in various sub-sectors such as commercial banks, savings banks, cooperative banks and mortgage banks. Mergers between banks belonging to the same sub-sector are observed to be more frequent than those crossing two or more sub-sectors. Though the empirical evidence on the outcome of M&A operations in terms of efficiency and profitability gains is rather mixed, there is evidence that domestic mergers between small local banks with the aim of raising (local) concentration have had a large and lasting impact on the post-merger performance of these banks (see, for example, *Hahn*, 2004B).

Figure 1.3: Concentration in banking
5 largest banks as a percentage of balance sheet total



Source: BIS.

Employing Advanced Technology

A further factor which has accelerated consolidation and rationalization in the banking sector is technology. This is considered to be one of the most important forces of structural change in banking. There is little doubt that developments in the use of new computing and telecommunications technology have had a major impact on all kinds of banking operations, including customer-bank interface and business management (for a competent review of this topic, see *Goddard – Molyneux – Wilson*, 2001).

Customer-facing technology such as automatic teller machines (ATMs), cash dispensers, bank cards, automatic transfer payment and retrieval of basic account information by customers is the most visible sign of increasing technological sophistication in banking. Home banking has also become quite common, likewise Internet banking that has turned out to be the most favorite direct banking device of sophisticated customers.

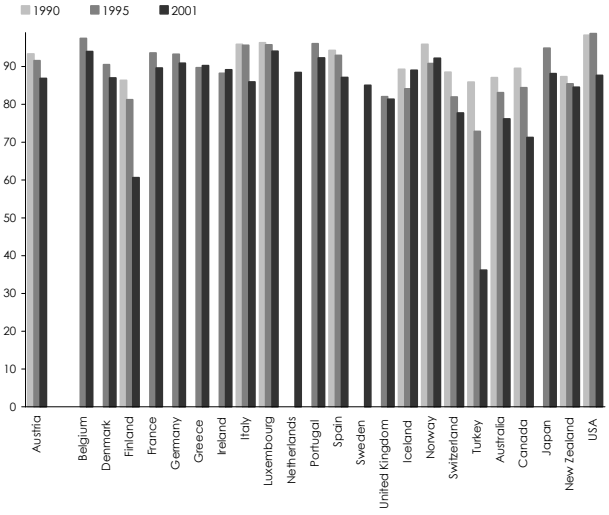
Modern information technology also has been extensively applied to improve the organization and flow of information within financial institutions aimed to enhance managerial decision-making. Data warehousing, data mining, middleware, and credit and risk management depend heavily on the availability of state-of-the-art data processing technology. This has become a very important issue in conjunction with the development and introduction of the New Basel Accord (Basel II). Basel II requires, among other things, that banks' risk management be based on modern cutting-edge analytical techniques which are capable of processing high quality data.

Focusing on Non-Interest Income

According to *Goddard – Molyneux – Wilson* (2001), a strong indication that consolidation and the overall fall in the number of banks has not adversely affected competitive conditions in banking is reflected in the decline in net interest margins in virtually every banking sector. While margins have a tendency to vary with the business cycle, the overall trend is downward. As net interest margins have been subjected to increasing competitive pressures, fees and commissions have, instead, become one of the profit-generators arising from banks' diversifying their activities. *Goddard – Molyneux – Wilson* (2001) argue that the growth of bancassurance and off-balance-sheet operations has further fuelled the potential of non-interest income in generating profitability. This has been an important motivation for mergers intended to enhance revenue and/or expand product ranges. Overall, given the increasingly varied and sophisticated demands of banks' customers, non-interest income is evident to account for increasing proportions of total income, at the expenses of traditional interest earnings, on most banks' income statement. *Goddard – Molyneux – Wilson* (2001) may rightly presume that this trend is likely to be grossly understated, given the large number of small local and regional banks in most OECD countries. The proportion of non-interest income earned by the largest banks is certainly significantly larger than generally reported, since

these banks are usually much more involved in activities such as off-balance-sheet business and trading.

Figure 1.4: Interest revenues in banking
Interest revenues as a percentage of total revenues

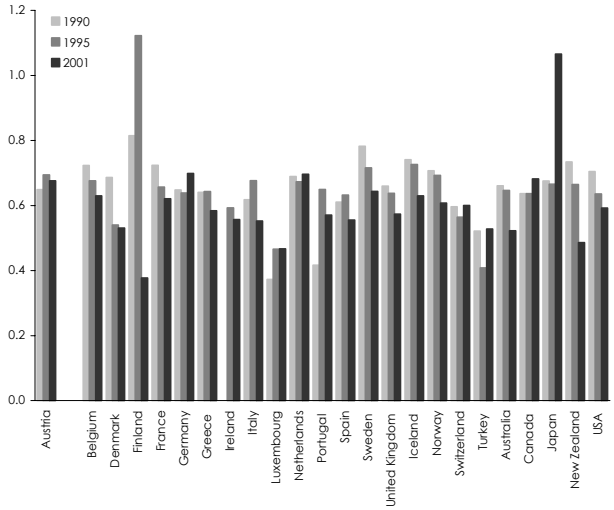


Source: OECD.

Lowering Costs at all Levels

The trend in the source of banks income is unambiguously characterized by a fall in interest margins compensated by an increase in non-interest income. The picture for changes in cost, however, is less obvious. The most popular measure for bank efficiency in practice is the cost-income ratio. However, this rough measure can be biased by various factors, many of which are not endogenous. As pointed out in *Goddard – Molyneux – Wilson* (2001), restrictive labor laws in many OECD countries have hindered significant staff reduction and productivity improvement so that the cost-income ratio in these bank markets may have been affected adversely over the short and medium run. Other factors, such as merger and acquisition activities and certain trading activities may add to the cost side in the short run, before all the efficiency savings and /or increased revenue streams have been realized. In the longer perspective, however, the cost-income ratio in banking tends downwards indicating increasing long-run efficiency.

Figure 1.5: Cost-income ratio in banking
Total costs over total revenues



Source: OECD.

Fostering Efficiency Through Private Bank Ownership

Agency problems have also been long considered as a drag on banking efficiency, particularly in Europe. This concern alludes to the supposedly negative effect of mutual and government ownership on banks' efficiency and performance. This argument rests on the view that the incentives for managers to efficiently allocate resources depend strongly on the specific nature of the ownership arrangement. The conjecture is that privately owned banks are run more efficiently than state-run banks simply due to the fact that the management of private banks benefits from running the operation more efficiently to a much more larger extent than the management of state-owned financial institutions. However, the empirical evidence on this topic is rather mixed. For example, *Molyneux – Thornton* (1992) have found that there is a statistically significant positive relationship between state ownership and bank profitability, suggesting that state-owned banks generated higher returns on capital than their private-sector competitors. The authors argued that the results may not be so surprising because state-owned banks generally maintain lower capital ratios (because the government implicitly underwrites their operations) than their private-sector counterparts.

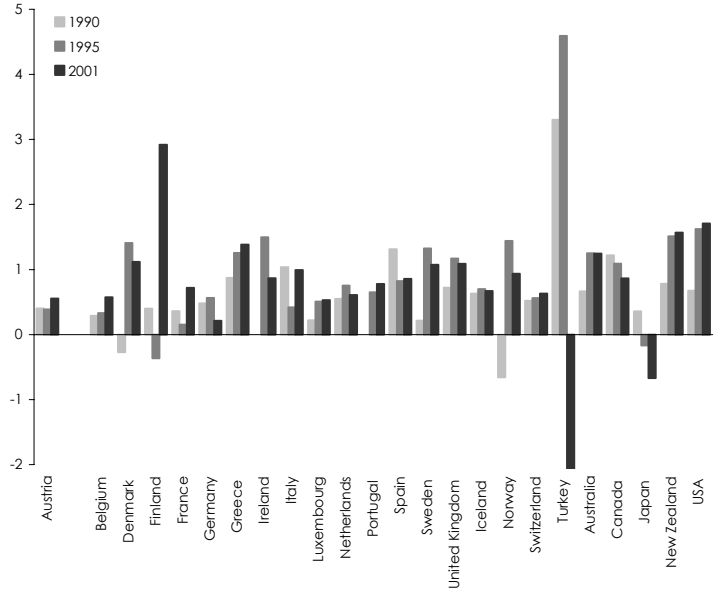
Privatization programs in banking have been carried out in many countries in order to raise efficiency and pave the way for banking restructuring. A further motivation for privatizing (partly or totally) state-owned banks has certainly been the poor state of public finances in many countries. Debt-ridden governments may have had the strongest incentive to accelerate the pace of privatization in banking. In many OECD countries, with the transfer of ownership to the private sector a major source of competitive distortion in banking has been

running dry since there is ample evidence that state-owned banks usually receive public (financial) support that private banks normally lack.

Elevating Returns

Naturally, the trends in income and costs described above are reflected in the data for profitability. Though the results for return on assets present a rather mixed picture, in the majority of cases the returns have improved over the last decade. The fact that there is no obvious downward trend in bank performance across the OECD countries doesn't mean that overall competition has not significantly increased. As just argued, banks are increasingly building on non-interest income in areas such as investment banking, brokerage, insurance, pensions, mutual funds and other collective investment product areas where there are strong established operators not willing to give up easily their market positions.

Figure 1.6: Return on assets in banking
Profit before tax as a percentage of balance sheet total



Source: OECD.

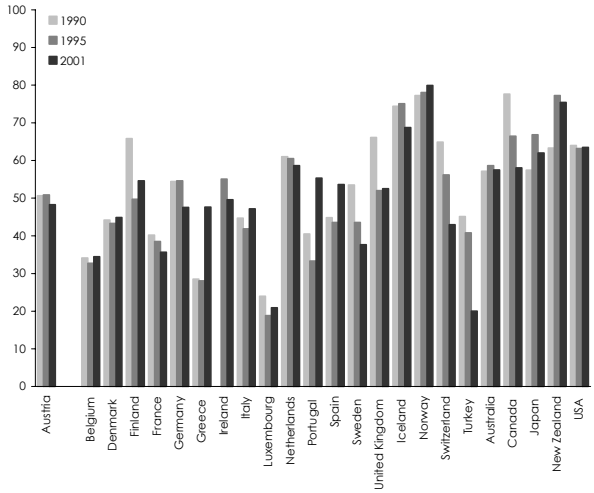
Shifting to Allfinanz

In all major industrial countries, the distinction between traditional banking activities such as supplying deposits and making loans, and other capital market activities, has become eroded. As stressed in *Hughes – MacDonald* (2002) the traditional separation between commercial banking, insurance, investment banking, brokerage and asset management that characterized many national financial markets no longer exists in Europe, and is gradually being eroded in the USA, Japan and many other jurisdictions. In the twentieth century there

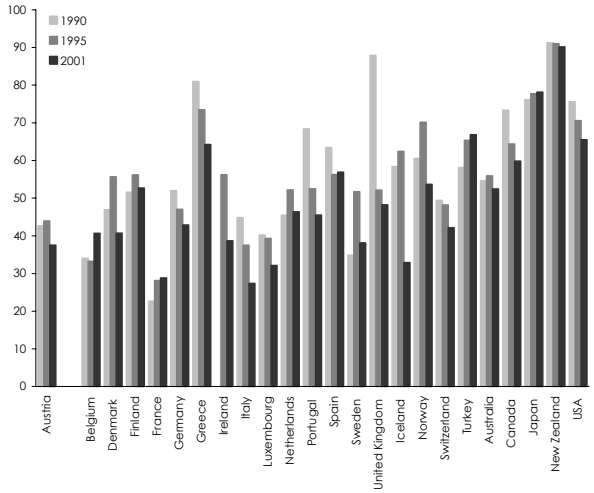
was a marked divergence between the United States and Japan, which demarcated commercial and investment banking activities in their countries, vis-à-vis the European and the Canadian banking regime that is built on universal banking. Universal banking comes out of the European tradition and allows banks to provide, under one roof, a wide range of financial services, such as taking deposits, making loans and underwriting securities, and, in some cases, insurances. Though the creation of fully universal banks in the United States and Japan has not yet occurred, globalization will continue to dictate change and, at the end, will bring the homogenization of banking systems across the OECD countries on the basis of the Allfinanz or bancassurance model. It is worth noting that the 1999 repeal of the federal Glass-Steagall Act has effectively reopened the door to universal banking in the United States with the likelihood running high that universal banking will prevail.

Figure 1.7: Loans and deposits in banking

Loans as a percentage of balance sheet total



Non-bank deposits as a percentage of balance sheet total



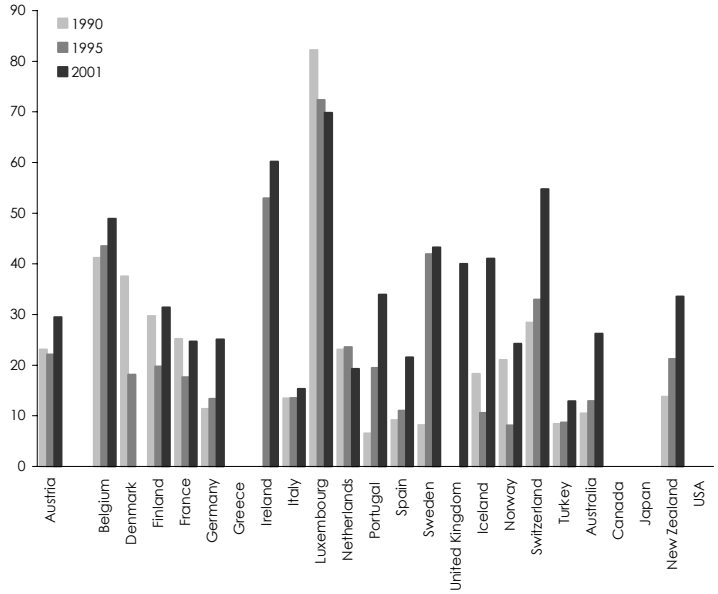
Source: OECD.

Increasing International Orientation

The internationalization of banking has been one if not the most important source of restructuring and enhanced competition since the break-down of the Bretton-Woods system (*Hughes – MacDonald*, 2002). The past decades have witnessed growing internationalization of banking mainly in investment and wholesale banking, less in retail banking. International banking grew in the 1960s and 1970s, with U.S. institutions dominating as they were rapidly expanding into foreign markets. The hike in oil prices in the early 1970s meant that petrodollars – that is, dollars generated by enhanced oil revenues through OPEC – required recycling. U.S. and European banks became active agents in this process, by taking Saudi and Kuwaiti oil profits as deposits and lending them to countries in Asia, Latin America, and

Africa. By the end of the 1990s, international banking was dominated by large institutions headquartered in the most developed economies. Although national boundaries continue to have some relevance, the major trends defining international banking are, as mentioned, consolidation within national frontiers, cross-border mergers, and the ongoing shift to universal banking.

Figure 1.8: Foreign liabilities in banking
Foreign liabilities as a percentage of balance sheet total

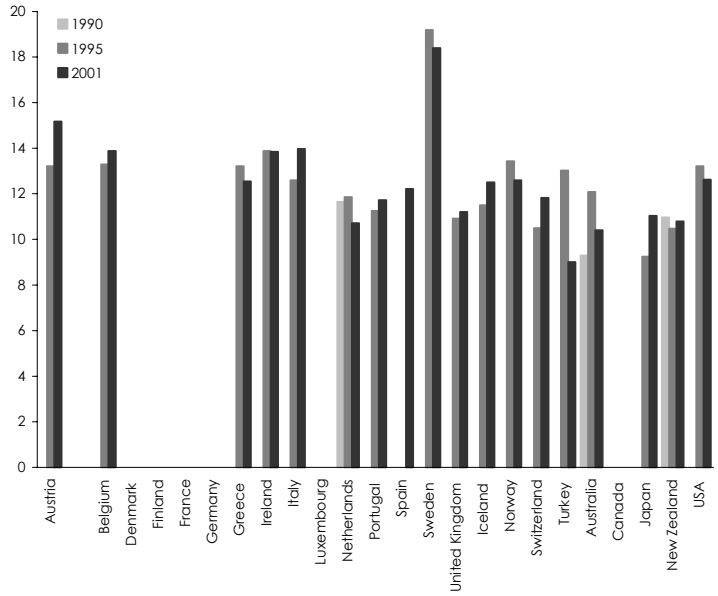


Source: OECD.

Harmonizing Regulatory Standards

Globalization of financial markets, internationalization in banking and insurance and increasing competition have also changed the parameter of risk. Consequently, the regulatory environment has to adjust to these new markets conditions in banking. At the beginning of the twenty-first century, most countries have well-established public policies for the regulation and supervision of banks. While it is generally recognized that prudent bank supervision and regulation are important components in making both, the domestic and international financial system work, there is no single global bank regulator. What can be observed, however, is a tendency to harmonize regulatory and supervisory principles across the most developed economies. This trend is most vividly recognizable in the establishment of the minimum capital requirements for financial institutions as outlined in the two Basel Accords.

Figure 1.9: Risk-based capital ratio
Equity as a percentage of risk-weighted assets according to Basel I



Source: OECD.

The first Capital Accord ("Basel I"), which agreed on binding minimum capital requirements to contain the credit risk for internationally active banks, constitutes a milestone of modern bank regulation. The object of the Accord was to limit and contain excessive risk-taking by banks by mandating a supervised minimum capital requirement regime. Stability of the international financial system was to be strengthened by ensuring that banks would be adequately capitalized and risk-conscious.

The Basel Capital Accord of 1988, according to which banks must have own capital amounting to at least 8 percent of their risk-weighted assets, quickly became an internationally recognized standard. The EU's current capital requirements are extensively based on the Basel recommendation. Basel I has since become the established foundation for supervision of bank capital in more than 100 countries. In Austria, the principles of Basel I were embedded in the Bankwesengesetz (BWG) in 1993 and have been applied since 1994. With increasing numbers of countries accepting the requirements of Basel I in the 1990s, banks markedly improved their risk-weighted capital adequacy (*Hahn*, 2003).

Basel I has, however, been gradually undermined in its effectiveness by its undifferentiated and coarse measurement of credit risks and the rapid pace of financial innovation. As evidenced by the financial crises in the second half of the 1990s, the simple Accord was not adequate to strengthen the stability of the international banking system. Some comments even pointed at a direct link between the severity of the recent crises (e. g., the Russian crisis and that in South Asia) and Basel I. Thanks to the broad-brush-type risk differentiation, banks

can boost their profits in many of their business sectors by accepting higher risks without the need to increase their capital (capital arbitrage). This supervisory leeway is excessively used, in particular for loans to private enterprises: such loans need to be underpinned by capital at a level of 8 percent in all cases, regardless of the actual economic risk which may vary considerably between enterprises. In other words, the risk weight for loans to private enterprises is 100 percent[2]). The effectiveness of Basel I was further and most seriously reduced by the explosive growth of bank transactions the risks of which are inadequately or not at all covered by the existing regime. Banks which are subject to low credit risks, on the other hand, can lower their capital requirement by securitizing their claims, a method that frequently leads to a deterioration in the quality of the portfolio remaining on their balance sheet.

The new proposal ("Basel II") is aimed at eliminating such weaknesses of its predecessor and at reducing the gap between the capital required by supervisory regulations and that required by managerial prudence, by providing modern and improved methods of risk measurement. Jointly with more efficient supervision and greater market discipline, the new Accord is to ensure the stability of the financial system and to substantially reduce the danger of systemic risks.

It is worth noting that the regulatory framework banks in the EU operate in today bears little resemblance to that existing two decades ago (see, *Moore*, 2002). The regulatory cornerstone for liberalizing banking services in the EU is the Second Banking Directive which establishes the key conditions for the free provision of banking services in Europe (i. e., a single banking license or passport and the principle of home country control). As mentioned above, in key supervisory areas like capital adequacy, the EU regulatory system has been developed in line with international convergence objectives and criteria. However, despite these recent regulatory developments worldwide it should be noted that banking still remains a highly regulated industry but legislative changes in the past decades have put an increasing emphasis on establishing a regulatory framework to encourage rivalry and efficiency whilst not compromising the need to maintain financial stability and protection for depositors (*Moore*, 2002).

[2]) Example: a loan of € 100 requires € 8 in underlying capital when the risk weight is 100 percent.

2. Recent Developments in the Austrian Banking System[3])

In accordance with the international trends outlined in the previous chapter, the Austrian banking system has undergone a fundamental change since the mid 1990s aimed to become more competitive and profit-oriented. Though these international trends in banking have been widely adopted in Austria the processes of structural change and consolidation have progressed at a somewhat moderate pace, at least compared to other OECD countries.

To begin with, in the first half of the 1990s the Austrian banking industry was given a new legal fundament by rapidly adopting EU banking legislation. This stern realignment of the legal standards in banking was primarily dictated by the instance that Austria joined the EU in 1995. The new legal frame in banking has been mainly coined by the Bankwesengesetz (BWG) 1993. This key Banking Act had paved the way for tearing down the major barriers among the different banking sectors and for creating a level playing field for providing banking services in Austria. The new legislation has also tailored the banking industry a new organizational design at the firm level. Since the implementation of the BWG 1993 only three types of bank enterprises can be established: a joint stock bank (Aktienbank), a mutual and cooperative bank (Genossenschaftsbank) and a public savings bank (Sparkasse).

Mergers and Acquisitions

As in many other OECD countries, concentration and consolidation have been mainly brought about by accelerating domestic mergers and acquisitions.

More than 250 domestic mergers have been observed since 1990. The number of credit institutions in Austria declined from 1,210 (1990) to 883 (2004). Though there has been a number of domestic mergers and acquisitions involving the country's then largest banks (i. e., Erste Bank and Girocredit, Bank Austria and Creditanstalt) and one major cross-border merger (Bank Austria – Creditanstalt and HypoVereinsbank), the core of the 'consolidation wave' was made of domestic mergers among small to medium-scaled regional banks, primarily within the group of mutual and cooperative banks and within the savings banks group. As observed internationally, bank mergers and bank acquisitions crossing two or more bank groups have been quite rare in Austria.

[3]) This chapter draws on Ali – *Gstach* (2000), *Andreani* (2004), *Breyer* (2004), *Bruckner – Stickler* (2000), and *Hahn* (2004B, 2005).

Table 2.1: Number of domestic banking mergers

	1990 to 1994	1995	1996	1997	1998	1999	2000	2001	2002	Total
NUTS-I regions										
Eastern Austria	56	5	12	14	10	3	7	5	7	119
Southern Austria	16	3	1	0	2	0	0	3	1	26
Western Austria	54	5	7	6	9	8	10	9	4	112
Aggregated economic regions[1])										
Human capital intensive	57	7	8	12	12	5	10	7	7	125
Physical capital intensive	27	1	5	2	6	2	4	6	2	55
Rural	42	5	7	6	3	4	3	4	3	77
Bank sectors										
Joint stock and private banks	2	0	0	0	2	0	2	1	0	7
Savings banks	29	2	1	4	1	2	1	3	4	47
State mortgage banks	1	0	0	0	0	0	0	0	0	1
Raiffeisen credit cooperatives	76	9	14	13	14	8	14	9	7	164
Volksbank credit cooperatives	15	0	3	1	2	1	0	2	0	24
Building and loan associations	0	0	0	0	0	0	0	0	0	0
Special purpose banks	3	2	2	2	2	0	0	2	1	14
Total	126	13	20	20	21	11	17	17	12	257

Source: OeNB; WIFO computations. – [1]) Definition is given in the Appendix.

Remarkably, the network of bank branches has remained rather tightly knitted conveying still the impression that Austria continues to remain a (over-)densely branched country. The reduction in the number of banks has only been partly accompanied by a significant decrease of banking offices. During the 1990s, the branching network has only slightly declined from 4,497 (1990) to 4,359 (2004). Nevertheless, empirical evidence suggests that the small and medium-scaled domestic mergers have been, on average, successful in terms of efficiency gains (*Hahn*, 2004B). Since the merged banks operate closer to their optimal size, efficiency and profitability at the lower end of banking have improved, in numerous cases even significantly.

Concentration

Despite the ongoing consolidation process the Austrian banking sector has remained relatively low concentrated. The figures indicate quite clearly that concentration, as measured by the share of the 5 largest banks in total assets, has only increased by a small margin from 39.9 percent (1995) to 46.9 percent (2004) which is, of course, in line with the observation that consolidation mainly occurs at the local and regional banking level (Table 2.2).

Costs, Revenues and Returns

Key indicators of bank performance over the last decade show that the interest margin (calculated as net interest income over earning assets) has narrowed, from 58 percent in 1990 to 49 percent in 2004. This development reflects the intensification of competition in the market for bank intermediation. Cost-income ratios as a rough measure of operational

Table 2.2: Structure and performance indicators of the Austrian banking sector

	1995	1996	1997	1998	1999	2000	2001	2002
	As a percentage of balance sheet total							
Assets								
Cash and balance with Central bank	8.1	8.7	7.8	6.6	5.9	5.5	5.3	4.6
Interbank deposits	30.2	29.2	28.1	30.1	29.0	28.4	29.7	26.6
Loans	50.9	50.8	51.2	49.5	48.7	48.8	48.3	50.2
Securities	7.6	8.3	9.8	10.8	13.2	14.0	13.3	15.3
Other assets	3.1	3.0	3.1	3.1	3.2	3.2	3.4	3.4
Claims on non-residents	21.1	22.2	24.3	23.3	25.5	28.5	26.9	27.4
Liabilities								
Capital and reserves	4.6	4.8	4.9	5.0	4.9	4.7	4.9	5.0
Interbank deposits	29.3	30.0	30.0	32.7	34.2	33.2	32.6	29.3
Non-bank deposits	44.0	43.2	42.0	40.1	37.9	36.9	37.5	38.6
Bonds	17.4	17.3	17.9	17.2	18.0	19.9	19.1	21.0
Other liabilities	4.7	4.8	5.2	4.9	5.1	5.3	5.7	6.2
Liabilities to non-residents	22.2	24.5	27.6	26.5	28.5	31.6	29.6	28.7
Income statement	As a percentage of gross income							
Interest income	224.2	196.9	197.5	190.7	184.1	206.7	194.7	174.9
Interest expenses	163.3	137.6	140.2	137.5	132.9	156.6	144.4	123.6
Fees and commissions receivable	20.6	21.9	24.0	25.4	28.2	30.6	29.3	29.8
Fees and commissions payable	4.2	4.5	5.2	5.4	6.4	7.5	7.3	7.5
Other non-interest income	22.7	23.3	23.9	26.9	27.1	26.7	27.7	26.4
Performance ratios								
Cost-income ratio	0.69	0.69	0.69	0.68	0.69	0.67	0.67	0.70
Return on assets	0.31	0.28	0.30	0.33	0.37	0.41	0.46	0.25
Return on equity	6.7	6.0	6.1	6.6	7.5	8.7	9.3	4.9
Risk-based capital ratio[1])	12.1	12.6	13.3	14.5	14.0	14.7	14.7	14.0
	1,000 € (real terms, at 1995 prices)							
Staff costs per employee	55.4	57.0	57.7	60.6	61.5	62.1	63.3	63.5
Return per employee	17.1	16.4	18.1	22.9	27.4	32.2	36.6	19.0
Bank concentration	As a percentage of balance sheet total							
5 largest banks	39.9	39.8	44.5	44.5	44.7	46.9	46.5	46.9
Bank density								
Residents per institution	7,635	7,810	8,008	8,215	8,404	8,680	8,868	9,012
Residents per institution and branch	1,388	1,393	1,401	1,438	1,446	1,462	1,475	1,506
Institutions and branches per 100 km^2	6.8	6.8	6.8	6.6	6.6	6.5	6.5	6.4
Number of ATM[2]) per 1,000 residents	0.25	0.27	0.29	0.30	0.32	0.33	0.33	0.34

Source: OeNB; WIFO computations. – [1]) According to Basel I. – [2]) Automatic teller machines.

efficiency have remained relatively high compared to international standards and exhibit only a very modest decline in the 1990s. As a result, the return on assets of Austrian banks has only improved at a very slow pace (Table 2.2). Similarly the resulting return on equity has also remained well below 10 percent during the 1990s and early 2000s. Part of the explanation for the modest average profitability of the Austrian banking sector can be found in the structure of revenues and costs. On the liability side, approximately 40 percent of the funding consists of customer deposits and some 30 percent are interbank deposits. The funds are invested in nearly equal proportion in commercial loans and other earning assets (i. e. securities, interbank loans). As deposit markets become more competitive, due to the availability of

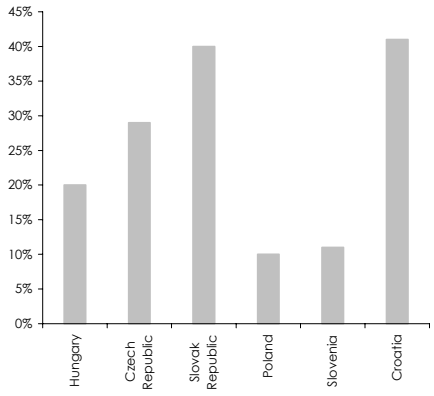
investment alternatives such as mutual funds, as credit markets become more contestable, especially in the area of housing loans, but also in the segment of credit to small enterprises, and as the government steadily reduces its borrowing needs, banks profits are becoming increasingly vulnerable. The empirical evidence indicates clearly that the interest margin is still the primary component of total revenues, while fee business represents less than 20 percent but rising steadily due to the increasing importance of investment banking services (Table 2.2).

The development of the risk-based capital ratio shows convincingly a solid capital coverage, well above the required minimum level. In the 1990s, Austrian banks markedly improved their risk-weighted capital adequacy ranking in the upper third with their risk-weighted capital ratio within the OECD countries (Figure 1.9).

Internationalization

As far as internationalization is concerned, Austrian banks, in particular the country's largest banks such as Bank Austria – Creditanstalt (BA–CA), Erste Bank and Raiffeisen Zentralbank were eager to gather benefits of a first mover strategy in the former neighboring socialist countries. During the first half of the 1990s most of the Austrian banks focused their activities on assisting domestic entrepreneurs aiming to invest in the East European countries, and on arranging and coordinating the privatization process in these countries (*Andreani*, 2004). Since the mid of the 1990s the Austrian banks have begun to develop their services also for non-institutional and for resident customers, most of the time within the strategic approach of Allfinanz. In particular the Austrian banks took part in the privatization process of the main state-owned banks, both by acquiring controlling stakes, or a qualified minority. At present, Austrian banks hold a leading position in the East European countries markets (see, for example, *Breyer*, 2004).

Figure 2.1: Market share of Austrian banks in the East European countries 2003



Source: OeNB; Breyer (2004).

Privatization

The expansion of Austrian banks in the East European countries was accompanied by a thorough privatization program of the Austrian Republic through which main controlling stakes in banking companies (i. e., such as in the Creditanstalt and Postsparkasse) were transformed to the private sector. This process reached its climax when Bank Austria – Creditanstalt until then controlled by the Municipality of Vienna merged with the HypoVereinsbank in 2001. The merger between these two banking groups was the first major cross-border merger in the European banking system, topped by the friendly take-over of the HBV group by the Italian bank conglomerate UniCredit in 2005.

3. Determinants of Banking Profitability in Austria

Modern economic analysis of the banking industry exclusively builds on the economics of industrial organization. Within the banking literature, theoretically and empirically, the structure-conduct-performance (SCP) paradigm receives the most attention. It is still the leading approach in banking analysis, though the economics of industrial organization has further been developed through the integration of the analysis of strategic behavior of firms with respect to decisions concerning both price and non-price behavior (*Goddard – Molyneux – Wilson*, 2001). New industrial organization uses extensively game theory to examine competitive behavior in situations where threats, commitments, creditability and reputation are important. So far, game-theoretic models have been used quite rarely to analyze banking behavior. As stressed by *Goddard – Molyneux – Wilson* (2001), this is mainly due to the complexity of rivalry behavior between multi-product service firms, where detailed and standardized product and price data are not readily available. Since barriers to entry are likely to be important in banking the notion of contestability has been considered to describe the competitive structure of many banking business areas just as well as, if not better than models of strategic competition between oligopolists.

Since the Austrian banking sector mainly consists of small banks servicing local markets we consider models which refer to the structure-conduct-performance paradigm or related notions such as the relative-market-power hypothesis, and to the notion of contestability as appropriate views for analyzing the determinants of banking performance in Austria.

In its simplest form, the SCP paradigm views market structure as exogenous, in the sense that it is the structural characteristics of markets that tend to influence or dictate both the conduct and, ultimately the performance of businesses. Most early empirical research based on the SCP paradigm focused on the relationship between concentration and performance measured by profitability. A positive correlation between concentration and profit was typically interpreted as evidence that firms act collusively in order to achieve high profits. This view has been criticized on the grounds that structure as well as conduct and performance require explanations and therefore must be regarded as endogenous (*Goddard – Molyneux – Wilson*, 2001). The most profound attack came from the Chicago school, prominently represented by *Demsetz* (1973, 1974) who argues that a positive relationship between concentration and profits does not necessarily imply collusive behavior on the part of the firms. Instead, Demsetz suggests that the positive concentration-profit linkage simply reflect the fact that the larger firms tend to operate more efficiently and tend to make a higher profit as a result. In this study, we make an attempt to improve upon the standard efficiency hypothesis by maintaining that the ability of a production unit to transform inputs into outputs be influenced not only by its internal efficiency (the quality of its management) but also by its external operating environment. Examples of external variables affecting managerial efficiency include the form of ownership, location or markets

characteristics, labor relations, and regulatory rules. Thus, not controlling for external environmental factors such as external market conditions may substantially bias the measurement of managerial efficiency resulting in adverse and inferior policy reactions. Above all, the comparison of efficiency across firms is substantially impaired when managerial inefficiencies cannot be separated from those components of inefficiency that are external to the firm.

A major challenge to the traditional SCP approach has also been the notion of contestability by breaking the empirical link between observed concentration and observed profitability. The theory of contestable markets was developed in an attempt to address many of the criticisms of the SCP approach. The literature on contestability stresses rightly that observed concentration does not necessarily reflect the extent of potential competition which, of course, is not directly observable (see, i. e., *Baumol – Panzar – Willig*, 1988). A perfectly contestable market is given when potential entrants have access to the same technology as incumbents, there are no sunk costs and there is free entry and exit. According to the theory of contestable markets the nature of entry and exit barriers is the most important structural characteristic influencing the conduct and performance of firms (banks) operating in the industry concerned. In so doing, the contestable market hypothesis questions one of the central assumption critical to the traditional SCP paradigm. Entry barriers allow firms (banks) in highly concentrated markets to make optimal pricing and output decisions while effectively disregarding potential competitors (*Molyneux – Altunbas – Gardener*, 1997).

The expected relationship between local market structure, bank conduct, and bank performance continues to be the driving force behind anti-concentration enforcement in the banking industry. The SCP paradigm hypothesizes that where market resources are highly concentrated, collusive behavior (either tacit or overt) among firms will result in larger-than-normal profits (*Goddard – Molyneux – Wilson*, 2001). Contestability, in turn, implies that potential competitors could weaken any non-competitive pricing behavior through the threat of entry, thereby limiting the role of antitrust scrutiny during bank concentration, for example, through bank mergers. Note, in modern banking the threat of new entry does no longer require the presence of bricks-and-mortar offices, because banks can easily get access to new markets through telephone and Internet banking. As put in *Goddard – Molyneux – Wilson* (2001), nowadays brand image is likely to be more important than a physical presence.

3.1 Modeling Bank Profitability

3.1.1 Foundation of the Structure-Performance Relationship

The predominant methodology in Industrial Economics is the SCP framework. In following standard textbooks (i. e., *Waterson*, 1984), we introduce the basic idea of this framework by discussing the standard case of a monopolist maximizing profits by equating

marginal cost (MC) with marginal revenue. As known, this is related to price and the elasticity of demand via the well-known condition

$$(1^*) \qquad \frac{p - MC}{p} = \frac{1}{\eta},$$

where η is the own-price elasticity of demand and p the price of the good produced.

This well-known conditions says that the price-cost margin is equal to the inverse of the elasticity of demand. Obviously, this equilibrium condition becomes a causal relationship by assuming that conduct be determined by structure. In the given example, conduct was embodied in the assumption that the monopolist was able to choose output to maximize profits. Thus, causation runs from structure (monopoly) to performance. Of course, as stressed in *Waterson* (1984) the SCP paradigm had to extend beyond this simple frame in order to become the leading view in Industrial Economics.

In the empirical literature on banking, the SCP paradigm has also become the predominant methodology (see, among others, *Berger*, 1995). The most rigorous foundation of the SCP paradigm in banking is given in the seminal paper from *Hannan* (1991). In this paper, special emphasis is given to the roles of market concentration and market share (which are allowed to differ across the markets in which banks operate) as implied by the SCP paradigm. The structure of the model refers to that developed by *Klein* (1971) and is held, in the interest of tractability, rather simply. Though omitting a number of aspects of bank modeling, most notably, intertemporal considerations and the treatment of risk, the model by *Hannan* (1991) allows for deriving the key results of the SCP paradigm rigorously.

Hannan's analysis considers a bank that has M different types of deposits D and uses deposits and capital funds K to purchase securities S and make N different categories of loans L. Critical to the model is the assumption that variable costs are separable by activity. Since the analysis primarily focuses on the relationship between bank profits and market structure this assumption allows bank $i's$ profit π to be expressed as the sum of the variable profits earned in each type of loan and deposit category, with each functionally depending on the level of concentration CR in the relevant market, plus profits earned directly with capital funds, less total fixed cost C_f.

Formally, in following Hannan's notation the bank $i's$ profit per unit of time can be expressed as

$$(1) \qquad \pi^i = \sum_{n=1}^{N} \left(r_l^{in} - c_l^{in}\right) L_n^i + \left(r_s - c_s^i\right) S^i - \sum_{m=1}^{M} \left(r_d^{im} + c_d^{im}\right) D_m^i - C_f^i$$

where r_l^{in}, c_l^{in}, and L_n^i represent the interest rate, variable non-interest cost per Euro, and Euro quantity associated with the $n-th$ category of loans held by bank i; r_d^{im}, c_d^{im}, and D_m^i are equivalently defined for the $m-th$ category of deposits. Finally, r_s denotes the constant securities rate and c_s^i the variable non-interest costs of holding S^i.

Substituting the following standard balance sheet constraint into equation (1)

$$(2) \qquad \sum_n^N L_n^i\left(CR_l^n\right) + S^i = \sum_n^M D_m^i\left(CR_d^m\right) + K^i,$$

where all deposit D_m and loan categories L_n are indicated as functions of the appropriate market concentration measure CR, and the amount of securities S, serving as a residual to balance the equation. Using bank $i's$ total assets A as scale variable the following model of the $i-th$ bank yields the SCP base model

$$(3) \qquad \Pi^i = \sum_n^N \Pi_l^{in}\left(CR_l^n\right) + \sum_m^M \Pi_d^{im}\left(CR_d^m\right) + \left(r_s - c_s^i\right)K_A^i - C_{f,A}^i.$$

As mentioned, the profit equation (3) states that the return on asset Π is explained by the sum of the variable profit ratios attributable to category n loans and category m deposits, respectively, the capital-asset ratio K_A and the ratio of fixed costs to assets $C_{f,A}$.

As shown in *Hannan* (1991), the additivity of the profit ratios follows from the assumptions of profit maximization, separable costs, no cross-price effects among loan and deposit categories, and a security rate that does not vary with bank $i's$ security holdings.

Suppositional that total assets' being negatively correlated with deposit market concentration is appropriately accounted for, a key result of the analysis in *Hannan* (1991) is that the return of assets increases with respect to an increase in loan markets concentration and deposit markets concentration, respectively. That is, respective differentiation yields

$$(4) \qquad \frac{\partial\left(\pi^i / A^i\right)}{\partial CR_l^n} = \frac{\left(\partial \pi_l^{in} / \partial CR_l^n\right)}{A^i} > 0, \text{ and}$$

$$(5) \qquad \frac{\partial\left(\pi^i / A^i\right)}{\partial CR_d^m} = \frac{\left(\partial \pi_d^{im} / \partial CR_d^m\right)}{A^i} - \left[\pi^i / \left(A^i\right)^2\right]\left(\partial A^i / \partial CR_d^m\right) > 0.$$

Note, the given structure of the model implies that changes in deposit market concentration may have a bigger effect on the return on assets than do changes in loan market concentration since $\partial A^i / \partial CR_d^m < 0$. This is rooted in the specification of the balance sheet constraint assuming that changes in loan market concentration do not alter total assets (since securities are taken as residuals) while changes in deposit market concentration do. Since an increase of m – deposit concentration leads to a decrease of bank $i's$ m – deposit holdings and the respective concentration increase does not influence other categories of deposits or capital, it follows that total assets are negatively correlated with deposit concentration, as indicated above.

To sum up, the analysis thus far indicates that, according to the SCP paradigm, the return on assets of a bank is a function of the capital-asset ratio, the fixed cost-asset ratio, and the level of concentration of each of the potentially large numbers of markets in which the bank participates.

Data limitation in empirical research often requires that only concentration measures calculated from total deposit data can be used. As stressed by *Hannan* (1991), the use of a general deposit measure of concentration to account for the influence of concentration in many different markets may represent a serious compromise if the levels of concentration of the markets in which each bank operates are not highly correlated.

Thus the positive relationship between the return on assets and one measure of concentration, as typically estimated in the empirical literature, reflects the summation of the effects of concentration on the profits attributable to each of the bank's activities (divided by assets) plus a positive term reflecting the fact that increments in concentration also serve to reduce a bank assets. In algebraic terms, reshaping equations (4) and (5) accordingly yields the respective relation

$$(6) \qquad \frac{\partial\left(\pi^i / A^i\right)}{\partial CR} = \sum_n^N \frac{\left(\partial \pi_l^{in} / \partial CR\right)}{A^i} + \sum_m^M \frac{\left(\partial \pi_d^{im} / \partial CR\right)}{A^i} - \left[\pi^i / \left(A^i\right)^2\right]\left(\partial A^i / \partial CR\right) > 0 .$$

In the early empirical literature, this SCP model has been translated into the following specific form (see, *Frame – Kamerschen*, 1997)

$$(7) \qquad \Pi_i = a_0 + a_1 CR_j + \sum_{j=2}^{P} a_j Z_{ij} + \varepsilon_i \ ,$$

where Π is an accounting measure of performance (either return on assets or return on equity) for the $i-th$ bank, CR is a measure of market structure usually proxied by either an $n-$bank concentration ratio or the Hirschman-Herfindahl index HHI for the $j-th$ local (deposit) market (the HHI for a market equals the sum of each firm's market share squared,

that is, $HHI = \sum_{i=1}^{n} MS_{ij}^2$, MS_{ij} is the market share of the $i-th$ firm in the $j-th$ market), and Z_{ij} are additional explanatory variables included to control for individual bank risks and costs, as well as market demand factors. The term ε represents the usual stochastic disturbance term. Evidently, support for the hypothesis that market structure influences economic performance is found when the coefficient a_1 is, in a statistical sense, larger than zero.

3.1.2 Limitations of Bank Structure-Performance Modeling

The simple SCP model has been challenged on both grounds, theoretical and empirical. A good discussion of the limitations and shortcomings of the SCP model applied to the banking industry is given, among other, in *Molyneux – Altunbas – Gardener* (1997). The criticism on the bank SCP modeling has, primarily, to be viewed against the background of a rather mixed empirical evidence questioning the robustness and significance of a positive relationship between concentration and performance in banking. The lack of consistent results have led some researchers to argue that the literature contains too many inconsistencies and contradictions to establish a satisfactory SCP relationship in banking. The defects of trying to quantify empirically the relationship between commercial bank performance and market structure are many ranging from the difficulty to define a meaningful market area and a reasonable measure of concentration under a multi-product banking regime, to the incompetence to settle on adequate standards of performance measurements in banking (see, i. e. *Mooslechner – Schnitzer*, 1994).

However, the most profound objection against the SCP paradigm has been raised by researchers associated with the 'Chicago School' such as *Demsetz* (1973) and *Brozen* (1982). Their argumentation rests on the view that an industry's structure may exist as a result of a superior efficiency in production by some firms which enables them to increase market share thus increasing market concentration. This proposition termed as the efficiency structure hypothesis (ESH) suggests that it is not collusion which leads to higher-than-normal profits but rather economies of scale and scope. In response to the ESH , *Shepherd* (1982) introduced the relative market power hypothesis $(RMPH)$ that states that only firms with large shares and well-differentiated products be able to exert market power in pricing these products and earn supernormal profits.

In a seminal paper, *Berger* (1995) proposed a substantial refinement of the ESH by identifying two efficiency explanations of the positive profit-structure linkage: the X-efficiency version of the ESH says that firms with superior management or production technology have lower costs and therefore higher profits. These firms are also assumed to gain large market shares which may result in higher concentration levels. The scale efficiency version of the ESH argues that some firms just produce at more efficient scales than others, resulting in lower unit costs and higher profits. Note that scale efficiency is not identical to scale elasticity

(or economies of scale). Scale efficiency, if output-oriented, measures the change in output required to produce at minimum efficient scale, whereas scale elasticity is a measure related to the relative change in costs associated with an incremental change from a particular output level. The latter concept is usually associated with the measurement of economies of scale. Empirically, *Berger* (1995) finds support for this enhanced ESH when using an extensive U.S. dataset.

A major shortcoming of the SCP paradigm in investigation banking performance has also been considered the neglect of the risk-return preference of the bank's management. *Rhoades* (1982) claims rightly that ignoring the possibility of trading off potential profits for lower risk when a bank operates in different concentrated markets may very likely result in biased estimates of the coefficient of the concentration measure. Though neglecting risk preference aspects in the SCP paradigm is viewed as a serious defect enhancing bank SCP modeling into this direction has so far been not a very active area of research. Most empirical work in this strand of the literature is closely related to the so-called quiet-life hypothesis. This hypothesis proposes that banks with larger market power may forego some of their potential profits by choosing safer portfolios than banks with less market power. Thus, the profit rates in the monopolistic markets may not exceed those in the competitive markets but the monopoly profits may be more secure. *Heggestad* (1977) argues that the failure to find convincing evidence supporting the concentration-profitability relationship in banking as suggested by the SCP paradigm may result from greater avoidance of uncertainty by banks exercising large market power. This argument resembles very much the point already raised by *Hicks* (1935) who tartly stated that the best of all monopoly profits be the quiet life. Likewise, little attention has also been paid to the fact that the propensity of banks with large market power to inflate operating expenses could also be a possible explanation for the failure to find empirical evidence for the concentration-profitability relationship in banking. This point was forcefully raised, among others, by *Leibenstein* (1966). In this study, neither the 'Hicks' nor the 'Leibenstein' effect will be covered.

Conversely, more attention has been paid to the notion of contestability. According to the theory of contestability, the weak linkage between concentration and profitability in banking is mainly due to the low entry and exit barriers in local banking which forces banks to adopt competitive behavior. In the following sections, this and the major enhancements of the SCP paradigm will be empirically tested for the Austrian banking system. For this purpose we use an extended dataset of Austrian banks covering the period from 1995 to 2002.

3.2 Testing the Structure-Conduct-Performance Hypothesis, the Efficient-Structure Hypothesis and the Relative-Market-Power Hypothesis

As outlined above, the traditional SCP paradigm hypothesizes that, where market resources are highly concentrated, collusive behavior among banks will result in supernormal (monopoly) profits. To test this proposition two assumptions are critical: the existence of entry

barriers and the correct definition of markets to evaluate market concentration. For the analysis to come, we assume that both assumptions be valid. It is worth noting that the anti-contestability assumption is less serious because it can be checked empirically (we will do so in the succeeding chapter). The correct delineation of markets is the more demanding challenge since the usual markets concentration measures in empirical work build on the single-product-single-market perception. Needless to state that, in practice, banks usually supply many different products and operate in many markets. In the present study as to the treatment of market delineation we follow *Mooslechner – Schnitzer* (1994) and calculate one market share per bank – derived from deposit holdings. Since less than 20 percent of the Austrian banks entertain operation units outside of the regional district where the head office is located we conclude that this very region provide a good basis for the approximation of the home or local market condition of the banks under study. The definition of a regional district is identical with that of an Austrian administrative district, a geographic unit just below the NUTS-III level of EUROSTAT[4]). Thus, geographically a district (Bezirk) is treated as a local banking market, although the demand for banking services, as stressed by *Mooslechner – Schnitzer* (1994), without doubt is not restricted by district borders. However, we hold that the likelihood is relatively high that local banks do provide most of the services demanded by their local clientele. Accordingly, we use this market delineation notion, as proposed by *Mooslechner – Schnitzer* (1994), to form the basis for connecting bank-specific variables to relevant banking markets and allocating 'real' characteristics of these markets (districts) to individual banks (*Mooslechner – Schnitzer*, 1994).

3.2.1 Variable Definition and Data Sample

To check the proposed hypotheses we use a sample consisting of a balanced panel of annual report data of 747 Austrian banks (unfortunately, access to quarterly or monthly data was not made possible). The bank data were extracted from non-consolidated income statement and balance sheet data ranging over 1995 to 2002. The data set has been drawn from the electronic database of the Oesterreichische Nationalbank (OeNB). We will use this specific balanced dataset for all empirical tests conducted in this study[5]). In addition, an unbalanced bank sample is used, when we assess productive efficiency on the basis of DEA-oriented models (in chapter 5.2). The choice of a balanced data set entails the advantage that the empirical analysis is not aggravated by cumbersome sample selection issues which might be somewhat subtle, particularly in our case. However, the balanced data set used may generate a selection bias by its own since it has not been adjusted for bank mergers. Adjusting for mergers would have cut the available sample of Austrian banks over the entire period of investigation by more than a half which we consider to be too high a

4) According to *Mayerhofer* (2002) the area of an Austrian administrative district is 847 square kilometers on average, and its population is roughly 87,000.

5) All data of this database are deflated by GDP deflator, 1995 = 100.

price in terms of data loss. That is, the data set covers banks, not taken over by another bank since 1995 and 'take-over' banks since 1995. Since the majority of the bank mergers in Austria took place among small banks we do not expect a serious selection bias due to severe changes of behavior of these banks in terms of business mix and business conduct. What we do expect, however, is a selection bias due to the strong leaning of balanced samples not adjusted for mergers towards overstating well performing firms (i. e., survivor effect). Descriptive statistics of the balanced panel of Austrian banks are given in the Appendix.

In line with the respective empirical literature, we use the ratio return on assets, denoted ROA as the measure of banking profitability in the following regression analysis[6]). Further, the set of regressors consists of a measure of market concentration proxied by the Hirschman-Herfindahl index for the $i-th$ bank's local market derived from the respective deposit holdings, denoted $HHID$ and the number of branches located in the home district of the $i-th$ bank $(HHIB)$, respectively[7]). In the hypotheses tests conducted we employ the composed concentration measure $CONC$ constructed as interaction variable between $HHID$ and $HHIB$. We expect that this measure reflects the local market concentration more adequately than each index separately. Further regressors are the market share variable (MS) depicting the share of the $i-th$ bank in the local deposit market, capital-asset ratio (CAP), and the fixed cost ratio (FIX) defined as fixed capital expenses over assets.

In following *Berger* (1995), we assess the influence of three types of efficiency: the X-efficiency $(X-EFF)$, scale economies $(SCALE)$ and scale efficiency $(S-EFF)$ on banking profitability. The variable $X-EFF$ measuring managerial quality or technical efficiency is derived from a DEA model and a SFA-oriented cost function model, respectively. Both approaches (and both scores) are presented and discussed in detail in chapter 5. The variables $SCALE$ and $S-EFF$ are derived from respective DEA models which are also discussed in detail in chapter 5.2. A detailed description of the variables employed can be found in the Appendix.

3.2.2 Model, Test and Estimation Method

The regression model used to test the $SCPH$, the ESH and the $RMPH$ has the following structure:

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[6]) Alternative measures of profitability, such as the ratio return on equity, do not alter the basic findings of the econometric analyses to come.

[7]) The HHI for a home market is defined as $HHI=\sum_{i=1}^{n} MS_{ij}^2$, MS_{ij} is the market share of the $i-th$ firm in the $j-th$ market, $j=$ deposits and branches, respectively.

$$ROA_{i,t} = b_0 + b_1 CONC_{j,t} + b_2 MS_{j,t} + b_3 \left(X - EFF\right)_{i,t} + b_4 SCALE_{i,t} + b_5 \left(S - EFF\right)_{i,t} + \sum_{q=6}^{Q} b_q Z_{ij,t} + \lambda_t + \eta_i + \varepsilon_{i,t} \quad (8),$$

where Z_{ij} stands for the variables CAP, FIX, and for indicators proxying the (demand) characteristics of the home market of the $i-th$ bank. The λ_t and η_i are respectively unobserved time- and bank-specific effects, with time periods $t = 1,2,...,T$, and banks $i = 1,2,....,N$, and $\varepsilon_{i,t}$ is the remainder stochastic disturbance term.

As mentioned above, the home market of the $i-th$ bank is defined according to the district-based market delineation in *Mooslechner – Schnitzer* (1994). Due to lack of banking environment-related data we use district-based income level and district-based growth rate as home market indicators, denoted $BRPK$ and $WACHS$, respectively. Both, per capita income and real growth rate of the district in which the $i-th$ bank headquarters, are applied as proxies for the local demand structure that might determine banking services supply. In so doing, we maintain that, for example, the level of income per capita, by determining the structure of demand for banking services, determine to a large extent the market conditions for banks. For example, as compared with low-income customers a high-income clientele is expected to show both, a higher demand for advanced banking services such as investment banking products and a higher product quality awareness. Further, high-income districts are more likely to be economically more developed than low-income regions which again results in higher demand for high-end banking products in the former and for low-end banking products in the latter.

In accordance with the literature, we claim the findings of the econometric analysis based on equation (8) should be read as follows: the traditional structure-collusion hypothesis (i. e., SCP) is supported by the data if the coefficient on $CONC$ is positive and statistically significant $(b_1 > 0)$ regardless of the sign on market share and on the direct measures of efficiency, respectively. If the coefficient on $CONC$ is negative or insignificant and the coefficient on MS is positive and statistically insignificant $(b_2 > 0)$ this arguably reflects market power and supports the $RMPH$, regardless of the sign on efficiency measures. If profit is driven by productive efficiency as proposed by the ESH, the coefficients on both variables, concentration $CONC$ and market share MS should become statistically insignificant when applying direct efficiency measures such as $X - EFF$, $SCALE$, and $S - EFF$.

As known, obtaining consistent estimators of the coefficients in regression models using panel data requires to cope with the so-called omitted variables problem. In the empirical literature on banking profitability, the most preferred estimation technique has long been pooled OLS. Roughly speaking, consistent estimates via pooled OLS can only be obtained if the

assumption of orthogonality between the vector of observable explanatory variables $x \equiv (x_1, x_2, ...x_K)$ and the unobservable random variable c is valid, that is, $E(x'_{it}\, c_i) = 0$, $t = 1, 2, ...T$. However, as the ongoing discussion in the empirical literature on banking performance shows, the likelihood is quite high that this is too strong an assumption. Consequently, in order to make sure that we gain consistent and unbiased estimators for the coefficients in equation (8) both pooled OLS and the fixed effects estimation method are applied. The latter panel data estimation technique deals explicitly with the fact that omitted variables (as represented by c) may be arbitrarily related to the observable regressors x, that is, $E(x'_{it}\, c_i) \neq 0$. According to *Wooldridge* (2002), in many applications the whole point of using panel data is to allow for c_i to be arbitrarily correlated with the x_{it}. The fixed effects analysis provides consistent estimates of the coefficients on x_{it} in the presence of a time-constant omitted variable that can be arbitrarily related to the observables x_{it}.

When the fixed effect panel estimator is used, we add time dummy variables to account for yearly macro effects. This procedure is retained throughout the study. Standard test procedures are conducted to decide whether to apply fixed effects, random effects or pooled OLS estimations. That is, the significance of the individual effects is tested by an F-test for fixed effects estimation and a Breusch-Pagan test for random effects. The Hausman specification test indicates in the case of significant individual effects the use of fixed or random effects. In so doing, we check if the fixed effects estimation, our preferred estimation model, is superior to pooled OLS and random effects estimation, respectively.

In order to evaluate the differences in bank performance between urban and more rural banks we classify the overall bank sample into three sub-groups: $HUMAN$ for banks which are headquartered in districts belonging to Austria's human capital intensive economic regions, $PHYSICAL$ for banks which are headquartered in districts belonging to Austria's capital intensive economic regions, and $RURAL$ for banks which are headquartered in districts belonging to Austria's rural economic regions. This regional classification scheme is built on WIFO's 'district typology' due to *Palme* (1995)[8]). Since the regional classification due to WIFO correlates strongly with regional per capita income, both $BRPK$ and $WACHS$ are omitted from the regression analysis of the sub-groups. For further data details, we refer the reader to the Appendix.

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[8]) This WIFO regional classification scheme results in 9 economic regions: metropolitan area, city, suburban, medium-sized town, intensive industrial region, intensive touristic region, extensive industrial region, touristic periphery, industrial periphery. $HUMAN$ encompasses metropolitan districts, city districts, suburban districts, and medium-sized town districts. $PHYSICAL$ encompasses intensive industrial and intensive touristic districts. $RURAL$ encompasses extensive industrial regions and the industrial and touristic periphery.

3.2.3 Empirical Findings and Interpretation

The findings based on the estimation procedures discussed are reported in Table 3.1. The tests show that the fixed effects regression should provide efficient estimates conditioned on the respective structures of the underlying models. Contrary to *Mooslechner – Schnitzer* (1994), on the basis of the extended dataset covering the activities of Austrian banks from 1995 to 2002 we find support for the traditional $SCPH$. Given the regional demarcation within Austria's bank groups preventing them from harshly competing each other within their group, the result is not that surprising that Austrian banks do exert, to some degree, local market power. The coefficient on $CONC$ is larger than zero and significant, at least at the 10 percent significance level, in all model specifications for both, the overall sample and the regional classification except for the economic region denoted $PHYSICAL$ (remember this regional sub-group encompasses all districts with capital intensive production). However, the fact that the coefficient on $CONC$ is only weakly significant in the model covering local rural banks and highly significant in the model covering local urban banks indicates that the chosen market delineation may lean towards overstating the strength of the concentration-profitability linkage. We get a similarly structured support for the traditional $SCPH$ when $HHID$ and $HHIB$ enter the regression equation separately. The analysis shows very clearly that market power as measured by the market share on local deposits markets does not reflect efficiency. The coefficient on MS is negative and insignificant which, of course, indicates that the $RMPH$ is not supported by the data. The positive and significant influence of X-efficiency, derived from both DEA-oriented and SFA-oriented models, on bank profitability as measured by ROA does not interfere with the structure-collusion proposition. The positive relationship just indicates that X-efficiency exerts a direct and autonomous influence on profitability and does not affect bank performance indirectly via increased market power[9]). Interestingly, the estimated coefficient on $SCALE$ is insignificant indicating that scale economies have no significant impact on bank profitability in Austria. However, some (though weak) evidence can be detected supporting the view that an increase in scale efficiency may enhance banking profitability. This is in line with the expectation that banks operating closer to their optimal (cost minimizing) size reap higher profits. The estimates of the coefficients on the remaining variables (CAP, FIX) meet the expectations with a positive impact of the capital ratio and a negative impact of the fixed cost ratio on banking performance, respectively. The impact of the variables $BRPK$ and $WACHS$ on banking profitability in the model specification covering the overall sample is also negative, though in the case of $WACHS$ insignificant (that is, the higher the economic development of the home market, the lower the bank profits).

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[9]) The difference in coefficient estimates on $X-EFF_{DEA}$ and $X-EFF_{SFA}$, as reported in Table 3.1, is primarily due to a scale effect.

Table 3.1: Estimation results from robust fixed effects panel regression

Profit model (8)

Dependent variable: *ROA*	Coefficients	*p-values*	Coefficients	*p-values*
CONC	1.108	*0.000*	0.776	*0.050*
MS	-0.251	*0.562*	-0.287	*0.002*
X-EFF$_{DEA}$	1.053	*0.000*		
X-EFF$_{SFA}$			0.244	*0.031*
SCALE$_{DEA}$	-0.350	*0.520*	-0.309	*0.000*
S-EFF$_{DEA}$	0.412	*0.026*	0.236	*0.078*
FIX	-0.228	*0.000*	-0.302	*0.000*
CAP	0.140	*0.000*	0.093	*0.000*
BRPK	-0.561	*0.001*	-0.541	*0.744*
WACHS	-0.007	*0.429*	-0.018	*0.000*
Constant	-1.379	*0.000*	-1.951	*0.000*
R^2 adjusted	0.258		0.237	
p (F-test)	0.000		0.000	
p (Breusch-Pagan)	0.000		0.000	
p (Hausman)	0.000		0.000	
Number of banks	747		747	
Number of observations	5,976		5,976	

	HUMAN		PHYSICAL		RURAL	
	Coefficients	*p-values*	Coefficients	*p-values*	Coefficients	*p-values*
CONC	2.222	*0.000*	-1.140	*0.133*	0.924	*0.086*
MS	-0.652	*0.305*	-1.691	*0.065*	0.578	*0.425*
X-EFF$_{DEA}$	0.987	*0.000*	0.673	*0.000*	1.298	*0.000*
SCALE$_{DEA}$	-0.000	*0.579*	-0.737	*0.006*	-0.389	*0.056*
S-EFF$_{DEA}$	0.576	*0.075*	0.359	*0.357*	-0.433	*0.427*
FIX	-0.214	*0.000*	-0.331	*0.000*	-0.438	*0.000*
CAP	0.116	*0.000*	0.145	*0.000*	0.211	*0.000*
Constant	-1.748	*0.000*	0.052	*0.916*	-0.868	*0.192*
R^2 adjusted	0.354		0.316		0.159	
p (F-test)	0.000		0.000		0.000	
p (Breusch-Pagan)	0.000		0.000		0.000	
p (Hausman)	0.002		0.000		0.000	
Number of banks	243		242		262	
Number of observations	1,944		1,936		2,096	

The findings for the Austrian banking system based on firm-level data resemble to a large degree those gained by *Goddard – Molyneux – Wilson* (2001) for the European banking sector based on banking data from 15 European countries covering the period form 1989 to 1996. However, the explanatory power of the model estimated with the Austrian banks' dataset is significantly higher than that used by *Goddard – Molyneux – Wilson* (2001) to draw conclusions from a supranational dataset. Almost one fourth of the variation in banking profitability in Austria can be explained by the model presented as compared to 5 percent computed by *Goddard – Molyneux – Wilson* (2001) for the sample of European banks. Thus,

we hesitate to concur with the concerns, put forward by researchers such as *Berger* (1995), about the capability of such models to explain variations in banking performance.

By supporting, to some degree, the collusion hypothesis, our findings are at odds with the conventional view held in Austria maintaining that the Austrian banking market is overly competitive and, thus, only allows for extremely low banking profitability. In order to empirically assess the actual competitive conditions in the Austrian banking markets we enhance the analysis by the so-called Panzar-Rosse methodology. This approach, closely related to the New Empirical Industrial Organization literature, enables us to examine more closely the underlying nature of the structure-collusion linkage detected in the Austrian banking system.

3.3 Testing the Contestability Hypothesis

The approach developed by *Rosse – Panzar* (1977) and *Panzar – Rosse* (1982, 1987) is based on the estimation of the reduced form revenue equation of the market participants $R*(z,r,w)$, with z denoting exogenous variables shifting the firm's revenue function, r denoting exogenous variables shifting the firm's cost function and w representing factor prices (see, for example, *Hempell*, 2002). The reduced form equation is derived from marginal revenue and cost functions and the zero profit constraint in equilibrium. At the center of this approach is the estimation of the elasticities of total revenues of the individual firm with respect to the firm's input prices which are summed up to constitute the so-called $H-statistic$

$$H = \sum_{j=1}^{m} \left(\frac{\partial R*}{\partial w_j} \frac{w_j}{R*} \right). \tag{9}$$

Panzar – Rosse (1987) show that under certain assumptions (i. e., homothetic productions functions, exogenous factor prices) perfect competition is indicated by H equal to 1 in market equilibrium $(H=1)$. Values for H above 0 but below 1 correspond to the existence of monopolistic competition $(0<H<1)$. Values for H equal or below 0 are related to monopoly or perfectly collusive oligopoly $(H \le 0)$.

Panzar – Rosse (1987) motivate $H=1$ by stating that in a perfectly competitive equilibrium an increase in input prices and hence in average costs should lead to a proportionate price increase and – at the firm level – to a proportionate rise in revenues, yielding $H=1$. Under a monopoly or perfectly collusive oligopoly H is negative because a rise in input prices increases marginal costs and – by setting them equal to marginal revenues – reduces equilibrium output and the firms revenues, resulting in $H \le 0$. Consequently, the $H-statistic$ with $0<H<1$ covers the middleground, reflecting monopolistic competition behavior.

Though this approach due to the set of strong assumptions it is based upon needs some care when applied to banking, we share the view expressed, among others, in *Hempell* (2002) that the Panzar-Rosse methodology has proved itself to be a valuable tool in getting a closer look at (bank) market behavior conditions. For a useful and competent discussion of the foundation and limitation of the Panzar-Rosse approach, particularly when applied to banking, we refer the reader to *Hempell* (2002).

3.3.1 Variable Definitions and Data Sample

Using the OeNB dataset consisting of a balanced panel of annual report data of 747 Austrian universal banks ranging over 1995 to 2002 we define total revenue over total assets $(TRTA)$ as dependent variable in the Panzar-Rosse analysis aimed at assessing the adjustment of the banks' revenues in responds to changes in cost conditions. Following the literature, the costs for labor, fixed capital and funding are proxied by personnel expenses over assets (PEA), capital expenses over assets (CEA), and interest expenses over total funds (IEF). Differences in risk are captured by the risk capital ratio due to Basel I (RCA), scale economies are depicted by total assets (TA), and differences in business mix are covered by the ratio customer loans over total assets (CLA) and the ratio interbank deposits to total deposits $(IDTD)$, respectively.

3.3.2 Model and Test

In order to estimate the $H-statistic$, we set up the following estimation equation (similar in specification to that in *Molyneux – Lloyd-Williams – Thornton*, 1994):

$$\begin{aligned}\ln TRTA_{i,t} = a_1 + b_1 \ln PEA_{i,t} + b_2 \ln CEA_{i,t} + b_3 \ln IEF_{i,t} + c_1 \ln TA_{i,t} + c_2 \ln RCA_{i,t} \\ + c_3 \ln CLA_{i,t} + c_4 \ln IDTD_{i,t} + \lambda_t + \eta_i + \varepsilon_{i,t}\end{aligned} \quad (10),$$

with time periods $t = 1,2,...,T$, and banks $i = 1,2,....,N$. As indicated above, the λ_t and η_i are unobserved time- and bank-specific effects, respectively, and $\varepsilon_{i,t}$ is the remainder stochastic disturbance term.

As in the previous chapter, the above equation is estimated by both, pooled OLS and two-way error component panel regression. Again, in order to evaluate the differences in competitive behavior between urban and more rural banks we classify the overall bank sample into the three regional sub–groups $HUMAN$, $PHYSICAL$ and $RURAL$ according to WIFO's regional typology.

3.3.3 Empirical Findings and Interpretation

Starting with the results of the overall sample, the $H-statistic$ reaches a value of 0.68 which is consistent with monopolistic competition as the major characteristic of Austrian banks' behavior. Since the reported $H-value$ is closer to one than to zero we conclude that the structure-collusion linkage in the Austrian banking system as established in the previous chapter is rather fragile (the hypothesis of $H=0$ was strongly rejected). According to the common tendency in this literature $H-value$ between 0.5 and 1 suggests a fairly high level of contestability indicating that entry and exit conditions are relatively free. The result obtained for Austria is in line with a broad body of research suggesting that in Europe most banking markets exhibit distinct characteristics of contestability (see, for Europe, *Molyneux – Lloyd-Williams – Thornton*, 1994, and, for Germany, *Hempell*, 2002). Since the legal framework for banking in Europe is aimed at providing a level playing field suitable to ensure a high level of competition, empirical findings like these may be read as an additional piece of evidence corroborating the view that banking profitability in Europe is low because of potential (rather than actual) competition.

Table 3.2: Estimation results from robust fixed effects panel regression
Contestability model (10)

Dependent variable: ln*TRTA*	Overall sample	HUMAN	PHYSICAL	RURAL
ln*PEA*	0.332	0.371	0.343	0.195
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*
ln*CEA*	0.000	0.022	-0.028	-0.000
	(0.954)	*(0.000)*	*(0.000)*	*(0.167)*
ln*IEF*	0.344	0.330	0.377	0.344
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*
H-statistic	0.676	0.732	0.692	0.539
p (F-test)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
R^2 adjusted	0.639	0.702	0.616	0.694
p (F-test)	0.000	0.000	0.000	0.000
p (Breusch-Pagan)	0.000	0.000	0.000	0.000
p (Hausman)	0.000	0.000	0.000	0.000
Number of banks	747	243	242	262
Number of observations	5,976	1,944	1,936	2,096

p-values below the H-statistic are the values for the hypothesis H = 1.

As expected, the lowest $H-statistic$ of 0.54 is obtained for the banks operating in rural markets. Rural banking markets are still strongly demarcated and primarily serviced by small cooperative banks with a traditionally low competitive disposition. Banks that are headquartered in urban areas attain the highest $H-statistic$ of 0.73, indicating competitive conditions close to perfect (however, the hypothesis of $H=1$ was rejected).

As in most studies the costs for funds make the largest contribution to the $H-statistic$ with coefficients between 0.33 and 0.38. The lowest elasticity is estimated for the price of fixed capital, partially insignificant and partially of negative sign.

3.4 Concluding Remark

To sum up, a cautious reading of the empirical results presented in this section suggests that the likelihood be relatively low that the banking markets in Austria are strongly biased by perfect collusion. Likewise, on the grounds of the given evidence we can also reject the hypothesis of perfect competition for Austrian banks. In the face of the findings obtained it appears relatively safe to maintain that the Austrian banks do exert, on average, some local market power but the gains in terms of excess profits are rather minor due to low deterrence powers of the incumbent banks. The economic region with the seemingly strongest support for the structure-collusion link in banking (that is, the districts with human capital intensive production) is also the area where potential competition in banking runs high. Moreover, the overall measurement of the concentration–profit linkage appears to be somewhat upwards biased due to the chosen market delineation.

Consequently, the far more important driver of banking performance in Austria and elsewhere appears to be banking efficiency which we will focus on for the rest of the study.

4. Recent Approaches to Measuring Banks' Productive Efficiency – A Primer

In this section we give a brief introduction to the very basics of the two methods of performance measurement which are extensively applied in the remainder of this study. These best-practice methods are the Stochastic Frontier Analysis (SFA) and the Data Envelopment Analysis (DEA). The former approach is parametric, the latter non-parametric. The basic DEA models used to estimate the frontier functions refer to the deterministic mathematical programming approach assuming that the observed data are neither random nor contaminated by measurement errors. The alternative approach SFA assumes the opposite by explicitly accounting for data noise. Consequently, statistical (or econometric) techniques are used as analytical tools. Other methods used in applied work but not surveyed here are the Distribution Free Approach (DFA) and the Thick Frontier Approach (TFA), both of which are built on assumptions similar in spirit to the SFA. These methods differ mainly in their assumptions with respect to the shape of the efficient frontiers and in their treatment of random errors, respectively. More importantly, both methods used in this study are superior to the DFA and TFA, respectively in that the former provide point estimates of efficiency for each firm at one point in and over time.

For example, the DFA can be applied by using fixed effect panel regression. Each firm's inefficiency score is then measured by the coefficient of the very dummy associated with that firm. One of the advantages of DFA is that no specific distributional assumptions are required, the downside is that efficiency differences are assumed to be stable over time. If efficiency is to change over time, DFA is only capable of capturing the average deviation of each firm from the average best-practice frontier, rather than efficiency at one point in time (*Goddard – Molyneux – Wilson*, 2001). Similarly, the TFA also imposes no distributional assumptions, but does not provide exact point estimates of efficiency for each firm either. For a competent review of the methods not discussed here, we refer the reader, inter alia, to *Bauer et al.* (1998).

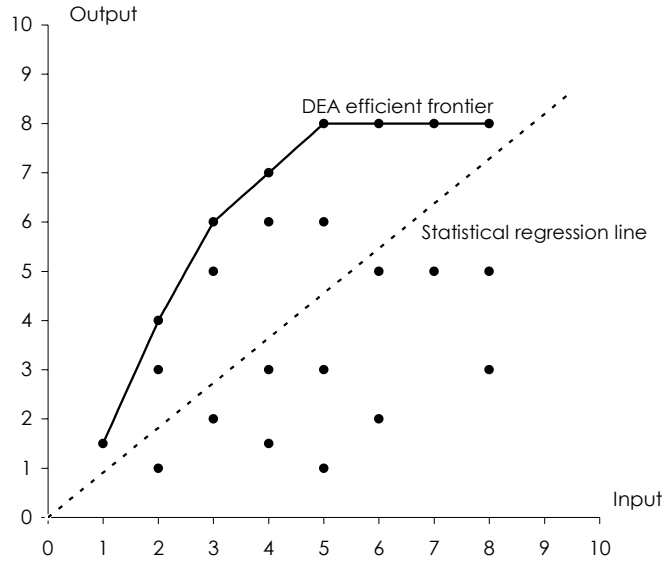
4.1 The Data Envelopment Analysis

Originally developed by *Charnes – Cooper – Rhodes* (1978), basic DEA applies deterministic mathematical programming techniques to observed input-output related data to reveal the efficient (best practice) frontier. Basic DEA is guided by the idea that the performance of a decision-making unit, denoted DMU, such as a firm or a non-profit institution is best estimated when one gauges the management's capability of minimizing input usage in the production of output (or vice versa) relative to the performance of other firms or institutions.

More formally, using multiple inputs and outputs the DEA techniques compute the technical efficiency of a DMU in relation to an estimated frontier surface. That is, the techniques employed are to uncover the closest fitting frontier which envelops all data points. To be

efficient the DMU has to lie on this envelopment surface. Those $DMUs$ that do not lie on this surface are termed inefficient. Thus, in contrast to parametric methods such as SFA, standard DEA does not account for data randomness. That is, no a-priori assumptions regarding the statistical distribution of the observed data points are required. This assumption concerning the data quality is considered to be one of the main deficiencies of the basic DEA models. The main advantage of DEA over SFA is that DEA models do not require a-priori assumptions with respect to the analytical form of the frontier (Figure 4.1).

Figure 4.1: Comparison of DEA and Regression Approaches



Source: *Siems – Barr* (1998).

In its simplest form, the DEA approach builds on the relative productive efficiency of a firm as measured by the ratio of its total weighted output to its total weighted input. By applying linear programming methods the DEA maximizes this ratio for each firm by putting higher weights on those inputs the firm uses least and those outputs the firm produces most (*Siems – Barr*, 1998).

As mentioned, the most basic DEA model has been pioneered by *Charnes – Cooper – Rhodes* (1978), since then known as CCR model. It is an input-oriented, constant returns-to-scale (CRS) model where for each firm or DMU, an efficiency measure is obtained by defining the ratio of all outputs over all inputs, that is, $\frac{u' y_O}{v' x_O}$ with y_O denoting the output vector of the $o-th$ firm and x_O the input vector, respectively. The output and input weights are denoted by u and v, respectively.

The optimal weights of the DMU_O, where o ranges over $1,2,.....,n$ are gained by solving the linear mathematical programming problem (1):

$$
\begin{aligned}
&\max_{u,v} && \theta = \sum_{i=1}^{s} u_i y_{iO} \\
&\textit{subject to} && \sum_{j=1}^{m} v_j x_{jO} = 1 \\
&(1) && \sum_{i=1}^{s} u_i y_{i,k} \le \sum_{j=1}^{m} v_j x_{j,k} \\
& && (k = 1,.....,n) \\
& && v_1, v_2, ..., v_m \ge 0 \\
& && u_1, u_2, ..., u_s \ge 0
\end{aligned}
$$

The linear program (1), called the multiplier form, is equivalent to the fractional programming problem which focuses on maximizing the ratio of weighted outputs over all weighted inputs of the DMU_O. Designing the maximization problem as a linear programming exercise has the advantage of avoiding the nuisance of an infinite number of solutions which plagues the fractional programming approach. In the applied literature the preferred form of the DEA programming problem is the dual form of the linear program (1) because of the computational ease due to fewer constraints. The relative efficiency scores are bounded by zero (lowest level of efficiency) and unity (highest level of efficiency).

4.2 The Stochastic Frontier Analysis

The SFA deals with the problem that not all deviations from the frontier may be due to inefficiency. Deviations from the benchmark may also occur due to bad (or good) luck or measurement errors. *Aigner – Lovell – Schmidt* (1977) address this problem by proposing a stochastic frontier model with a random disturbance term. This term is designed as the sum of two random components where the one is symmetrically distributed around zero capturing measurement errors and unobservable shocks and the other is strictly negative measuring inefficiency.

The basic SFA model has the following form in case of a production function:

$$
(2) \qquad y_{it} = \exp(x_{it}\beta + v_{it} - u_{it})
$$

with y_i denoting the output of the $i-th$ DMU, x_{it} is a $(1 \times k)$ vector of values of known inputs of production and β the unknown parameter vector, v_{it} stands for the symmetric and

u_{it} for the non-negative random term, respectively. The disturbance term v_i is assumed to be independently and identically distributed (iid) normal with zero mean and σ_v standard deviation, i. e., $N(0,\sigma_v^2)$. Though also iid and independently generated from v_i the inefficiency term u_i is supposed to follow a statistical distribution allowing for $u_i \geq 0$ such as, for example, the truncated normal distribution or the upper half of the $N\left(0,\sigma_u^2\right)$.

Battese – Coelli (1988) observe that an appropriate predictor for the technical efficiency involves the conditional expectation of $\exp\left(-u_{i,t}\right)$, given the random variable ε_{it}. Thus, technical efficiency can be estimated by

$$TE_{it} = E\left[\exp(u_{it}) \mid \varepsilon_{it}\right]. \tag{3}$$

As indicated above, the main shortcoming of SFA is its rather arbitrary choice of both, the functional form of the production (cost) function and the distributional assumption regarding the inefficiency component of the error term (see for a discussion of these topics, for example, *Wagenvoort – Schure*, 1999).

4.3 The Role of the Environment in Efficiency Analysis

In the applied efficiency measurement literature, a usual assumption is that all the firms investigated share the same production technology and face similar environmental conditions. However, this is certainly too strong an assumption since the ability of a production unit to transform inputs into outputs is usually influenced by both, its internal technical efficiency (the quality of its management) and its external operating environment which is often different from firm to firm. Examples of external factors affecting managerial efficiency include the form of ownership, market structure and market regulation. Thus, not controlling for external environmental factors such as external market conditions may substantially bias the measurement of managerial efficiency. Most importantly, the measurement of productive efficiency across firms is substantially impaired when managerial inefficiencies cannot be separated from those components of inefficiency that are external to a firm.

In this study we make an attempt to assess the technical efficiency (or X-efficiency) of the Austrian banking sector, with the focus on both, the internal and controllable factors and the environmental and non-controllable factors critical to banking markets.

In the respective literature various ways are discussed concerning the proper account of the impact of external variables when measuring firm efficiency (see for an introduction to this topic, i. e., *Coelli – Prasada Rao – Battese*, 1998). In the DEA-oriented efficiency measurement literature the two-stage approach is the most prominent. This approach uses the relative efficiency measure computed by a DEA model as the dependent variable in a

censored regression with the explanatory variables supposed to capture the impact of the external factors. Though this approach allows for testing the influence of external factors in terms of sign and significance it ignores the information contained in the input slacks and output surpluses. Consequently, this procedure does not provide an adequate analytical technique to separate the management component of inefficiency from the external components.

Fried – Schmidt – Yaisawarng (1999) introduce an extension of the two-stage model aimed at obtaining a measure of the management component of inefficiency that is unaffected by the influences of external or environmental factors. Only a pure measure of managerial inefficiency allows for comparing the performance of managers across firms because only in rare cases do firms operate under the same external environment. In order to isolate the internal factors *Fried – Schmidt – Yaisawarng* (1999) propose the following four-stage procedure. First, a DEA frontier based on the traditional input-output relation according to the standard production theory is computed. Second, depending on model specification the input slack (or the output surplus) is used as dependent variable in a regression analysis approach with a set of external factors as regressors measuring the relevant features of the external environment in which the DMU under investigation is operating. Third, these parameter estimates are used to adjust the input slacks or output surpluses of the $DMUs$ so that the adjusted values represent the allowable slack or surplus due to the operating environment (*Fried – Schmidt – Yaisawarng*, 1999). In the final stage the initial data is reassessed according to the calculations in the third stage and the initial DEA model is re-estimated on the basis of the adjusted data set.

Put differently, this procedure is aimed at adapting the external conditions of the $DMUs$ in the sense that the environmental factor is no longer critical in terms of biasing managerial inefficiency. As a result, a new frontier can be computed which is (or is supposed to be) net of environmental interferences and better qualified to measure the pure managerial component of inefficiency. In chapter 5.2, we apply an extended version of this approach to a balanced and an unbalanced panel of Austrian banks covering the period from 1995 to 2002. We primarily improve upon this approach by using a slacks-based DEA model (SBM) introduced by *Tone* (2001) and by introducing a Bootstrap estimator, respectively.

In the SFA-oriented literature, there are basically two approaches to address the issue of environment. The first approach treats the environment as a factor that changes the shape of the technology and thus is to be included directly into the production or cost function (see, i. e. *Good et al*, 1993). The second approach deals with the environment as a factor that changes directly the degree of technical efficiency and thus is to be modeled so that it directly exerts influence on the efficiency level (see, i. e., *Battese – Coelli*, 1995). Since the approach due to *Battese – Coelli* (1995) is, within the SFA philosophy, similarly motivated as the DEA-based four-stage approach due to *Fried – Schmidt – Yaisawarng* (1999) we apply

the Battese-Coelli model for gaining SFA-based managerial efficiency estimates for the Austrian banks that are not biased by distinct environmental conditions.

The reason why we apply both methodologies simply is that there is no consensus in the respective literature as to the best measurement technique for estimating frontier efficiency. The same applies to the production model used for estimating best-practice in banking. By using both different efficiency measurement procedures and different production models, we follow the recommendations brought forward by *Bauer et al.* (1998) suggesting that technical efficiency be assessed by various methods and various models to draw as much consistent information as possible. Thus, the efficiency scores, unadjusted and adjusted for environmental factors, generated by both methods based on various models are to be exposed to certain standard consistency and plausibility checks so as to gauge the thus generated findings in terms of reliability and information content (i. e., for regulatory authorities and/or for policy decision makers).

5. Banking Efficiency in Austria – A Micro-Macro Approach

5.1 Environmental Factors in SFA Efficiency Analysis – An Integrated Approach

5.1.1 The Battese-Coelli Approach

Battese – Coelli (1995) propose a SFA model that is capable of estimating the parameters of the stochastic frontier and the inefficiency model simultaneously. Their model is aimed at overcoming the nuisance of inconsistency associated with the usual two-stage approach. As known, the first stage of the traditional approach involves the specification and estimation of a stochastic frontier and the prediction of the technical efficiency scores, under the assumption that these efficiency effects are identically distributed. In the second stage the predicted technical inefficiencies are regressed upon a number of explanatory factors, hence suggesting the inefficiency scores are not identically distributed.

To be specific, the Battese-Coelli model differs from the base model as expressed by equation (2) in chapter 4.2 in that the efficiency term is made an explicit function of a vector of environmental factors, h_{it}, with the random term u_{it}, representing technical inefficiency, to be independently but not identically distributed as non-negative truncations of a general normal distribution of the form (see, *Coelli – Perelman – Romano*, 1999)

$$(1) \qquad N\left(m_{it} = \delta_0 + \sum_{j=1}^{M} \delta_j h_{j,it}, \sigma_u^2\right).$$

The parameters δ_0 and δ_j are simultaneously estimated, with all the other unknown parameters of the model, by maximum likelihood. In addition, the reparameterization $\sigma^2 = \sigma_v^2 + \sigma_u^2$ and $\gamma = \sigma_u^2 / \sigma^2$, replacing σ_u^2 and σ_v^2 is employed which has advantages during estimation. Since the value of γ must lie between zero and one the γ – parameterization facilitates the iterative maximization algorithm involved. A value of γ of zero (one) is related to a situation with the deviations from the frontier entirely due to noise (inefficiency). As expressed in *Coelli – Perelman – Romano* (1999) technical efficiency is then estimated as

$$(2) \qquad \begin{aligned} TE_{it} &= E\left[\exp(u_{it}) \mid \varepsilon_{it}\right] \\ &= \left\{\exp\left[-\mu_{it} + \frac{1}{2}\sigma_*^2\right]\right\} \left\{\Phi\left[\frac{\mu_{it}}{\sigma_*} - \sigma_*\right] \Big/ \Phi\left[\frac{\mu_{it}}{\sigma_*}\right]\right\}, \end{aligned}$$

where $\Phi(\bullet)$ denotes the distribution function of the standard normal variable,

$$\mu_{it} = (1-\gamma)\left[\delta_0 + \sum_{j=1}^{M}\delta_j h_{j,it}\right] - \gamma\varepsilon_{it}, \quad (3)$$

and

$$\sigma_*^2 = \gamma(1-\gamma)\sigma^2. \quad (4)$$

The technical efficiency estimates TE obtained by the Battese-Coelli model include the influence of environmental factors and, hence, are, technically speaking, gross measures. In order to gain efficiency scores net of environmental factors the term $\sum_{j=1}^{M}\delta_j h_{j,it}$ in equation (1) has to be replaced by $\min\left(\sum_{j=1}^{M}\delta_j h_{j,it}\right)$ and the technical efficiency predictions have to be re-calculated. In so doing, efficiency is measured under the terms that all firms are assumed to face identical external conditions. Assuming that all major environmental factors have been accounted for, the thus gained net efficiency scores are supposed to be reliable measures of pure managerial efficiency. Consequently, the difference between the gross and the net efficiency measure of the $i-th$ firm may be viewed as the contribution of the environment to the inefficiency of that firm.

5.1.2 Input and Output Definition and Data Sample

In the banking efficiency literature the most debated issue regards the modeling of the bank production process. There are several approaches used which differ in the definition and measurement of banks' inputs and outputs. The various production models reflect the different views held by researchers regarding the nature and functions of financial intermediaries. In the empirical efficiency literature the intermediation approach is frequently considered to be superior for evaluating frontier efficiency (*Molyneux – Altunbas – Gardener*, 1997). This model views financial institutions as mediators between the supply and the demand of funds. Accordingly, loans and investments are taken as outputs whereas labor, capital and deposits are regarded as inputs to the bank's production process. However, deposits may also be viewed as output to the bank's production process which is done so by the so-called production approach. Deposits are also viewed as output in the value-added approach and the user cost approach, respectively, since deposits create value added and cause opportunity costs to the customer.

As already pointed out, since there is no agreement on the perfect production approach in the banking literature (because of a lack of a well-founded and generally accepted theory of intermediation) we use, within the frame of SFA, a variation of the intermediation and the

production approach as proposed, among others, by *Williams* (2002) with total customer loans Q_1, other earning assets Q_2, and total customer deposits Q_3 regarded as outputs and with price of labor P_1 (staff expenses per employee), price of funding P_2 (interest expenses over total deposits) and price of fixed capital P_3 (other non-interest expenses over total fixed assets) regarded as inputs. The vector of environmental variables consists of the local market indicators used in the performance analysis covering regional economic conditions such as the income per capita and regional demographic and structure conditions. Since we employ the stochastic cost frontier approach to obtain estimates of X-efficiencies total costs VC are represented by the sum of staff expenses, other non-interest expenses and interest expenses. The data used to estimate the cost function parameters are identical with the bank sample applied in the previous sections. That is, we use a data sample consisting of a balanced panel of annual report data of 747 Austrian banks, extracted from non-consolidated income statement and balance sheet data ranging over 1995 to 2002.

5.1.3 ML Estimation of the Stochastic Cost Fourier Function

In the SFA-oriented banking efficiency literature the focus is on assessing productive efficiency via the cost function approach. Due to the duality concept the production function and cost function approach contain the same information about the production possibilities of a firm. Thus, both views generate identical efficiency estimates. Since a bank is usually a multi-product firm, the researchers' choice of a stochastic frontier cost model is a quite natural one.

The Fourier-flexible functional form is applied to estimate the common cost function for the Austrian banking industry using the stochastic frontier methodology proposed by *Battese – Coelli* (1995). There is consensus that the global approximation of the Fourier-flexible form is superior to the local approximations like the commonly specified translog form (*Casu – Molyneux*, 2004).

The stochastic frontier cost function in the Fourier-flexible form to be estimated has the following structure:

$$
\begin{aligned}
\ln VC = {} & \alpha_0 + \tau_1 T + 1/2\,\tau_2 T^2 + \sum_{i=1}^{3} \alpha_i \ln Q_i + \sum_{j=1}^{2} \beta_j \ln P_j + \sum_{i=1}^{3} \gamma_i T \ln Q_i + \sum_{j=1}^{2} \theta_j T \ln P_j \\
& + 1/2 \Big[\sum\nolimits_{i=1}^{3} \sum\nolimits_{j=1}^{3} \theta_{ij} \ln Q_i \ln Q_j + \sum\nolimits_{i=1}^{2} \sum\nolimits_{j=1}^{2} \psi_{ij} \ln P_i \ln P_j \Big] + \sum_{i=1}^{3} \sum_{m=1}^{2} \eta_{im} \ln Q_i \ln P_m \\
& + \sum_{i=1}^{3} \left[a_i \cos(z_i) + b_i \sin(z_i) \right] + \sum_{i=1}^{3} \sum_{j=1}^{3} \left[a_{ij} \cos(z_i + z_j) + b_{ij} \sin(z_i + z_j) \right] \\
& + \sum_{i=1}^{3} \sum_{j\geq 1}^{3} \sum_{k\geq j, k\neq i}^{3} \left[a_{ijk} \cos(z_i + z_j + z_k) + b_{ijk} \sin(z_i + z_j + z_k) \right] + v_i + u_i
\end{aligned}
\tag{5}
$$

where VC, P_1 and P_2 are normalized by P_3, T is a time trend, and the z_i are adjusted values of $\ln Q_i$ so that they span the interval $[0.1*2\pi, 0.9*2\pi]$, with $z_i = 0.2\pi - \mu a \ln Q_i$ where $\mu = (0.9*2\pi - 0.1*2\pi/(b-a))$ and $[a,b]$ is the range of $\ln Q_i$. The specification of z_i is due to *Gallant* (1981) who observed that the given restrictions exposed on z_i reduce the approximation problems near the endpoints. In following *Berger – Mester* (1997) and *Altunbas et al.* (2001) the Fourier terms only encompass the outputs because the input prices show very little variation. The random errors v_i are assumed to be $iid\ N(0,\sigma_v^2)$, independently distributed of the u_i. The technical inefficiency effects u_i are explained by

$$E[u_i] = m_i = \delta_0 + \delta_1 \ln RISK_i + \delta_2 \ln BRPK_{ij} + \delta_3 WACHS_{ij} + \delta_4 \ln DICHTE_{ij} + \delta_5 \ln ALTQ_{ij} + \delta_6 \ln ALQ_{ij} + E[w_i] \quad (6)$$

where i stands for the $i-th$ bank and j for the district, the $i-th$ bank is located. The variable $RISK$ is the $i-th$ bank's credit risk, $BRPK$ is income per capita of the home district of the $i-th$ bank, $WACHS$ is the economic growth rate of the home district of the $i-th$ bank, $DICHTE$ the population density of the home district of the $i-th$ bank, $ALTQ$ the share of population older than 65 in total population of the home district of the $i-th$ bank, and ALQ is the unemployment rate of the home district of the $i-th$ bank. The random variable w_i is defined by the truncation of the normal distribution $N(0,\sigma_w^2)$, such that the point of truncation is $-(\delta_0 + \sum_{j=1}^{M} \delta_j h_{j,it})$. This assumption allows u_i being a non-negative truncation of the $N\left(m_{it} = \delta_0 + \sum_{j=1}^{M} \delta_j h_{j,it}, \sigma_u^2\right)$-distribution as requested by the Battese-Coelli estimation procedure.

As indicated above, we assume that the cost function is linearly homogenous in input prices which is achieved by scaling the dependent variable and the input prices by the price of fixed capital and by imposing the following standard restrictions on equation:

$$\theta_{ij} = \theta_{ji} \qquad \psi_{ij} = \psi_{ji}, \qquad (i = 1,2,3),\ (j = 1,2)$$

$$\sum_{j=1}^{2} \beta_j = 1, \qquad \sum_{j=1}^{2} \psi_{ij} = 0, \qquad \sum_{m=1}^{2} \eta_{im} = 0 \quad (7)$$

As emphasized by *Girardone – Molyneux – Gardener* (2004) and others, in the efficiency literature the consideration of input share equations comprising Shepherd's Lemma restrictions is excluded in order to allow for the possibility of allocative inefficiency.

The parameters of the stochastic frontier cost function represented by equation (5) and (6) are estimated by applying Maximum-Likelihood estimation as suggested by *Battese – Coelli* (1995). The estimation was carried out using the software package FRONTIER 4.1 (*Coelli*, 1996).

At this point of the empirical analysis, it is worth noting that in the applied banking efficiency literature the cost function approach is frequently used to estimate the extent of scale economies based on the elasticity of total cost with respect to output. Economies, diseconomies and constant return-to-scale are assumed to exist if the elasticity estimate is less than one, greater than one, or equal to one, respectively. That is, scale elasticities are estimated by summing the partial derivatives of the cost function with respect to each output according to the following expression

$$SCALE_{SFA} = \sum_{i=1}^{n} \frac{\partial \ln VC}{\partial \ln Q_i}. \qquad (8)$$

The degree of scale economies based on equation (8) is usually computed for bank size groups (i. e., small, medium, large) using the mean data level of the respective variables for each bank group. Estimating the degree of scale economies at the firm level using $SCALE$ as computed by equation (8) often generates counterproductive results. As noted above, in this study we evaluate the scale elasticities under the multiple-input-multiple-output framework of DEA which generates meaningful estimates of the degree of scale economies for each single bank under study.

Likewise, the cost function approach is also used to test for the existence of economies of scope at the level of bank groups. According to *Baumol – Panzar – Willig* (1988) a sufficient condition for overall economies of scope is the presence of cost complementarities between outputs. Cost complementarities (and hence the existence of scope economies) imply that the following relation holds

$$\frac{\partial^2 VC}{\partial Q_i \partial Q_j} < 0 \qquad for\ i \neq j\ . \qquad (9)$$

However, the test for cost complementarities is a local test and in the case of translog cost functions it is impossible to have cost complementarities at every point in time (i. e., *Berger – Hanweck – Humphry,* 1987). Thus, in the empirical literature a more appropriate test due to *Willig* (1979) is applied to identify the existence of scope economies. *Willig* (1979) suggests that scope economies $SCOPE$ be measured as follows:

$$(10) \qquad SCOPE_{SFA} = \frac{VC(Q_1,0,..,0)+VC(0,Q_2,0,..,0)+...+VC(0,...,0,Q_n)-VC(Q_1,Q_2...,Q_n)}{VC(Q_1,Q_2...,Q_n)}$$

Overall economies (diseconomies) of scope are indicated by $SCOPE > 0$ $(SCOPE < 0)$.

In this study, contrary to the usance in the respective literature, we refrain from calculating an indicator of economies of scope altogether since we consider the available data based on balance sheets and income statements as not appropriate to compute $SCOPE$ or related measures of scope economies. In the view taken in this study, product differentiation must be more articulate than usually provided by balance sheets and income statements in order to yield reliable and meaningful scope measurements in banking.

5.1.4 Results

To save space, only the ML estimates of the integrated inefficiency model (6) are presented in Table 5.1.1. The estimated coefficients of the environmental variables have the expected signs. The level of per capita income, the regional growth rate, population density and the capital ratio have a positive and mostly significant impact on X-efficiency while credit risks, the local older population ratio and the local unemployment rate exert a negative, but as to the latter variable, insignificant influence on technical efficiency[10]).

Table 5.1.1: ML-estimation results for the inefficiency model
Equation (6)

Dependent variable: *u*	Coefficients	*p-values*
CAP	0.149	*0.008*
RISK	-0.325	*0.009*
BRPK	1.049	*0.015*
WACHS	2.073	*0.101*
DICHTE	0.181	*0.023*
ALTQ	-1.695	*0.020*
ALQ	-0.099	*0.131*
Constant	-18.064	*0.000*
$\hat{\sigma}_s^2$	0.248	
$\hat{\gamma}$	0.977	
Log(likelihood)	4,530.816	
Number of banks	747	
Number of observations	5,976	

[10]) A likelihood ratio test was conducted to check whether the chosen model specification (5) provides the best fit to the data. In addition, the functional form of our model was tested against the hypothesis of a standard translog function. The structural tests support both the choice of the functional form (Fourier-flexible form) and the model augmented by the set of environmental factors. The tests are not reported but available on request.

Table 5.1.2a: X-EFF$_{SFA}$ of banks sectors

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Joint stock banks and private banks								
Minimum	0.269	0.260	0.251	0.242	0.233	0.224	0.216	0.207
Maximum	0.881	0.878	0.875	0.872	0.869	0.866	0.863	0.859
Mean	0.690	0.684	0.678	0.672	0.665	0.659	0.652	0.645
Median	0.644	0.636	0.629	0.621	0.614	0.606	0.598	0.590
Standard deviation	0.143	0.145	0.146	0.148	0.150	0.151	0.153	0.155
Coefficient of variation	0.207	0.211	0.216	0.220	0.225	0.230	0.235	0.240
Savings banks								
Minimum	0.634	0.626	0.619	0.611	0.603	0.595	0.587	0.579
Maximum	0.948	0.947	0.945	0.944	0.943	0.941	0.940	0.938
Mean	0.757	0.752	0.746	0.741	0.735	0.729	0.723	0.717
Median	0.747	0.741	0.735	0.729	0.723	0.717	0.711	0.705
Standard deviation	0.067	0.068	0.070	0.071	0.072	0.074	0.075	0.076
Coefficient of variation	0.089	0.091	0.093	0.096	0.098	0.101	0.104	0.107
State mortgage banks								
Minimum	0.771	0.765	0.760	0.755	0.749	0.744	0.738	0.732
Maximum	0.995	0.994	0.994	0.994	0.994	0.994	0.994	0.994
Mean	0.889	0.887	0.884	0.881	0.878	0.875	0.872	0.869
Median	0.580	0.572	0.564	0.556	0.547	0.539	0.530	0.522
Standard deviation	0.072	0.073	0.075	0.077	0.079	0.080	0.082	0.084
Coefficient of variation	0.081	0.083	0.085	0.087	0.089	0.092	0.094	0.097
Raiffeisen credit cooperatives								
Minimum	0.277	0.268	0.259	0.250	0.241	0.232	0.223	0.215
Maximum	0.970	0.969	0.968	0.968	0.967	0.966	0.965	0.964
Mean	0.750	0.745	0.739	0.734	0.728	0.722	0.716	0.710
Median	0.747	0.742	0.736	0.730	0.724	0.718	0.712	0.706
Standard deviation	0.081	0.082	0.084	0.085	0.086	0.088	0.089	0.090
Coefficient of variation	0.108	0.110	0.113	0.116	0.119	0.122	0.124	0.127
Volksbank credit cooperatives								
Minimum	0.506	0.497	0.488	0.479	0.470	0.461	0.452	0.443
Maximum	0.995	0.995	0.995	0.995	0.994	0.994	0.994	0.994
Mean	0.672	0.665	0.658	0.651	0.644	0.637	0.630	0.622
Median	0.654	0.647	0.639	0.632	0.624	0.617	0.609	0.601
Standard deviation	0.099	0.101	0.103	0.104	0.106	0.108	0.110	0.112
Coefficient of variation	0.148	0.152	0.156	0.160	0.165	0.169	0.174	0.179
All banks								
Minimum	0.269	0.260	0.251	0.242	0.233	0.224	0.216	0.207
Maximum	0.995	0.995	0.995	0.995	0.994	0.994	0.994	0.994
Mean	0.744	0.738	0.733	0.727	0.721	0.715	0.709	0.703
Median	0.744	0.738	0.733	0.727	0.721	0.715	0.708	0.702
Standard deviation	0.089	0.090	0.092	0.093	0.095	0.096	0.098	0.099
Coefficient of variation	0.119	0.122	0.125	0.128	0.131	0.134	0.138	0.141

Source: OeNB; WIFO computations.

Table 5.1.2b: X-EFF$_{SFA}$ of banks headquartered in economic regions

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Human capital intensive								
Minimum	0.269	0.260	0.251	0.242	0.233	0.224	0.216	0.207
Maximum	0.995	0.995	0.995	0.995	0.994	0.994	0.994	0.994
Mean	0.733	0.727	0.721	0.716	0.710	0.703	0.697	0.691
Median	0.736	0.730	0.724	0.718	0.712	0.705	0.698	0.692
Standard deviation	0.104	0.106	0.108	0.109	0.111	0.113	0.114	0.116
Coefficient of variation	0.142	0.145	0.149	0.153	0.156	0.160	0.164	0.168
Physical capital intensive								
Minimum	0.277	0.268	0.259	0.250	0.241	0.232	0.223	0.215
Maximum	0.954	0.953	0.952	0.951	0.949	0.948	0.947	0.945
Mean	0.736	0.731	0.725	0.719	0.713	0.707	0.701	0.695
Median	0.739	0.733	0.728	0.722	0.715	0.709	0.703	0.697
Standard deviation	0.087	0.088	0.090	0.091	0.092	0.094	0.095	0.096
Coefficient of variation	0.118	0.121	0.124	0.127	0.129	0.132	0.136	0.139
Rural								
Minimum	0.593	0.585	0.577	0.569	0.561	0.552	0.544	0.535
Maximum	0.970	0.969	0.968	0.968	0.967	0.966	0.965	0.964
Mean	0.761	0.756	0.751	0.745	0.740	0.734	0.728	0.722
Median	0.754	0.748	0.743	0.737	0.731	0.725	0.719	0.713
Standard deviation	0.070	0.072	0.073	0.074	0.076	0.077	0.079	0.080
Coefficient of variation	0.092	0.095	0.097	0.100	0.102	0.105	0.108	0.111

Source: OeNB; WIFO computations.

Table 5.1.2c: X-EFF$_{SFA}$ of banks headquartered in NUTS-I regions

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Eastern Austria								
Minimum	0.269	0.260	0.251	0.242	0.233	0.224	0.216	0.207
Maximum	0.995	0.995	0.995	0.995	0.994	0.994	0.994	0.994
Mean	0.762	0.757	0.751	0.746	0.741	0.735	0.729	0.723
Median	0.758	0.753	0.747	0.742	0.736	0.730	0.724	0.718
Standard deviation	0.096	0.098	0.099	0.101	0.103	0.104	0.106	0.108
Coefficient of variation	0.126	0.129	0.132	0.135	0.139	0.142	0.145	0.149
Southern Austria								
Minimum	0.529	0.520	0.511	0.503	0.494	0.485	0.476	0.466
Maximum	0.969	0.969	0.968	0.967	0.966	0.965	0.964	0.964
Mean	0.743	0.737	0.732	0.726	0.720	0.714	0.708	0.702
Median	0.742	0.736	0.730	0.724	0.718	0.712	0.706	0.699
Standard deviation	0.070	0.071	0.072	0.073	0.075	0.076	0.077	0.078
Coefficient of variation	0.094	0.096	0.098	0.101	0.104	0.106	0.109	0.112
Western Austria								
Minimum	0.277	0.268	0.259	0.250	0.241	0.232	0.223	0.215
Maximum	0.995	0.994	0.994	0.994	0.994	0.994	0.994	0.994
Mean	0.734	0.728	0.722	0.716	0.710	0.704	0.698	0.692
Median	0.739	0.733	0.727	0.721	0.715	0.709	0.703	0.697
Standard deviation	0.091	0.092	0.094	0.095	0.097	0.098	0.100	0.101
Coefficient of variation	0.124	0.127	0.130	0.133	0.136	0.139	0.143	0.146

Source: OeNB; WIFO computations.

In Table 5.1.2a the estimates of the gross X-efficiency measures are reported indicating that the average cost efficiency ratio of the Austrian banking system, unadjusted for environmental influences, ranges from 0.74 (1995) to 0.70 (2002). Remarkably, the evolution of the technical gross performance of the Austrian banks over time appears to be declining. The bank group with the highest average gross efficiency level over the period covered is the State mortgage banks group with an unadjusted cost efficiency 0.87 (or 87 percent). Equivalently, this bank group wastes, on average, 13 percent of its costs relative to the best practice bank. According to these estimates, the group of Volksbank credit cooperatives is the least gross efficient Austrian banking group with a waste ratio of about one third, on average, of its available resources.

When the differences in local environment are taken into account as expressed by the net-gross efficiency ratio, denoted $X - EFF_{SFA}^{Ratio}$ the differences in management quality diminishes (see, Table 5.1.3a). The efficiency level net of environmental factors not only exceeds, on average, the gross efficiency level by a margin of 25 percent over the period of investigation but also reduces the average range of volatility as measured by the coefficient of variation. The spread between the best performing bank group (savings banks) and the least-well performing bank group (Volksbank credit cooperatives) as measured by pure management efficiency (net of environment) narrows to 7 basis points on average as compared to a spread of 20 basis points between best (mortgage banks) and worst performer (Volksbank credit cooperatives) as measured by gross efficiency scores.

To conclude, the presented findings seem to suggest that the local market conditions considered external to a bank are, on average, lowering the overall banking efficiency in Austria. The differences in banking performance in Austria are mainly due to differences in (local) environment rather than differences in management quality. However, standard tests indicate that the differences between net and gross efficiency scores may not always be significant in a statistical sense.

When the X-efficiency findings are arranged according to banks operating in different geographical areas, the disparities among the regions are not as articulate as expected (see Table 5.1.2b, and c; Table 5.1.3b and c). Surprisingly, there are only minor differences observable as to banks having their head office in one of the three NUTS-I regions or in one of the regional clusters due to *Palme* (1995). According to these model computations, as to internal efficiency, it seemingly doesn't matter much in which geographic or economic region a bank is having its head office, since all banks gain in efficiency, on average, after controlling for environmental differences across local markets.

Table 5.1.3a: X-EFF$_{SFA}^{Ratio}$ of banks sectors

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Joint stock banks and private banks								
Minimum	0.571	0.775	0.959	0.784	1.065	0.997	1.109	0.854
Maximum	1.690	1.650	1.816	1.663	1.566	1.686	1.743	1.575
Mean	1.196	1.262	1.298	1.274	1.239	1.269	1.306	1.286
Median	1.226	1.276	1.290	1.246	1.228	1.278	1.293	1.310
Standard deviation	0.253	0.202	0.204	0.195	0.130	0.168	0.149	0.168
Coefficient of variation	0.212	0.160	0.157	0.153	0.105	0.132	0.114	0.131
Savings banks								
Minimum	1.030	1.033	1.036	1.038	1.040	1.042	1.040	1.028
Maximum	1.468	1.465	1.476	1.483	1.434	1.439	1.468	1.548
Mean	1.262	1.268	1.272	1.285	1.290	1.292	1.301	1.305
Median	1.275	1.284	1.278	1.297	1.302	1.305	1.311	1.311
Standard deviation	0.092	0.088	0.087	0.092	0.091	0.090	0.098	0.104
Coefficient of variation	0.073	0.069	0.068	0.071	0.071	0.070	0.075	0.080
State mortgage banks								
Minimum	0.954	0.930	0.957	0.947	0.976	0.970	0.928	0.959
Maximum	1.120	1.105	1.089	1.073	1.153	1.166	1.120	1.190
Mean	1.038	1.028	1.035	1.009	1.053	1.037	1.041	1.087
Median	1.048	1.049	1.046	1.003	1.039	1.022	1.037	1.100
Standard deviation	0.059	0.064	0.047	0.048	0.054	0.064	0.061	0.071
Coefficient of variation	0.057	0.063	0.045	0.047	0.052	0.061	0.058	0.065
Raiffeisen credit cooperatives								
Minimum	1.001	1.004	0.773	0.976	0.968	0.995	0.922	0.900
Maximum	1.789	1.842	1.841	1.929	1.936	1.895	1.896	2.092
Mean	1.246	1.245	1.248	1.262	1.264	1.278	1.294	1.296
Median	1.243	1.242	1.247	1.262	1.261	1.275	1.289	1.298
Standard deviation	0.100	0.102	0.105	0.104	0.110	0.110	0.119	0.122
Coefficient of variation	0.080	0.082	0.084	0.082	0.087	0.086	0.092	0.094
Volksbank credit cooperatives								
Minimum	0.983	0.983	0.986	0.989	0.985	0.982	0.958	0.982
Maximum	1.470	1.754	1.737	1.925	1.605	1.591	1.704	2.168
Mean	1.315	1.343	1.344	1.355	1.333	1.355	1.385	1.412
Median	1.331	1.364	1.367	1.365	1.351	1.371	1.396	1.412
Standard deviation	0.106	0.122	0.124	0.141	0.112	0.122	0.137	0.170
Coefficient of variation	0.081	0.091	0.092	0.104	0.084	0.090	0.099	0.120
All banks								
Minimum	0.571	0.775	0.773	0.784	0.968	0.970	0.922	0.854
Maximum	1.789	1.842	1.841	1.929	1.936	1.895	1.896	2.168
Mean	1.249	1.253	1.257	1.269	1.268	1.282	1.299	1.304
Median	1.250	1.255	1.261	1.273	1.272	1.283	1.300	1.305
Standard deviation	0.112	0.113	0.115	0.116	0.113	0.117	0.125	0.132
Coefficient of variation	0.090	0.090	0.091	0.091	0.089	0.091	0.096	0.101

Source: OeNB; WIFO computations.

Table 5.1.3b: X-EFF$_{SFA}^{Ratio}$ of banks headquartered in economic regions

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Human capital intensive								
Minimum	0.571	0.775	0.773	0.784	0.976	0.970	0.928	0.854
Maximum	1.755	1.842	1.841	1.929	1.936	1.895	1.896	2.168
Mean	1.251	1.265	1.269	1.275	1.274	1.287	1.304	1.303
Median	1.264	1.276	1.276	1.281	1.283	1.290	1.312	1.305
Standard deviation	0.140	0.139	0.144	0.146	0.131	0.139	0.145	0.162
Coefficient of variation	0.112	0.110	0.113	0.115	0.103	0.108	0.111	0.124
Physical capital intensive								
Minimum	1.001	1.006	0.936	1.008	1.008	1.009	0.922	1.008
Maximum	1.789	1.782	1.580	1.538	1.548	1.545	1.622	1.619
Mean	1.257	1.257	1.263	1.276	1.273	1.283	1.301	1.310
Median	1.252	1.254	1.268	1.277	1.277	1.282	1.304	1.308
Standard deviation	0.104	0.104	0.100	0.098	0.100	0.101	0.114	0.110
Coefficient of variation	0.083	0.082	0.079	0.077	0.078	0.078	0.087	0.084
Rural								
Minimum	1.006	1.004	0.991	1.001	0.968	0.995	0.972	0.900
Maximum	1.468	1.465	1.476	1.501	1.536	1.573	1.600	1.637
Mean	1.239	1.238	1.240	1.257	1.258	1.277	1.294	1.298
Median	1.237	1.244	1.245	1.259	1.263	1.278	1.287	1.301
Standard deviation	0.088	0.090	0.094	0.098	0.107	0.107	0.115	0.119
Coefficient of variation	0.071	0.073	0.076	0.078	0.085	0.084	0.089	0.092

Source: OeNB; WIFO computations.

Table 5.1.3c: X-EFF$_{SFA}^{Ratio}$ of banks headquartered in NUTS-I regions

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Eastern Austria								
Minimum	0.571	0.775	0.773	0.784	0.983	0.982	0.958	0.900
Maximum	1.673	1.842	1.841	1.929	1.936	1.895	1.896	2.092
Mean	1.230	1.246	1.245	1.255	1.263	1.271	1.287	1.282
Median	1.240	1.254	1.242	1.255	1.269	1.272	1.287	1.285
Standard deviation	0.137	0.134	0.140	0.139	0.133	0.138	0.143	0.151
Coefficient of variation	0.111	0.107	0.112	0.111	0.106	0.109	0.111	0.117
Southern Austria								
Minimum	0.987	0.989	0.976	0.951	1.003	0.978	0.922	1.019
Maximum	1.755	1.793	1.817	1.583	1.638	1.620	1.549	1.786
Mean	1.266	1.270	1.281	1.289	1.294	1.297	1.305	1.317
Median	1.271	1.276	1.288	1.299	1.305	1.309	1.312	1.322
Standard deviation	0.096	0.097	0.100	0.096	0.096	0.099	0.106	0.104
Coefficient of variation	0.076	0.077	0.078	0.074	0.074	0.076	0.081	0.079
Western Austria								
Minimum	0.968	0.938	0.936	0.974	0.968	0.970	0.928	0.854
Maximum	1.789	1.782	1.737	1.925	1.563	1.591	1.704	2.168
Mean	1.252	1.249	1.252	1.267	1.259	1.282	1.304	1.310
Median	1.247	1.239	1.250	1.269	1.256	1.280	1.303	1.306
Standard deviation	0.102	0.105	0.103	0.109	0.106	0.110	0.122	0.131
Coefficient of variation	0.081	0.084	0.082	0.086	0.085	0.086	0.093	0.100

Source: OeNB; WIFO computations.

5.2 Environmental Factors in DEA Efficiency Analysis – A Multiple-Stage Approach

In this chapter we introduce the multiple-stage DEA approach due to *Fried – Schmidt – Yaisawarng* (1999) and apply this methodology to both, a balanced and an unbalanced panel of Austrian banks covering the period from 1995 to 2002. The latter data set comprises all banks throughout the entire time-span, including banks which are either new entrant banks, or exiting banks. By exposing both data sets to this approach we intend to gain information to what extent the environmentally adjusted X-efficiency scores gained are affected by data selection mechanisms.

Methodologically, we improve upon the approach due to *Fried – Schmidt – Yaisawarng* (1999) by using a slacks-based DEA model (SBM) introduced by *Tone* (2001). This alternative DEA model has two important properties which standard DEA models lack: First, the relative efficiency measure gained by this model is invariant with respect to the unit of measurement of each input and output item, and second, the efficiency measure is monotone decreasing in each input and output slack (*Cooper – Seifried – Tone*, 2000). That is to say, the SBM deals with input excesses and output shortfalls directly by incorporating the information contained in the slacks into the objective function. No matter what the scale of the measurement, the SBM generates a representative measure able to gauge the depth of inefficiency by reflecting non-zero slack in inputs and outputs when they are present.

An inherent property of all DEA models is that all measures generated by these models are dependent on each other in the statistical sense. This critical point has been recently raised by *Xue – Harker* (1999). The authors argue that the dependency property triggers a serious setback when the DEA efficiency measures such as the scores or the slacks are used in standard regression analysis to explain the variations of these measures. Because the DEA measures violate the assumption of independence within the sample, statistical inference is impaired when standard regression techniques are applied without controlling for this constraint. Thus, conclusions reached on the basis of standard regression analysis may be flawed since given dependency of the response variable the standard errors of the regression coefficient estimates are no longer correct. That is, the $t-$ratios and the $p-$values for the hypothesis tests are very likely to be severely biased. This unpleasant consequence of the inherent dependency problem of the DEA has long been ignored in the literature. *Xue – Harker* (1999) suggest the Bootstrap method to mitigate the inference fallout of the DEA dependency problem. We follow this recommendation and apply the Bootstrap to the multiple-stage procedure introduced by *Fried – Schmidt – Yaisawarng* (1999). A Bootstrap estimator to overcome the dependency problem in a two-stage framework has also been applied by *Casu – Molyneux* (2003).

5.2.1 The Formal Procedure

The proposed multiple-stage procedure for measuring the pure managerial inefficiency consists of the following phases:

Phase 1: Computing the frontier

The DEA model proposed to compute technical efficiency is the input-oriented SBM due to *Tone* (2001). In the most general form, the SBM has the following structure:

$$
\begin{aligned}
&\min_{t,\lambda,s^-,s^+} && \tau = t - \tfrac{1}{m}\sum_{i=1}^{m}\frac{S_i^-}{x_{io}} \\
(1^*) \qquad &subject\ \ to && 1 = t + \tfrac{1}{s}\sum_{r=1}^{s}\frac{S_r^+}{y_{ro}} \\
& && tx_o = \mathrm{X}\Lambda + S^- \\
& && ty_o = \mathrm{Y}\Lambda + S^+,
\end{aligned}
$$

with $\mathrm{X} = \left(x_{ij}\right) \in \Re^{m\times n}$, $\mathrm{Y} = \left(y_{ij}\right) \in \Re^{s\times n}$ representing the set of inputs and outputs, respectively, $S^- = ts^- \geq 0,\ S^+ = ts^+ \geq 0,\ \Lambda = t\lambda,$ where t is a positive scalar variable and $\lambda \in \Re^n$, s^-, s^+ denote the total (that is, radial and non-radial) input and output slack vectors defined as $x_o = \mathrm{X}\lambda + s^-$ and $y_o = \mathrm{Y}\lambda + s^+$, respectively[11]). Note that input-orientation requires that the scalar variable t be set equal one.

Phase 2: Estimating the slack equations by Bootstrap

Since the response variables generated by DEA models are censored by nature, estimating the slack equations with external factors as regressors requires an appropriate econometric technique. We consider the Tobit-censored regression model to be appropriate in the given context. Given the DEA is input-oriented the objective is to quantify the effect of the environmental factors on the excessive use of inputs. That is, we estimate the following m input slack equations

$$
\begin{aligned}
(2^*) \qquad & ITS_j^k = f_j(Q_j^k, \beta_j, v_j^k), \quad && k = 1,.....,n \\
& && j = 1,.....,m,
\end{aligned}
$$

where ITS_j^k represents the $k-th\ \ DMU's$ total slack for input j as calculated by a DEA model such as (1^*), Q_j^k is a vector of variables capturing the influence of the operating environment of $DMU\ \ k$ on the usage of input j, β_j is the vector of parameters to be estimated and v_j^k is the disturbance term.

---

11) For a definition and related illustration of radial and non-radial input slack, see, for example, *Fried – Schmidt – Yaisawarng* (1999), Figure 1.

The Bootstrap

According to *Xue – Harker* (1999) we apply the Bootstrap method to overcome the inherent dependency of the m input slack variables ITS_j^k. The proposed Bootstrap procedure introduced by *Efron – Tibshirani* (1993) has the following general structure:

Step 1

Construct the sample probability distribution $\hat{F}$ by assigning probability of $1/n$ at each DMU in the observed sample: $(x_1, x_2, ..., x_n)$.

Step 2

Draw c (c is a constant) random samples of size n with replacement from the original sample $(x_1, x_2, ..., x_n)$:

$$S_k = (x_{k1}, x_{k2}, ..., x_{kn}), \quad k = 1, ..., c,$$

where $x_{ki} = (u_{ki}, v_{ki}), i = 1, ..., n.$ S_k is the so-called Bootstrap sample.

Step 3

For each Bootstrap sample $S_k, k = 1, ..., c,$ run the DEA model and re-calculate the efficiency scores and slacks for all n $DMUs$:

$$\theta_{kj} = \phi_i(u_k), \quad i = 1, ..., n,$$

where ϕ_i represents the DEA model for DMU i.

Step 4

For each Bootstrap sample $S_k = (x_{k1}, x_{k2}, ..., x_{kn}), \quad k = 1, ..., c,$ evaluate the Bootstrap replication $\hat{\beta}_{kj}$, $k = 1, ..., c, \quad j = 0, 1, ..., m$ by fitting the regression model:

$$\theta_{ki} = G(\beta_k, v_{ki}) + \varepsilon_{ki}, \quad i = 1, ..., n,$$

$$\beta_k = (\beta_{k0}, \beta_{k1}, ..., \beta_{kj}, ..., \beta_{km}).$$

Step 5

Estimate the standard error $se\left(\hat{\beta}_j\right)$ by the sample standard deviation of the c Bootstrap replications of $\hat{\beta}_j$:

$$\hat{se}_c\left(\hat{\beta}_j\right)=\left\{\frac{\sum_{k=1}^{c}(\hat{\beta}_{kj}-\overline{\beta}_j)^2}{(c-1)}\right\}^{\frac{1}{2}}, \quad j=0,1,....,m,$$

where

$$\overline{\beta}_j=\frac{\sum_{k=1}^{c}\hat{\beta}_{kj}}{c}, \quad j=0,1,.....,m.$$

The term $se\left(\hat{\beta}_j\right)$ is called the Bootstrap estimator for the standard error of $\hat{\beta}_j$.

Step 6

Test the following hypothesis by applying a t – Test:

$$t=\frac{\hat{\beta}_j}{\hat{se}_c\left(\hat{\beta}_j\right)} \quad ,$$

and compare t to the critical value $t_{\alpha/2}$ from the student t distribution with degrees of freedom equal to $(n-m-1)$.

Phase 3: Adjusting primary data for the influence of external conditions

The estimated coefficients of equation (2^*) are used to calculate the prediction value of the total input slack for each input and for each DMU based on its external factors:

$$(3^*) \qquad \hat{ITS}_j^k=f_j\left(Q_j^k,\hat{\beta}_j\right), k=1,.....,n \quad j=1,.....,m\,.$$

Based on these predictions the primary inputs for each DMU are adjusted according to the difference between maximum predicted slack and predicted slack:

$$(4^*) \qquad x_j^{k\,adj} = x_j^k + [\max^k \{\hat{ITS}_j^k\} - \hat{ITS}_j^k] \,, \qquad \begin{matrix} k = 1,.....,n \\ j = 1,.....,m \,. \end{matrix}$$

These input adjustment equations establish an equal base for all $DMUs$ concerning their non-controllable surroundings. Obviously, the chosen adjustment mechanism is designed to generate an identical pseudo environment which is to be the least favorable for all $DMUs$. Needless to state, the opposite adjustment mechanism (that is, the firms are assumed to operate under the most favorable external circumstances) works as well and leads to the same results.

Phase 4: Re-run the DEA model using the adjusted primary data set

Model (1^*) is re-run based on the adjusted input data set according to the equation system (4^*). This generates new radial scores which are capable of measuring the inefficiency which is attributable to management.

5.2.2 Input and Output Definition and Data Sample

We apply the multiple-stage approach as outlined in the previous section, first, to the balanced bank panel of Austrian banks we have been working with as yet and, second, to an unbalanced bank sample comprising all Austrian banks, both of which covering the period from 1995 to 2002.

As already mentioned, a still unresolved problem in the banking performance literature is the definition and measurement of the concept of bank output and, of course, bank input. In order to get as much robust information on banking efficiency as possible we employ, within the frame of DEA, a more profit-oriented approach rather than the more production-oriented specification used in the SFA-based analysis in chapter 5.1. According to *Berger – Mester* (2003) the profit approach has the advantage to focus strongly on the ongoing changes towards higher quality services in banking and the stronger profit-orientation of the banks' management observable since the beginning of the 1990s. Thus, we specify cost components as inputs such as employee expenses, other non-interest expenses and risk-weighted assets as measured by Basel I. The latter input variable is supposed to account for a bank's financial risk exposure which might have a significant impact on relative efficiency scores. The argument is that higher financial risk exposure is likely to elevate the bank's cost of funds (see, for example, *Akhigbe – McNulty*, 2003). The output variables consist of the following revenue components: net interest revenue, net commission revenue, and other income.

In addition, we apply the intermediation approach which views financial institutions as mediators between the supply and the demand of funds. Following *Casu – Molyneux* (2003) we specify an intermediation-oriented model that consists of two outputs (total loans, other earnings) and two inputs (total costs covering interest expenses, non-interest expenses, and employee expenses, respectively, and total deposits)[12]).

Some descriptive statistics of the balanced bank sample used in the profit-oriented model can be found in the Appendix. The Appendix also gives the details on the definition of the variables.

As indicated in the previous sections, the great majority of Austrian banks operate on a regional or local basis and only a few banks provide their services on a national or even international scale. Again we state that the very region where the bank is having its head office provide a good basis for the approximation of the home or local market condition of the bank under study. That is, the definition of a local banking market is identical with that of an Austrian administrative district. In the following analysis, we use income per capita of these districts as the main indicator for the local demand structure that might determine banking services supplied. This reasoning rests on the assumption that the level of income per capita, by determining the structure of demand for banking services, determines to a large extent the market conditions for local banks. Thus, the expectation is that banks which primarily operate in richer districts face an external environment which is likely to foster banking efficiency. Meeting the sophisticated demands of a wealthy clientele ought to call for the employment of high-quality personnel and of state-of-the-art information and communication processing technology, respectively, both of which certainly propel banking efficiency. Conversely, banks doing business in less advanced and poorer regions are expected to be less efficient due to external conditions which hamper managerial excellence. Banks in rural areas mostly serve a low- to middle-income clientele with a strong preference for standardized retail banking products. As a result, the professional qualifications of the employees and the state of technology in rural banks are likely to be of lower order than in urban banks. We tend to consider the latter as one of the most compelling reasons why gross banking efficiency in rural areas may be expected to drag behind gross efficiency in urban regions.

According to these considerations, we apply our approach to a data sample grouped along the lines of WIFO's most disaggregated classification of Austrian districts. Again, this classification scheme builds on *Palme* (1995), who classifies the Austrian administrative districts by their economic structures using multivariate cluster analysis. Not surprisingly, the regional income indicators used in the SFA-oriented analysis in chapter 5.1 play a leading role in this cluster analysis approach. This classification scheme results in 9 economic regions: metropolitan area (PALME 0), city (PALME 1), suburban (PALME 2), medium-sized town

12) Data and results of the intermediation-related model are not reported but available on request.

(PALME 3), intensive industrial region (PALME 4), intensive touristic region (PALME 5), extensive industrial region (PALME 6), touristic periphery (PALME 8), industrial periphery (PALME 9). The same line of reasoning as outlined above suggests that banks, for example, operating in a metropolitan, city or suburban area may be able to sustain a higher level of gross efficiency than banks doing business in rural or less developed regions such as touristic or industrial peripheries[13]).

5.2.3 Findings – Balanced versus Unbalanced Bank Sample

5.2.3.1 X-Efficiency Scores Based on the Balanced Bank Sample

According to our analytical approach, we start with calculating the efficiency scores without incorporating environmental factors for the balanced sample of Austrian banks on the basis of an input-oriented, variable returns-to-scale SBM model[14]). As stressed previously, the period of analysis ranges from 1995 to 2002. A summary of the gross efficiency results of the profit-oriented DEA model is reported in Table 5.2.1 and reveals a higher degree of inefficiency than that derived form the SFA-based analysis. The efficiency scores range from 0.70 (1995) to 0.55 (2002). The lower levels of efficiency due to DEA than due to SFA are mainly caused by the conceptional differences in methodology (remember, DEA generates a deterministic, all-point enveloping frontier, SFA generates a stochastic frontier with some points left uncushioned).

In a second step we try to account for the very environmental factors which are closely related to the local market conditions of Austrian banks. Referring to the regional grouping of the data sample due to WIFO's disaggregated district classification scheme we run Tobit-censored regressions with the slacks of the cost components 'employee expenses', 'non-interest expenses' and 'risk-weighted assets, as measured by Basel I', as the dependent variables.

---

13) For robustness tests, we apply a third classification scheme of districts building on population density. Accordingly, the Austrian administrative districts are divided into three groups: regions of dense population, regions of medium population density, and regions of sparse population. The rationale of this classification is that, for bank management, higher levels of banking efficiency may be easier to sustain in densely populated areas than in sparsely populated districts. This is mainly due to the fact that banks in densely populated areas are more likely to operate closer to their optimal size than banks in sparsely populated regions. Estimation results of this model are not reported but available on request.

14) The relative efficiency scores and the related input slacks were obtained from the DEA Solver Professional Program due to *Cooper – Seifried – Tone* (2000). The author is very grateful to Prof. Tone who made possible the usage of the SBM-module of DEA Solver Professional which greatly facilitated the compilation of the Bootstrap estimator.

Table 5.2.1a: X-EFF$_{DEA}$ of banks sectors

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Joint stock banks and private banks								
Minimum	0.361	0.280	0.326	0.494	0.520	0.451	0.404	0.385
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	0.832	0.781	0.813	0.864	0.906	0.870	0.820	0.834
Median	1.000	0.767	0.893	1.000	1.000	1.000	1.000	0.967
Standard deviation	0.206	0.230	0.203	0.164	0.148	0.180	0.222	0.189
Coefficient of variation	0.248	0.294	0.250	0.190	0.163	0.207	0.270	0.226
Savings banks								
Minimum	0.577	0.427	0.516	0.498	0.518	0.526	0.422	0.444
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	0.750	0.653	0.738	0.748	0.772	0.706	0.559	0.584
Median	0.716	0.608	0.711	0.719	0.757	0.686	0.521	0.536
Standard deviation	0.129	0.143	0.132	0.137	0.125	0.126	0.148	0.141
Coefficient of variation	0.171	0.220	0.179	0.183	0.162	0.179	0.265	0.241
State mortgage banks								
Minimum	0.668	0.708	0.805	0.789	0.823	0.718	0.351	0.360
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	0.863	0.852	0.945	0.915	0.957	0.869	0.736	0.741
Median	0.867	0.812	0.994	0.946	1.000	0.881	0.802	0.788
Standard deviation	0.114	0.108	0.071	0.089	0.063	0.123	0.222	0.236
Coefficient of variation	0.132	0.126	0.076	0.098	0.065	0.142	0.302	0.319
Raiffeisen credit cooperatives								
Minimum	0.459	0.392	0.450	0.450	0.429	0.467	0.353	0.353
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	0.684	0.591	0.639	0.657	0.688	0.690	0.518	0.533
Median	0.673	0.580	0.631	0.648	0.683	0.677	0.506	0.523
Standard deviation	0.100	0.094	0.086	0.090	0.096	0.097	0.083	0.082
Coefficient of variation	0.146	0.159	0.135	0.138	0.139	0.140	0.160	0.154
Volksbank credit cooperatives								
Minimum	0.452	0.336	0.370	0.420	0.476	0.495	0.340	0.358
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	0.692	0.597	0.693	0.691	0.724	0.713	0.526	0.547
Median	0.671	0.565	0.679	0.680	0.713	0.686	0.502	0.528
Standard deviation	0.121	0.133	0.129	0.115	0.126	0.122	0.116	0.099
Coefficient of variation	0.175	0.223	0.186	0.166	0.174	0.171	0.221	0.180
All banks								
Minimum	0.361	0.280	0.326	0.420	0.429	0.451	0.340	0.353
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	0.697	0.606	0.661	0.677	0.708	0.701	0.535	0.551
Median	0.679	0.583	0.643	0.658	0.697	0.680	0.509	0.528
Standard deviation	0.115	0.119	0.113	0.112	0.115	0.112	0.118	0.115
Coefficient of variation	0.165	0.196	0.171	0.166	0.162	0.160	0.221	0.209

Source: OeNB; WIFO computations.

Table 5.2.1b: X-EFF$_{DEA}$ of banks headquartered in economic regions

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Human capital intensive								
Minimum	0.361	0.280	0.326	0.420	0.476	0.451	0.340	0.358
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	0.722	0.638	0.691	0.697	0.729	0.716	0.562	0.587
Median	0.696	0.594	0.657	0.663	0.709	0.677	0.507	0.540
Standard deviation	0.135	0.153	0.145	0.137	0.136	0.137	0.166	0.157
Coefficient of variation	0.188	0.240	0.210	0.197	0.186	0.191	0.295	0.267
Physical capital intensive								
Minimum	0.459	0.392	0.481	0.467	0.504	0.467	0.366	0.353
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	0.672	0.581	0.644	0.660	0.695	0.696	0.532	0.530
Median	0.654	0.563	0.623	0.643	0.685	0.678	0.513	0.523
Standard deviation	0.110	0.106	0.100	0.103	0.100	0.103	0.096	0.088
Coefficient of variation	0.163	0.182	0.155	0.156	0.144	0.149	0.180	0.166
Rural								
Minimum	0.528	0.408	0.450	0.450	0.429	0.479	0.353	0.375
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	0.697	0.599	0.648	0.675	0.701	0.693	0.512	0.538
Median	0.692	0.592	0.644	0.668	0.702	0.686	0.506	0.524
Standard deviation	0.092	0.082	0.079	0.090	0.104	0.091	0.068	0.077
Coefficient of variation	0.132	0.136	0.122	0.133	0.148	0.132	0.132	0.144

Source: OeNB; WIFO computations.

Table 5.2.1c: X-EFF$_{DEA}$ of banks headquartered in NUTS-I regions

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Eastern Austria								
Minimum	0.361	0.280	0.326	0.420	0.429	0.451	0.340	0.358
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	0.720	0.626	0.674	0.692	0.721	0.703	0.524	0.577
Median	0.697	0.596	0.648	0.663	0.703	0.673	0.483	0.537
Standard deviation	0.132	0.142	0.132	0.133	0.132	0.129	0.150	0.145
Coefficient of variation	0.184	0.227	0.195	0.192	0.183	0.183	0.286	0.252
Southern Austria								
Minimum	0.496	0.453	0.504	0.465	0.498	0.495	0.353	0.361
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	0.690	0.604	0.658	0.684	0.726	0.704	0.517	0.531
Median	0.672	0.584	0.642	0.668	0.714	0.700	0.508	0.516
Standard deviation	0.097	0.097	0.101	0.098	0.097	0.086	0.087	0.085
Coefficient of variation	0.141	0.161	0.153	0.143	0.133	0.123	0.168	0.161
Western Austria								
Minimum	0.459	0.392	0.470	0.467	0.478	0.467	0.366	0.353
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	0.688	0.594	0.654	0.666	0.692	0.699	0.550	0.546
Median	0.666	0.577	0.638	0.647	0.677	0.677	0.525	0.533
Standard deviation	0.111	0.112	0.105	0.104	0.110	0.113	0.108	0.104
Coefficient of variation	0.161	0.188	0.161	0.157	0.160	0.161	0.196	0.191

Source: OeNB; WIFO computations.

Since the results of the DEA-based Tobit regressions are biased due to the dependency problems we use the Bootstrap estimates with c = 1,000 to adjust the inputs for the environmental bias. As illustration, in Table 5.2.2 we report the Bootstrap Tobit regression results of the three slack equations based on the regional WIFO classification due to *Palme* (1995) for the years 1996 and 2001. The findings correspond with the expectation that those banks which are located in a metropolitan area, city, or suburban region tend to maintain a higher level of technical efficiency than banks having their head offices in rural or peripheral regions. The same holds true when we use income per capita and population density as proxies for external factors determining local banking markets conditions. Banks in high-income or densely-populated areas attain, on average, a significant higher level of technical efficiency than banks working primarily markets in low-income or sparsely-populated districts. It is worth mentioning that these results are robust over time, that is, we get similar results for each year, from 1995 to 2002.

Table 5.2.2: Slack Equations – Bootstrap Tobit-censored Regression Results for 1996 and 2001 with c = 1,000 Samples

SBM Stage 1 Total Input Slacks

	1996			2001		
	Employee expenses	*Non-interest expenses*	*Risk-weighted assets*	*Employee expenses*	*Non-interest expenses*	*Risk-weighted assets*
PALME 0[1])	1.176	0.511	58.611	0.339	1.259	244.299
	(0.000)	*(0.000)*	*(0.000)*	*(0.180)*	*(0.000)*	*(0.000)*
PALME 1	2.745	0.867	198.044	3.073	2.161	355.405
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
PALME 2	0.621	0.274	12.813	0.675	0.424	34.497
	(0.000)	*(0.000)*	*(0.064)*	*(0.000)*	*(0.000)*	*(0.113)*
PALME 3	1.154	0.510	47.326	1.486	0.942	101.665
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.001)*
PALME 4	0.724	0.357	21.235	0.781	0.430	54.708
	(0.000)	*(0.000)*	*(0.001)*	*(0.000)*	*(0.000)*	*(0.008)*
PALME 5	0.427	0.276	18.048	0.441	0.340	38.283
	(0.000)	*(0.000)*	*(0.015)*	*(0.000)*	*(0.002)*	*(0.100)*
PALME 6	0.560	0.341	12.022	0.591	0.403	33.567
	(0.000)	*(0.000)*	*(0.105)*	*(0.000)*	*(0.000)*	*(0.151)*
PALME 8	0.457	0.231	11.186	0.477	0.330	21.988
	(0.000)	*(0.000)*	*(0.225)*	*(0.003)*	*(0.016)*	*(0.429)*
PALME 9	0.564	0.258	11.823	0.611	0.365	28.783
	(0.000)	*(0.000)*	*(0.142)*	*(0.000)*	*(0.023)*	*(0.257)*

p-values in parentheses. – 1) This variable includes or consists of the 23 boroughs of Vienna, respectively.

Table 5.2.3a: X-EFF$_{DEA}^{Ratio}$ of banks sectors

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Joint stock banks and private banks								
Minimum	0.385	0.328	0.350	0.398	0.354	0.340	0.321	0.131
Maximum	1.000	1.147	1.075	1.090	1.000	1.110	1.199	1.123
Mean	0.800	0.847	0.832	0.834	0.799	0.842	0.862	0.853
Median	0.781	0.944	0.882	0.868	0.827	0.922	0.978	0.921
Standard deviation	0.189	0.195	0.199	0.204	0.214	0.203	0.207	0.223
Coefficient of variation	0.236	0.230	0.239	0.244	0.268	0.241	0.241	0.262
Savings banks								
Minimum	0.627	0.702	0.663	0.686	0.653	0.746	0.818	0.802
Maximum	1.148	1.293	1.248	1.260	1.167	1.290	1.385	1.265
Mean	0.985	1.121	1.028	1.015	0.998	1.079	1.162	1.102
Median	1.000	1.152	1.035	1.002	1.000	1.097	1.200	1.121
Standard deviation	0.097	0.132	0.103	0.096	0.091	0.101	0.116	0.099
Coefficient of variation	0.098	0.118	0.100	0.095	0.091	0.093	0.100	0.090
State mortgage banks								
Minimum	0.859	0.924	0.927	0.944	0.965	0.963	0.957	0.976
Maximum	1.051	1.032	1.124	1.053	1.000	1.058	1.143	1.087
Mean	0.947	0.961	0.993	0.990	0.995	0.996	1.013	1.010
Median	0.924	0.935	0.989	0.993	1.000	0.995	0.994	1.000
Standard deviation	0.059	0.040	0.055	0.031	0.011	0.027	0.055	0.035
Coefficient of variation	0.062	0.042	0.056	0.031	0.011	0.027	0.054	0.034
Raiffeisen credit cooperatives								
Minimum	0.164	0.197	0.208	0.203	0.215	0.207	0.271	0.273
Maximum	1.351	1.806	1.638	1.624	1.642	1.396	1.751	1.777
Mean	0.912	1.032	0.983	0.957	0.925	0.961	1.107	1.078
Median	0.960	1.087	1.029	1.004	0.971	1.009	1.165	1.122
Standard deviation	0.197	0.228	0.212	0.202	0.190	0.197	0.216	0.211
Coefficient of variation	0.216	0.221	0.216	0.211	0.205	0.205	0.195	0.196
Volksbank credit cooperatives								
Minimum	0.047	0.047	0.046	0.047	0.045	0.044	0.051	0.058
Maximum	1.189	1.334	1.205	1.139	1.125	1.203	1.382	1.309
Mean	0.918	1.033	0.942	0.940	0.912	0.982	1.091	1.042
Median	1.000	1.121	1.003	1.019	0.988	1.053	1.175	1.105
Standard deviation	0.223	0.256	0.222	0.214	0.204	0.223	0.233	0.218
Coefficient of variation	0.243	0.248	0.236	0.228	0.224	0.227	0.214	0.210
All banks								
Minimum	0.047	0.047	0.046	0.047	0.045	0.044	0.051	0.058
Maximum	1.351	1.806	1.638	1.624	1.642	1.396	1.751	1.777
Mean	0.915	1.032	0.979	0.956	0.926	0.969	1.101	1.069
Median	0.972	1.087	1.018	1.000	0.978	1.011	1.161	1.116
Standard deviation	0.194	0.226	0.207	0.197	0.188	0.196	0.215	0.209
Coefficient of variation	0.212	0.219	0.212	0.206	0.203	0.202	0.195	0.195

Source: OeNB; WIFO computations.

Table 5.2.3b: X-EFF$_{DEA}^{Ratio}$ of banks headquartered in economic regions

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Human capital intensive								
Minimum	0.047	0.047	0.046	0.047	0.045	0.044	0.051	0.058
Maximum	1.148	1.266	1.379	1.151	1.289	1.269	1.427	1.195
Mean	0.770	0.850	0.817	0.810	0.791	0.840	0.930	0.902
Median	0.809	0.897	0.878	0.864	0.848	0.900	0.997	0.972
Standard deviation	0.214	0.235	0.216	0.216	0.207	0.225	0.228	0.216
Coefficient of variation	0.278	0.276	0.264	0.266	0.261	0.268	0.245	0.240
Physical capital intensive								
Minimum	0.428	0.474	0.488	0.454	0.466	0.439	0.559	0.597
Maximum	1.174	1.342	1.248	1.529	1.153	1.203	1.385	1.309
Mean	0.919	1.041	0.974	0.956	0.919	0.963	1.101	1.065
Median	0.973	1.092	1.007	1.000	0.971	1.006	1.156	1.110
Standard deviation	0.145	0.165	0.139	0.146	0.128	0.152	0.145	0.126
Coefficient of variation	0.157	0.159	0.143	0.153	0.139	0.158	0.131	0.119
Rural								
Minimum	0.761	0.866	0.840	0.788	0.794	0.747	0.986	1.000
Maximum	1.351	1.806	1.638	1.624	1.642	1.396	1.751	1.777
Mean	1.045	1.194	1.133	1.093	1.059	1.094	1.261	1.226
Median	1.047	1.198	1.114	1.099	1.055	1.111	1.270	1.200
Standard deviation	0.095	0.113	0.116	0.097	0.105	0.102	0.108	0.125
Coefficient of variation	0.091	0.094	0.103	0.088	0.099	0.093	0.085	0.102

Source: OeNB; WIFO computations.

Table 5.2.3c: X-EFF$_{DEA}^{Ratio}$ of banks headquartered in NUTS-I regions

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Eastern Austria								
Minimum	0.047	0.047	0.046	0.047	0.045	0.044	0.051	0.058
Maximum	1.351	1.806	1.638	1.624	1.642	1.396	1.751	1.777
Mean	0.883	0.999	0.962	0.934	0.914	0.964	1.074	1.052
Median	0.975	1.061	1.000	1.000	0.988	1.058	1.157	1.117
Standard deviation	0.250	0.294	0.277	0.259	0.256	0.260	0.294	0.286
Coefficient of variation	0.283	0.294	0.288	0.277	0.280	0.270	0.274	0.272
Southern Austria								
Minimum	0.245	0.283	0.284	0.292	0.307	0.305	0.401	0.407
Maximum	1.263	1.440	1.346	1.248	1.242	1.290	1.440	1.568
Mean	0.955	1.088	1.032	1.008	0.970	1.027	1.159	1.114
Median	0.985	1.129	1.061	1.034	0.991	1.058	1.197	1.145
Standard deviation	0.151	0.175	0.162	0.151	0.141	0.150	0.162	0.160
Coefficient of variation	0.159	0.161	0.157	0.149	0.146	0.146	0.140	0.144
Western Austria								
Minimum	0.256	0.227	0.245	0.298	0.313	0.351	0.353	0.342
Maximum	1.326	1.535	1.430	1.529	1.289	1.269	1.518	1.772
Mean	0.914	1.024	0.961	0.943	0.911	0.942	1.088	1.055
Median	0.956	1.058	0.991	0.982	0.946	0.980	1.105	1.075
Standard deviation	0.170	0.196	0.172	0.169	0.153	0.163	0.174	0.168
Coefficient of variation	0.186	0.191	0.179	0.179	0.168	0.173	0.160	0.159

Source: OeNB; WIFO computations.

In the final step, we re-run the initial SBM using the adjusted instead of the original input variables. The initial gross and new net efficiency scores, the latter measured by the net-gross efficiency ratio and denoted $X-EFF_{DEA}^{Ratio}$, are reported in Table 5.2.3. Most importantly, controlling for the impact of environmental factors according to the WIFO district classification does not elevate the average efficiency over the period of analysis. However, when the X-efficiency findings are arranged according to banks operating in different economic regions, the disparities among the regions are more articulate than those drawn from the SFA-based analysis (see, Table 5.2.3b). Banks having their local markets in the rural region gain in efficiency while banks operating primarily in human capital intensive regions are downgraded as measured by internal efficiency. This meets our expectation that the technical efficiency of banks located in urban areas is generally overrated due to favorable external conditions and that of banks located in rural areas is generally underrated due to less favorable external conditions.

This finding puts the results based on the SFA-oriented analysis into perspective by indicating that the role of the environment as inefficiency factor may be somewhat overrated by the SFA-based analysis. In this respect it is worth recollecting that the differences between net and gross efficiency scores due to the SFA model have not been detected to be uniformly significant in a statistical sense.

5.2.3.2 X-Efficiency Scores Based on the Unbalanced Bank Sample

In this section, we report the results of the multiple-stage DEA when applied to an unbalanced bank sample comprising all Austrian banks being in the market at least once in the period covered. The X-efficiency scores are presented so that they can be directly compared with the findings drawn from the balanced sample in the previous section. Most noticeably, the DEA approach applied to the unbalanced bank sample seems to detect, on average, significantly larger differences among gross and net efficiency scores than drawn from the balanced sample (Table 5.2.4).

Controlling for external local market conditions not only elevates the average banking efficiency score of the Austrian banking system but also reduces the average range of volatility as measured by the coefficient of variation (see also Figure 5.2.1). Further, a decomposition of the gross and net-of-environment efficiency scores along the lines of the traditional bank groups of the Austrian banking system also yields that managerial efficiency of the special purpose banks tends to be overrated due to favorable environmental factors and that of cooperative banks (i. e., Volksbank and Raiffeisen credit cooperatives) to be underrated due to harsher local market conditions. Efficiency levels of joint stock banks and State mortgage banks, however, remain largely unaffected by changing environmental factors.

Table 5.2.4a: Efficiency of banks sectors – Unbalanced sample

Summary statistics

	Gross efficiency scores		Net efficiency scores	
	1996	2002	1996	2002
Joint stock banks and private banks				
Minimum	0.055	0.032	0.082	0.122
Maximum	1.000	1.000	1.000	1.000
Mean	0.532	0.484	0.555	0.545
Median	0.419	0.344	0.474	0.469
Standard deviation	0.338	0.316	0.301	0.267
Coefficient of variation	0.635	0.652	0.542	0.491
Savings banks				
Minimum	0.151	0.141	0.175	0.117
Maximum	1.000	1.000	1.000	1.000
Mean	0.412	0.342	0.644	0.530
Median	0.315	0.273	0.620	0.499
Standard deviation	0.221	0.221	0.159	0.158
Coefficient of variation	0.537	0.646	0.246	0.298
State mortgage banks				
Minimum	0.707	0.277	0.678	0.315
Maximum	1.000	1.000	1.000	1.000
Mean	0.827	0.600	0.807	0.614
Median	0.794	0.597	0.757	0.610
Standard deviation	0.118	0.234	0.122	0.210
Coefficient of variation	0.143	0.391	0.151	0.342
Raiffeisen credit cooperatives				
Minimum	0.060	0.044	0.045	0.096
Maximum	1.000	1.000	1.000	1.000
Mean	0.185	0.154	0.540	0.454
Median	0.149	0.124	0.548	0.453
Standard deviation	0.101	0.096	0.134	0.145
Coefficient of variation	0.545	0.620	0.248	0.320
Volksbank credit cooperatives				
Minimum	0.091	0.047	0.024	0.047
Maximum	1.000	1.000	0.880	0.676
Mean	0.320	0.277	0.468	0.417
Median	0.262	0.254	0.518	0.447
Standard deviation	0.195	0.188	0.187	0.152
Coefficient of variation	0.609	0.677	0.400	0.365
Building and loan associations				
Minimum	0.063	0.256	0.147	0.300
Maximum	1.000	1.000	1.000	1.000
Mean	0.554	0.554	0.576	0.570
Median	0.648	0.480	0.640	0.490
Standard deviation	0.311	0.291	0.282	0.276
Coefficient of variation	0.561	0.526	0.489	0.483
Special purpose banks				
Minimum	0.002	0.002	0.017	0.040
Maximum	1.000	1.000	1.000	1.000
Mean	0.473	0.438	0.270	0.335
Median	0.353	0.349	0.164	0.256
Standard deviation	0.364	0.344	0.267	0.263
Coefficient of variation	0.769	0.784	0.987	0.785
All banks				
Minimum	0.002	0.002	0.017	0.040
Maximum	1.000	1.000	1.000	1.000
Mean	0.262	0.224	0.517	0.449
Median	0.187	0.162	0.539	0.452
Standard deviation	0.220	0.207	0.193	0.177
Coefficient of variation	0.842	0.922	0.373	0.394

Source: OeNB; WIFO computations.

Table 5.2.4b: Efficiency of banks headquartered in economic region – Unbalanced sample
Summary statistics

	Gross efficiency scores		Net efficiency scores	
	1996	2002	1996	2002
Human capital intensive				
Minimum	0.002	0.002	0.017	0.040
Maximum	1.000	1.000	1.000	1.000
Mean	0.358	0.316	0.434	0.389
Median	0.256	0.224	0.453	0.382
Standard deviation	0.292	0.281	0.242	0.214
Coefficient of variation	0.816	0.887	0.558	0.550
Physical capital intensive				
Minimum	0.060	0.044	0.196	0.190
Maximum	1.000	1.000	1.000	1.000
Mean	0.201	0.159	0.530	0.432
Median	0.160	0.131	0.529	0.448
Standard deviation	0.128	0.093	0.121	0.099
Coefficient of variation	0.634	0.583	0.229	0.230
Rural				
Minimum	0.060	0.046	0.361	0.260
Maximum	1.000	0.430	1.000	1.000
Mean	0.191	0.163	0.612	0.543
Median	0.158	0.137	0.609	0.512
Standard deviation	0.099	0.089	0.104	0.133
Coefficient of variation	0.520	0.546	0.171	0.246

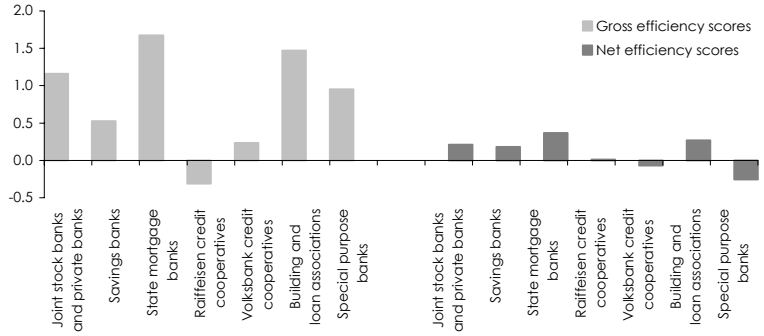
Source: OeNB; WIFO computations.

Table 5.2.4c: Efficiency of banks headquartered in NUTS-I regions – Unbalanced Sample
Summary statistics

	Gross efficiency scores		Net efficiency scores	
	1996	2002	1996	2002
Eastern Austria				
Minimum	0.002	0.002	0.017	0.042
Maximum	1.000	1.000	1.000	1.000
Mean	0.322	0.287	0.478	0.428
Median	0.241	0.214	0.505	0.424
Standard deviation	0.275	0.263	0.244	0.223
Coefficient of variation	0.854	0.917	0.510	0.521
Southern Austria				
Minimum	0.085	0.051	0.026	0.040
Maximum	1.000	0.916	1.000	1.000
Mean	0.250	0.207	0.576	0.511
Median	0.226	0.188	0.583	0.512
Standard deviation	0.142	0.127	0.154	0.142
Coefficient of variation	0.570	0.613	0.267	0.278
Western Austria				
Minimum	0.060	0.044	0.024	0.047
Maximum	1.000	1.000	1.000	1.000
Mean	0.220	0.184	0.523	0.436
Median	0.146	0.125	0.532	0.441
Standard deviation	0.187	0.173	0.150	0.141
Coefficient of variation	0.850	0.944	0.287	0.322

Source: OeNB; WIFO computations.

Figure 5.2.1: Deviation from the average efficiency score of all banks 2002



Source: OeNB; WIFO computations.

Thus, the empirical analysis based on an unbalanced panel of data covering all Austrian banks each year ranging over 1995 to 2002 shows that controlling for the impact of environmental factors according to the various regional classification schemes elevates the average efficiency over the period of investigation. In this respect, the findings based on DEA drawn from an unbalanced bank sample seem to corroborate the findings gained by the SFA-based on a balanced bank sample, presented in the previous section. Though there is a marked difference in the estimates of the efficiency levels gained by either method the margins by which efficiency scores net of environment improve upon gross efficiency scores is about the same in relative terms.

However, it seems more appropriate to read the results based on the unbalanced sample as clear indication that data selection issues do matter in the present banking analysis in the sense that banks facing an 'unfriendly' local environment are more likely to vanish, mostly by being taken over, than banks operating under 'favorable' external conditions. This perception of the empirical findings here presented squares well with the fact that the average efficiency scores for the Austrian banks drawn from the balanced bank sample are, for each year under study and for each banking group, almost twice as high as the average efficiency scores estimated for the Austrian banking system on the basis of the unbalanced bank sample.

5.2.4 Scale Efficiency and Scale Elasticity

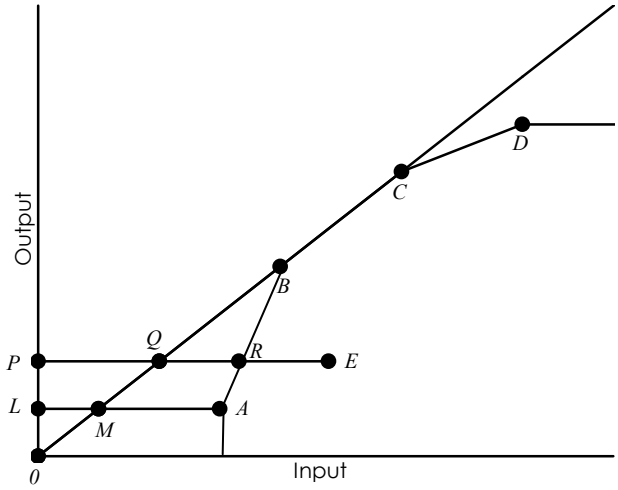
In the DEA methodology there is a natural way to decompose technical inefficiency into scale efficiency and into, what is termed in the DEA literature, 'local' technical efficiency. Formally, scale efficiency for a firm is obtained by conducting both a DEA-based on a 'constant return-to-scale' technology (CRS) yielding global (technical) efficiency scores and a DEA-based on a 'variable return-to-scale' technology (VRS) yielding local (technical) efficiency scores (*Cooper – Seifried – Tone*, 2001). A difference in the CRS and the VRS scores for a particular firm indicates that this firm has scale inefficiency. Let the CRS and

VRS scores of a DMU be $X-EFF_{CRS}$ and $X-EFF_{VRS}$, respectively, the scale efficiency $S-EFF_{DEA}$ is defined by the ratio

$$S-EFF_{DEA}=\frac{X-EFF_{CRS}}{X-EFF_{VRS}}. \qquad (1^{**})$$

It is easy to show that $S-EFF_{DEA}$ is bounded by zero and one. In the one-input-one-output frame, the scale efficiency can be illustrated by Figure 5.2.2 (see, i. e., *Cooper – Seifried – Tone*, 2001).

Figure 5.2.2: Scale efficiency due to DEA



Source: *Cooper – Seifried – Tone* (2001).

For example, the scale efficiency for the CRS efficient firm A is given by $S-EFF(A)=LM/LA<1$, indicating that firm A is operating locally efficient ('pure' technical efficiency is one) but faces technical inefficiency caused by scale inefficiency defined by LM/LA. That is, input-oriented $S-EFF$ measures the change in input required to produce at minimum-efficient scale. We use the relation (1^{**}) to compute scale efficiency scores for the Austrian banks as covered by the balanced sample ranging from 1995 to 2002.

The DEA methodology can also be used to derive measures for scale elasticities, denoted $SCALE_{DEA}$. *Tone – Sahoo* (2005) propose a model that evaluates scale elasticity of production in multiple input/output environments. Scale elasticity is defined as the ratio of marginal product (MP) to average product (AP), and is also called 'degree of scale elasticity' (DSE). This concept is due to *Baumol – Panzar – Willig* (1988) where DSE is

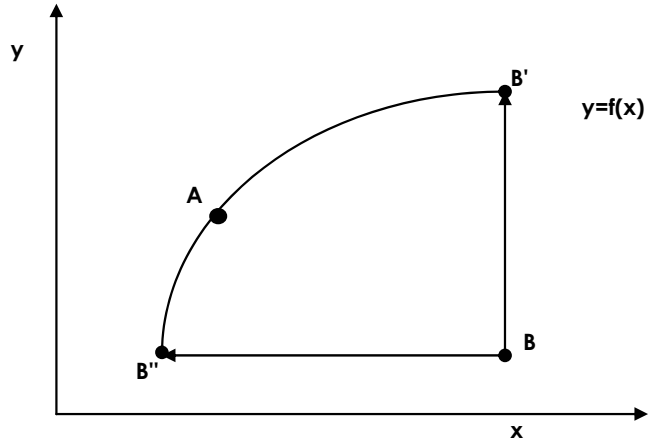
discussed in terms of cost and output. *Tone – Sahoo* (2005) apply this concept to a DEA framework with multiple inputs and multiple outputs.

Although the VRS model estimates the returns-to-scale qualitatively, the model by *Tone – Sahoo* (2005) does the same function quantitatively. In a single input-output case, if the output y is produced by the input x, $SCALE_{DEA}$ is defined by

$$(2**) \qquad SCALE_{DEA} = \mathrm{MP}/\mathrm{AP} = \frac{dy}{dx}\Big/\frac{y}{x}.$$

Figure 5.2.3 exhibits a sample curve $y = f(x)$ to demonstrate scale elasticity in production. Scale elasticity is well-defined at a point on the efficient portion of the input-output correspondence, e. g., the point A. For an inefficient DMU operating on a point such as B, input-oriented $SCALE$ is defined on its horizontally projected point B'', while output-orientation calls for upward projection (B').

Figure 5.2.3: Scale Elasticity due to DEA



Source: *Tone – Sahoo* (2005).

We use the model by *Tone – Sahoo* (2005) to compute $SCALE_{DEA}$ for the Austrian banks on the basis of the balanced bank sample ranging from 1995 to 2002. For the computation of input-oriented $S-EFF_{DEA}$ and $SCALE_{DEA}$, respectively we use the software package DEA-Solver-PRO 4.0. Estimations are based on both, the profit-oriented model and the intermediation-oriented model. The database is the balanced sample covering the period from 1995 to 2002. In the text only the results for the profit-oriented model are reviewed. The estimates for both efficiency measures, $S-EFF_{DEA}$ and $SCALE_{DEA}$ for each year are reported in Table 5.2.5 and Table 5.2.6, respectively.

Table 5.2.5a: S-EFF$_{DEA}$ of banks sectors

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Joint stock banks and private banks								
Minimum	0.534	0.477	0.567	0.580	0.684	0.602	0.556	0.553
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	0.884	0.861	0.877	0.890	0.923	0.909	0.942	0.937
Median	0.981	0.977	0.959	0.985	0.998	0.996	0.999	1.000
Standard deviation	0.165	0.182	0.154	0.148	0.120	0.137	0.120	0.124
Coefficient of variation	0.187	0.212	0.175	0.166	0.130	0.151	0.128	0.132
Savings banks								
Minimum	0.532	0.433	0.482	0.513	0.559	0.479	0.491	0.489
Maximum	1.000	1.000	0.983	1.000	1.000	1.000	1.000	1.000
Mean	0.886	0.913	0.875	0.883	0.916	0.924	0.930	0.928
Median	0.942	0.985	0.915	0.917	0.958	0.986	0.994	0.994
Standard deviation	0.132	0.156	0.112	0.113	0.112	0.130	0.133	0.136
Coefficient of variation	0.149	0.170	0.128	0.128	0.122	0.140	0.143	0.147
State mortgage banks								
Minimum	0.656	0.563	0.590	0.618	0.579	0.642	0.582	0.562
Maximum	0.786	0.821	0.676	0.790	0.889	0.954	0.945	0.985
Mean	0.700	0.638	0.641	0.683	0.782	0.752	0.738	0.715
Median	0.669	0.621	0.644	0.664	0.792	0.734	0.721	0.682
Standard deviation	0.049	0.074	0.027	0.060	0.093	0.085	0.111	0.127
Coefficient of variation	0.070	0.117	0.042	0.088	0.119	0.113	0.151	0.177
Raiffeisen credit cooperatives								
Minimum	0.598	0.452	0.534	0.723	0.740	0.707	0.714	0.676
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	0.976	0.961	0.959	0.967	0.973	0.983	0.975	0.976
Median	0.988	0.978	0.976	0.978	0.984	0.993	0.989	0.988
Standard deviation	0.042	0.057	0.052	0.037	0.034	0.029	0.038	0.035
Coefficient of variation	0.043	0.059	0.055	0.038	0.035	0.029	0.039	0.036
Volksbank credit cooperatives								
Minimum	0.744	0.598	0.582	0.687	0.756	0.772	0.726	0.862
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	0.961	0.965	0.939	0.948	0.955	0.971	0.984	0.981
Median	0.985	0.992	0.954	0.975	0.969	0.995	0.997	0.996
Standard deviation	0.053	0.066	0.067	0.064	0.047	0.052	0.044	0.034
Coefficient of variation	0.055	0.068	0.072	0.067	0.049	0.053	0.045	0.035
All banks								
Minimum	0.532	0.433	0.482	0.513	0.559	0.479	0.491	0.489
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	0.961	0.950	0.944	0.953	0.963	0.973	0.968	0.968
Median	0.986	0.980	0.970	0.975	0.982	0.993	0.991	0.990
Standard deviation	0.075	0.087	0.078	0.069	0.058	0.063	0.065	0.065
Coefficient of variation	0.078	0.092	0.083	0.072	0.061	0.064	0.067	0.067

Source: OeNB; WIFO computations.

Table 5.2.5b: S-EFF$_{DEA}$ of banks headquartered in economic regions

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Human capital intensive								
Minimum	0.532	0.433	0.482	0.513	0.559	0.479	0.491	0.489
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	0.930	0.919	0.916	0.926	0.943	0.947	0.950	0.949
Median	0.979	0.978	0.967	0.971	0.979	0.993	0.989	0.990
Standard deviation	0.114	0.134	0.118	0.104	0.090	0.101	0.099	0.099
Coefficient of variation	0.123	0.146	0.129	0.113	0.095	0.107	0.104	0.105
Physical capital intensive								
Minimum	0.735	0.631	0.635	0.790	0.839	0.878	0.768	0.692
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	0.979	0.969	0.965	0.972	0.979	0.987	0.983	0.983
Median	0.992	0.984	0.981	0.981	0.989	0.995	0.993	0.992
Standard deviation	0.034	0.044	0.044	0.034	0.025	0.020	0.029	0.032
Coefficient of variation	0.035	0.045	0.045	0.034	0.026	0.020	0.030	0.032
Rural								
Minimum	0.598	0.589	0.745	0.734	0.744	0.832	0.744	0.676
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	0.972	0.962	0.950	0.960	0.967	0.983	0.972	0.973
Median	0.982	0.976	0.958	0.967	0.976	0.990	0.989	0.986
Standard deviation	0.036	0.045	0.040	0.036	0.032	0.021	0.040	0.038
Coefficient of variation	0.037	0.046	0.042	0.037	0.033	0.021	0.041	0.039

Source: OeNB; WIFO computations.

Table 5.2.5c: S-EFF$_{DEA}$ of banks headquartered in NUTS-I regions

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Eastern Austria								
Minimum	0.532	0.433	0.482	0.513	0.559	0.479	0.491	0.489
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	0.948	0.942	0.928	0.938	0.956	0.966	0.964	0.962
Median	0.972	0.978	0.952	0.960	0.979	0.989	0.988	0.987
Standard deviation	0.082	0.098	0.089	0.078	0.069	0.074	0.074	0.076
Coefficient of variation	0.086	0.104	0.096	0.084	0.073	0.077	0.077	0.079
Southern Austria								
Minimum	0.602	0.540	0.534	0.619	0.675	0.621	0.548	0.540
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	0.969	0.964	0.935	0.955	0.957	0.980	0.978	0.977
Median	0.988	0.985	0.951	0.971	0.971	0.995	0.994	0.993
Standard deviation	0.064	0.075	0.071	0.062	0.051	0.054	0.063	0.062
Coefficient of variation	0.066	0.078	0.076	0.064	0.053	0.055	0.064	0.063
Western Austria								
Minimum	0.534	0.465	0.577	0.580	0.613	0.606	0.586	0.575
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	0.965	0.949	0.958	0.961	0.970	0.973	0.966	0.968
Median	0.988	0.978	0.981	0.981	0.988	0.993	0.990	0.988
Standard deviation	0.074	0.086	0.072	0.064	0.053	0.059	0.059	0.059
Coefficient of variation	0.077	0.091	0.075	0.067	0.055	0.060	0.061	0.061

Source: OeNB; WIFO computations.

Table 5.2.6a: $SCALE_{DEA}$ of banks sectors

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Joint stock banks and private banks								
Minimum	0.551	0.599	0.588	0.564	0.555	0.542	0.552	0.543
Maximum	1.050	1.042	1.047	1.023	1.007	1.007	1.056	1.006
Mean	0.839	0.825	0.825	0.837	0.834	0.826	0.847	0.855
Median	0.857	0.800	0.810	0.855	0.875	0.871	0.903	0.891
Standard deviation	0.140	0.143	0.131	0.145	0.152	0.165	0.162	0.157
Coefficient of variation	0.166	0.173	0.159	0.173	0.182	0.200	0.191	0.184
Savings banks								
Minimum	0.491	0.490	0.482	0.496	0.497	0.479	0.494	0.490
Maximum	1.029	1.043	0.993	1.023	0.999	1.011	1.032	1.030
Mean	0.896	0.932	0.896	0.873	0.925	0.924	0.942	0.940
Median	0.901	0.994	0.911	0.869	0.960	0.971	1.003	1.001
Standard deviation	0.095	0.128	0.084	0.095	0.095	0.106	0.124	0.113
Coefficient of variation	0.106	0.137	0.094	0.109	0.103	0.114	0.132	0.120
State mortgage banks								
Minimum	0.755	0.744	0.770	0.779	0.804	0.738	0.593	0.496
Maximum	0.886	0.889	0.847	0.879	0.904	0.832	0.784	0.974
Mean	0.834	0.808	0.802	0.832	0.844	0.776	0.700	0.676
Median	0.840	0.790	0.795	0.834	0.841	0.764	0.737	0.690
Standard deviation	0.040	0.053	0.023	0.033	0.034	0.032	0.069	0.141
Coefficient of variation	0.048	0.066	0.029	0.040	0.041	0.041	0.099	0.209
Raiffeisen credit cooperatives								
Minimum	0.640	0.587	0.592	0.686	0.670	0.662	0.668	0.635
Maximum	1.195	1.316	1.297	1.251	1.206	1.169	1.281	1.204
Mean	1.008	1.043	0.999	1.006	1.000	1.005	1.031	1.023
Median	1.015	1.032	0.986	1.011	0.996	1.006	1.017	1.016
Standard deviation	0.063	0.069	0.085	0.070	0.060	0.047	0.057	0.048
Coefficient of variation	0.062	0.066	0.085	0.070	0.060	0.047	0.055	0.047
Volksbank credit cooperatives								
Minimum	0.700	0.632	0.708	0.697	0.798	0.799	0.840	0.745
Maximum	1.066	1.094	1.100	1.675	1.051	1.031	1.073	1.064
Mean	0.953	0.973	0.944	0.955	0.959	0.975	0.992	0.981
Median	0.976	1.010	0.967	0.976	0.977	0.997	1.004	1.003
Standard deviation	0.067	0.094	0.075	0.120	0.051	0.048	0.042	0.060
Coefficient of variation	0.070	0.096	0.080	0.126	0.053	0.049	0.042	0.061
All banks								
Minimum	0.491	0.490	0.482	0.496	0.497	0.479	0.494	0.490
Maximum	1.195	1.316	1.297	1.675	1.206	1.169	1.281	1.204
Mean	0.986	1.018	0.978	0.983	0.983	0.988	1.010	1.004
Median	1.006	1.025	0.978	0.989	0.988	1.003	1.012	1.012
Standard deviation	0.084	0.098	0.097	0.095	0.078	0.076	0.087	0.082
Coefficient of variation	0.085	0.096	0.100	0.096	0.079	0.077	0.086	0.082

Source: OeNB; WIFO computations.

Table 5.2.6b: $SCALE_{DEA}$ of banks headquartered in economic regions

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Human capital intensive								
Minimum	0.491	0.490	0.482	0.496	0.497	0.479	0.494	0.490
Maximum	1.162	1.248	1.251	1.675	1.197	1.114	1.236	1.170
Mean	0.958	0.981	0.950	0.958	0.958	0.956	0.974	0.970
Median	0.990	1.015	0.972	0.972	0.982	0.997	1.008	1.007
Standard deviation	0.110	0.128	0.116	0.119	0.104	0.105	0.121	0.117
Coefficient of variation	0.115	0.131	0.122	0.125	0.109	0.110	0.124	0.120
Physical capital intensive								
Minimum	0.656	0.587	0.592	0.686	0.670	0.662	0.668	0.635
Maximum	1.146	1.202	1.190	1.198	1.175	1.133	1.281	1.191
Mean	0.992	1.022	0.987	0.992	0.990	0.994	1.015	1.012
Median	1.005	1.024	0.986	1.009	0.997	1.004	1.011	1.012
Standard deviation	0.063	0.082	0.083	0.074	0.055	0.055	0.054	0.049
Coefficient of variation	0.063	0.081	0.084	0.075	0.056	0.056	0.053	0.049
Rural								
Minimum	0.796	0.831	0.824	0.785	0.834	0.855	0.658	0.686
Maximum	1.195	1.316	1.297	1.251	1.206	1.169	1.257	1.204
Mean	1.008	1.050	0.995	0.998	1.000	1.011	1.040	1.027
Median	1.018	1.035	0.975	0.987	0.987	1.006	1.020	1.017
Standard deviation	0.063	0.058	0.085	0.080	0.061	0.042	0.058	0.053
Coefficient of variation	0.062	0.055	0.086	0.081	0.061	0.042	0.056	0.052

Source: OeNB; WIFO computations.

Table 5.2.6c: $SCALE_{DEA}$ of banks headquartered in NUTS-I regions

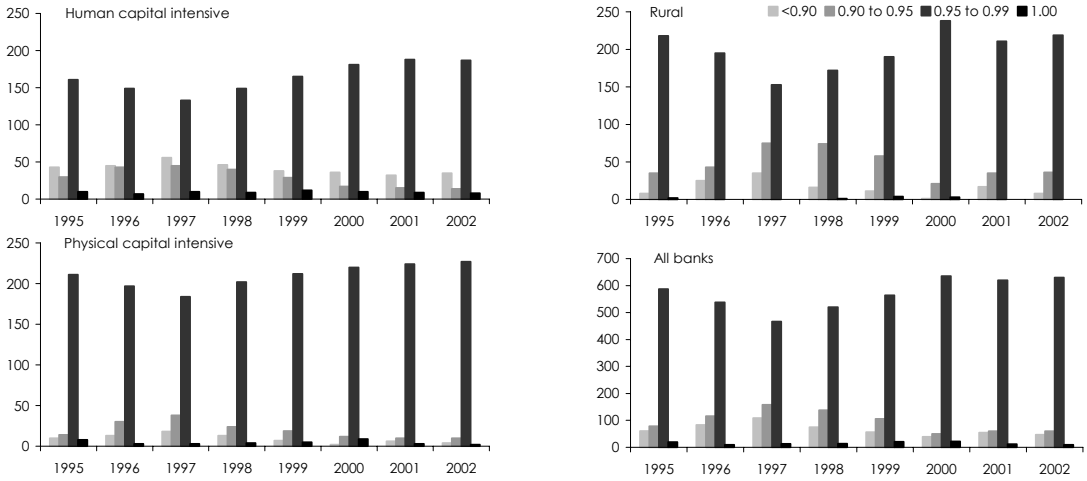
Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Eastern Austria								
Minimum	0.491	0.490	0.482	0.496	0.497	0.479	0.494	0.490
Maximum	1.195	1.316	1.264	1.675	1.206	1.102	1.175	1.164
Mean	0.974	1.013	0.967	0.966	0.974	0.970	0.996	0.987
Median	1.000	1.024	0.967	0.969	0.988	0.995	1.016	1.008
Standard deviation	0.107	0.122	0.115	0.124	0.102	0.096	0.113	0.104
Coefficient of variation	0.110	0.120	0.119	0.129	0.104	0.099	0.113	0.105
Southern Austria								
Minimum	0.696	0.672	0.710	0.728	0.768	0.700	0.652	0.581
Maximum	1.139	1.205	1.231	1.153	1.076	1.078	1.198	1.113
Mean	0.981	1.018	0.946	0.959	0.964	0.987	1.010	1.008
Median	0.996	1.022	0.943	0.962	0.969	0.996	1.008	1.011
Standard deviation	0.065	0.067	0.070	0.063	0.049	0.047	0.056	0.057
Coefficient of variation	0.066	0.066	0.074	0.065	0.051	0.047	0.055	0.056
Western Austria								
Minimum	0.640	0.587	0.592	0.686	0.670	0.662	0.593	0.522
Maximum	1.170	1.271	1.297	1.221	1.197	1.169	1.281	1.204
Mean	0.996	1.022	1.001	1.005	0.998	0.998	1.019	1.011
Median	1.010	1.026	0.992	1.017	1.005	1.007	1.012	1.013
Standard deviation	0.075	0.094	0.092	0.082	0.071	0.072	0.082	0.078
Coefficient of variation	0.075	0.092	0.092	0.082	0.071	0.072	0.080	0.077

Source: OeNB; WIFO computations.

The findings indicate that the scale inefficiency faced by the Austrian banks is slowly but steadily declining over time and, as compared to the overall X-inefficiency scores measured for Austrian banks, of a relatively low order (Table 5.2.5a). Most Austrian banks seem to operate not too far (but significantly) away from their most productive scale size (Figure 5.2.4). Among the bank groups the State mortgage banks face the largest degree of scale inefficiency. However, the overall findings are likely to show an upward bias due to sample balancing. Table 5.2.6a shows the scale economy estimates seemingly confirming that the Austrian banks show significant scale economies in the majority of cases. That is, Austrian banks across bank groups seem on average very likely to gain from potential scale economies.

Figure 5.2.4: Number of banks due to S-EFF$_{DEA}$ brackets



Source: OeNB; WIFO computations.

5.3 Concluding Remark

In this chapter we applied both a SFA-based and a DEA-based approach to compute X-efficiency scores net of environmental factors for Austrian banks for the period from 1995 to 2002. Though the findings depend, to some degree, on the type of production model used, on the methodology applied, and on the data covered, we gain sufficient empirical evidence for the view that local market conditions external to a bank's management do matter in terms of assessing technical efficiency in banking. The sets of computations presented suggest that banks having their home markets in more urban, that is, more economically developed areas are technically more efficient than banks doing business in more rural areas but that the differences are, to a significant degree, due to the more favorable environmental conditions. We also present evidence that the majority of Austrian banks operates, on average, not too far away from the most productive scale size, and show that most Austrian banks may gain from scale economies.

6. Revisiting the Structure-Performance Model for Austrian Banks

In this final section, we replace the X-efficiency variable in the profit model presented and estimated in chapter 3 by the measures of pure managerial (or internal) efficiency, denoted $X-EFF^{ADJ}$, derived in the preceding chapter. Re-estimating the thus augmented model $(8A)$ indicates that, while preserving support for the $SCPH$, the importance of X-efficiency as factor driving bank performance tends to be underrated when environmental differences in local banking markets influencing X-efficiency are not appropriately controlled for[15]). As shown in Table 6.1, this holds true for either net-efficiency measure, SFA-based and DEA-based, suggesting that both measures have a sufficient information overlap underlining strongly the robustness of our key finding that it is internal efficiency that truly drives bank performance in Austria.

$$ROA_{i,t} = b_0 + b_1 CONC_{j,t} + b_2 MS_{j,t} + b_3 \left(X-EFF\right)_{i,t}^{ADJ} + b_4 SCALE_{i,t} + b_5 \left(S-EFF\right)_{i,t} + \sum_{q=6}^{Q} b_q Z_{ij,t} + \lambda_t + \eta_i + \varepsilon_{i,t} \qquad (8A)$$

For the variables and the respective denotations, we refer the reader to chapter 3.2.

Table 6.1: Estimation results from robust fixed effects panel regression

Profit model (8A)

Dependent variable: *ROA*	Coefficients	*p-values*	Coefficients	*p-values*
CONC	0.799	*0.007*	0.861	*0.030*
MS	-0.298	*0.489*	-0.327	*0.000*
X-EFF $^{ADJ}_{DEA}$	1.286	*0.000*		
X-EFF $^{ADJ}_{SFA}$			0.343	*0.002*
SCALE$_{DEA}$	-0.000	*0.500*	-0.300	*0.000*
S-EFF$_{DEA}$	0.339	*0.010*	0.199	*0.135*
FIX	-0.209	*0.000*	-0.289	*0.000*
CAP	0.143	*0.000*	0.094	*0.000*
BRPK	-0.562	*0.001*	-0.377	*0.821*
WACHS	-0.006	*0.461*	-0.018	*0.000*
Constant	-1.552	*0.000*	-1.921	*0.000*
R^2 adjusted	0.262		0.236	
p (F-test)	0.000		0.000	
p (Breusch-Pagan)	0.000		0.000	
p (Hausman)	0.000		0.000	
Number of banks	747		747	
Number of observations	5,976		5,976	

[15]) As to the DEA-based net-efficiency measure, this is corroborated by a standard F-test. In addition, including 'external efficiency' as measured by the difference between gross and net efficiency as separate regressor to the right-hand side adds further evidence to the view that it is internal efficiency that promotes banking profitability.

7. Final Remark and Policy Implication

In this study a thorough attempt was made to investigate the determinants of banking profitability in Austria. For that purpose we conducted a panel econometric analysis aimed at testing the most prominent hypotheses in the literature on bank profitability: the structure-conduct-performance hypothesis $(SCPH)$, the efficient-structure hypothesis and the relative-market-power hypothesis.

Further, we tested whether Austrian banking markets are, on average, contestable. A newly compiled dataset covering more than 700 Austrian banks ranging over the period from 1995 to 2002 was used to carry out the econometric analyses.

At the heart of the analysis is the delineation of a representative banking market since the usual market concentration measures in empirical work build on the single-product-single-market perception. In the present study as to the treatment of market delineation we followed *Mooslechner – Schnitzer* (1994) and calculated one market share per bank – derived from deposit holdings. Since less than 20 percent of the Austrian banks entertain operation units outside of the regional district where the head office is located we concluded that this very geographical district provide a good basis for the approximation of the home or local market conditions of the banks under study. That is, the definition of a local bank market is identical with that of an Austrian administrative district, a geographic unit just below the NUTS-III level of EUROSTAT.

Contrary to *Mooslechner – Schnitzer* (1994), on the basis of the extended dataset covering the activities of Austrian banks from 1995 to 2002 we found support for the traditional $SCPH$. Given the regional demarcation within Austria's banking system the result is not that surprising that Austrian banks do exert, to some degree, local market power. In addition, X-efficiency was detected to exert a positive and autonomous influence on banking performance in Austria. By supporting the collusion hypothesis, our findings are at odds with the conventional view held in Austria maintaining that the Austrian banking market is overly competitive and, thus, only allows for extremely low banking profitability.

In order to empirically assess the actual competitive conditions in the Austrian banking markets we enhanced the analysis by the so-called Panzar-Rosse methodology. This approach, closely related to the New Empirical Industrial Organization literature, enabled us to examine more thoroughly the underlying nature of the structure-collusion linkage detected in the Austrian banking system. The Panzar-Rosse analysis suggests that the likelihood be relatively low that the banking markets in Austria are strongly biased by perfect collusion. Likewise, we can also reject the hypothesis of perfect competition for Austrian banks. In the face of the findings obtained it appears relatively safe to maintain that the Austrian banks do exert, on average, some local market power but the gains in terms of excess profits are rather minor due to low deterrence powers of the incumbent banks.

Consequently, we turned our attention to the far more interesting driver of banking performance in Austria, the X-efficiency. We noted that in the applied efficiency measurement literature, a usual assumption is that all the firms share the same production technology and face similar environmental conditions. We considered this too strong an assumption since the ability of a production unit to transform inputs into outputs is usually influenced by both, its internal technical efficiency (the quality of its management) and its external operating environment which is often different from firm to firm. Thus, we made an attempt to assess the technical efficiency (or X-efficiency) of the Austrian banking sector, with the focus on both, the internal and controllable factors and the environmental and non-controllable factors critical to banking markets.

We applied two approaches, the Stochastic-Frontier-Analysis-oriented approach and the Data-Envelopment-Analysis-oriented approach. Both methods were enhanced to deal directly with environmental factors considered capable of affecting X-efficiency at the firm level. Both methods generated evidence for the view that local market conditions external to a bank's management do matter in terms of assessing technical efficiency in banking.

The sets of computations presented suggest that Austrian banks having their home markets in more urban, that is, more economically developed areas are technically more efficient than banks doing business in more rural areas but that the differences are, to a significant degree, due to the more favorable environmental conditions. We also were able to find evidence that the Austrian banks, on average, may gain from both scale efficiency and scale economies.

A final analysis indicates that, while preserving support for the $SCPH$, the importance of X-efficiency as factor driving bank performance in Austria is significantly underrated when environmental differences in local banking markets influencing X-efficiency are not appropriately controlled for. We maintain as key finding of the presented analysis that it is internal efficiency that truly drives bank performance in Austria.

As to policy implications, we hold that the presented empirical evidence is in accordance with the view that consolidation of the banking sector should primarily progress through domestic banking mergers and acquisitions. This has been the common practice in many OECD countries, including Austria, since the early 1990s. Since local banking markets in Austria are found to be highly contestable it is too costly a strategy for entrant banks to succeed by trying hard to outperform incumbent local banks.

Importantly, domestic mergers among local banks or take-overs of small local banks by larger regional or national banks do not call for increased anti-trust awareness on the part of the regulatory authorities because increased concentration in contestable markets is not very likely to impair competition or cause social welfare losses by allowing for larger-than-normal profits.

Most notably, domestic banking mergers and acquisitions appear to be an appropriate means to raise productive efficiency in contestable banking markets that suffer from both, too many too small banks. Upon these terms domestic banking mergers and acquisitions may raise banking efficiency by, first, bringing banking units closer to their optimal size and, second, mitigating the negative effects of unfavorable environmental conditions characteristic for many underdeveloped (that is, too small) local banking markets. Thus, consolidating the Austrian banking system through domestic banking mergers and acquisitions appears to be a superior strategy from either point of view, microeconomic and macroeconomic, since it raises productive efficiency at both, the firm and the industry level.

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Appendix: Variables and Definitions

Symbol	Variable	Definition
ALQ	Unemployment rate	Unemployed as % of total labor force in the j-th district
ALTQ	Older population ratio	65 and older as a percentage of total population in the j-th district, 2001
BRPK	Per capita income	Regional GDP per capita in the j-th district, 1995 real term
CAP	Capital ratio	Equity over balance sheet total of the i-th bank
CEA	Costs of fixed capital	Capital expenses over balance sheet total of the i-th bank
CLA	Loan ratio	Customer loans over balance sheet total of the i-th bank
CONC	Concentration	HHID times HHIB
DICHTE	Population density	Population per km^2 in the j-th district, 2001
FIX	Fixed costs ratio	Capital expenses over balance sheet total of the i-th bank
HHIB	Branch concentration ratio	Hirschman-Herfindahl index for the i-th bank's j-th local market, based on ranches
HHID	Deposit concentration ratio	Hirschman-Herfindahl index for the i-th bank's j-th local market, based on deposits
HUMAN	Human capital intensive regions	PALME0 plus PALME1 plus PALME2 plus PALME3
IDTD	Interbank deposits ratio	Interbank deposits over total deposits of th i-th bank
IEF	Interest expenses ratio	Interest expenses over total funds of the i-th bank
MS	Market share	Share of the i-th bank's deposit in deposits of all banks in the j-th district
P1	Price of labor	Staff expenses per employee of the i-th bank
P2	Price of funding	Interest expenses over total deposits of the i-th bank
P3	Price of fixed capital	Other non-interest expenses over total fixed assets of the i-th bank
PALME0	Metropolitan area	Source: *Palme* (1995)
PALME1	City districts	Source: *Palme* (1995)
PALME2	Suburban districts	Source: *Palme* (1995)
PALME3	Medium-sized town districts	Source: *Palme* (1995)
PALME4	Intensive industrial districts	Source: *Palme* (1995)

PALME5	Intensive touristic districts	Source: *Palme* (1995)
PALME6	Extensive industrial districts	Source: *Palme* (1995)
PALME8	Industrial periphery districts	Source: *Palme* (1995)
PALME9	Touristic periphery districts	Source: *Palme* (1995)
PEA	Costs of labor	Staff expenses over balance sheet total of the i-th bank
PHYSICAL	Physical capital intensive regions	PALME4 plus PALME5
Q1	Loans	Total customer loans of the i-th bank, 1995 real terms
Q2	Securities	Other earning assets of the i-th bank, 1995 real terms
Q3	Deposits	Total customer deposits of the i-th bank, 1995 real terms
RCA	Risk capital ratio	Risk-weighted capital ratio of the i-th bank due to Basel I
RISK	Credit risks	Credit risks of the i-th bank, 1995 real terms
ROA	Return on assets	Profit after tax over balance sheet total of the i-th bank
RURAL	Rural regions	PALME6 plus PALME8 plus PALME9
$SCALE_{DEA}$	Scale elasticity	DEA-based scale elasticity due to *Tone – Sahoo* (2005)
$S\text{-}EFF_{DEA}$	Scale efficiency	DEA-based scale efficiency
TA	Total assets	Balance sheet total of the i-th bank, 1995 real terms
TRTA	Revenue ratio	Total revenue over balance sheet total of the i-th bank
VC	Total costs	Staff expenses plus interest expenses plus other non-interest expenses of the i-th bank, 1995 real terms
WACHS	Regional growth rate	Real growth rate of the j-th district's GDP
$X\text{-}EFF_{DEA}$	Technical efficiency	Gross technical efficiency scores due to DEA of the i-th bank
$X\text{-}EFF_{DEA}^{ADJ}$	Adjusted technical efficiency	Net technical efficiency scores due to DEA of the i-th bank
$X\text{-}EFF^{Ratio}$	Net-gross efficiency ratio	Net technical efficiency scores divided by gross technical efficiency scores
$X\text{-}EFF_{SFA}$	Technical efficiency	Gross technical efficiency scores due to SFA of the i-th bank
$X\text{-}EFF_{SFA}^{ADJ}$	Adjusted technical efficiency	Net technical efficiency scores due to SFA of the i-th bank

Appendix: Descriptive Statistics

Table A.1: Balance sheet total of Austrian banks

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Minimum	0.26	0.17	0.27	0.27	0.09	0.11	0.12	0.14
Maximum	49,262	53,251	58,335	92,072	105,153	116,118	97,523	104,882
Mean	377	399	429	486	541	593	613	600
Median	48	52	54	58	63	68	73	75
Standard deviation	2,551	2,701	3,077	3,724	4,186	4,692	4,381	4,455
Coefficient of variation	6.77	6.77	7.17	7.67	7.75	7.90	7.14	7.43
Number of observations	1,028	1,007	982	952	929	896	881	872

Source: OeNB; WIFO computations.

Table A.2: Summary statistics – Balanced sample: SFA

		VC	*Q1*	*Q2*	*Q3*	*P1*	*P2*	*P3*
1995								
	Minimum	0.45	2.03	3.12	6.85	34.23	0.027	0.043
	Maximum	1,417.93	10,591.54	8,383.61	10,054.77	122.25	0.213	1.094
	Mean	26.30	223.60	168.95	200.50	49.49	0.042	0.215
	Median	4.07	38.03	27.60	59.60	47.53	0.039	0.198
	Standard deviation	111.66	878.37	714.68	764.38	8.83	0.018	0.100
	Coefficient of variation	4.25	3.93	4.23	3.81	0.18	0.437	0.463
1996								
	Minimum	0.45	2.32	4.20	7.37	35.88	0.022	0.049
	Maximum	930.67	11,153.55	9,708.14	10,699.72	139.33	0.168	1.416
	Mean	23.40	236.43	174.00	208.21	50.21	0.036	0.228
	Median	3.91	39.42	26.71	60.97	48.34	0.033	0.209
	Standard deviation	90.31	918.00	762.57	796.35	8.91	0.015	0.113
	Coefficient of variation	3.86	3.88	4.38	3.82	0.18	0.414	0.497
1997								
	Minimum	0.47	2.27	3.50	7.77	13.58	0.020	0.047
	Maximum	2,241.53	18,610.16	19,941.07	12,113.53	101.75	0.161	0.828
	Mean	27.35	281.95	215.87	225.76	51.69	0.032	0.227
	Median	3.89	43.13	27.24	64.09	50.13	0.030	0.209
	Standard deviation	141.52	1,297.10	1,252.23	915.22	8.98	0.014	0.097
	Coefficient of variation	5.17	4.60	5.80	4.05	0.17	0.428	0.428
1998								
	Minimum	0.45	2.52	3.53	7.87	24.07	0.020	0.042
	Maximum	2,330.48	19,385.59	21,201.88	12,177.93	208.64	0.141	0.908
	Mean	28.67	302.45	233.50	237.19	53.29	0.031	0.236
	Median	4.00	46.50	28.95	66.30	51.08	0.028	0.215
	Standard deviation	147.32	1,366.90	1,354.43	943.09	11.99	0.012	0.105
	Coefficient of variation	5.14	4.52	5.80	3.98	0.23	0.402	0.442
1999								
	Minimum	0.45	2.51	3.64	8.20	31.74	0.016	0.036
	Maximum	2,214.57	19,620.98	21,056.12	12,296.05	108.00	0.149	1.054
	Mean	28.35	329.62	248.61	247.85	53.44	0.026	0.235
	Median	3.74	50.57	29.73	69.26	52.00	0.024	0.213
	Standard deviation	144.45	1,449.12	1,402.69	966.58	8.28	0.011	0.109
	Coefficient of variation	5.10	4.40	5.64	3.90	0.15	0.442	0.465
2000								
	Minimum	0.49	2.20	3.98	8.97	31.14	0.017	0.037
	Maximum	2,636.77	20,024.27	27,011.88	12,718.68	113.75	0.167	1.014
	Mean	34.26	355.99	284.19	251.73	53.65	0.028	0.238
	Median	4.05	53.35	29.44	68.59	52.42	0.025	0.219
	Standard deviation	175.80	1,538.33	1,742.29	969.35	8.28	0.014	0.113
	Coefficient of variation	5.13	4.32	6.13	3.85	0.15	0.495	0.473
2001								
	Minimum	0.54	2.24	3.74	9.87	35.57	0.017	0.049
	Maximum	2,479.39	21,202.94	26,962.61	14,815.10	124.50	0.165	1.029
	Mean	36.46	377.94	333.43	270.71	53.62	0.029	0.255
	Median	4.36	54.18	32.10	72.51	52.25	0.026	0.229
	Standard deviation	182.18	1,694.75	1,987.29	1,067.04	8.18	0.014	0.119
	Coefficient of variation	5.00	4.48	5.96	3.94	0.15	0.491	0.467
2002								
	Minimum	0.51	2.59	3.73	9.52	36.13	0.014	0.033
	Maximum	2,045.32	19,739.48	30,704.15	14,802.28	132.00	0.161	1.436
	Mean	32.33	385.76	347.82	277.52	53.78	0.025	0.261
	Median	4.25	57.77	34.20	74.83	52.28	0.023	0.235
	Standard deviation	151.25	1,676.44	2,073.96	1,068.43	8.43	0.015	0.132
	Coefficient of variation	4.68	4.35	5.96	3.85	0.16	0.609	0.506

Source: OeNB; WIFO computations.

Table A.3: Summary statistics – Balanced sample: DEA

		Employee expenses	Non-interest expenses	Risk-weighted assets	Net interest revenue	Net commission revenue	Other income
1995							
	Minimum	0.01	0.02	0.66	0.01	0.00	0.00
	Maximum	538.42	301.97	28,232.48	892.29	208.77	378.07
	Mean	3.82	1.92	177.10	6.47	1.55	3.14
	Median	0.87	0.44	34.60	1.73	0.27	0.45
	Standard deviation	22.92	12.92	1,177.09	37.39	9.39	17.90
	Coefficient of variation	6.00	6.74	6.65	5.78	6.08	5.69
1996							
	Minimum	0.01	0.02	0.68	0.01	0.00	0.00
	Maximum	559.21	305.30	29,883.57	891.47	214.43	426.54
	Mean	3.86	2.01	186.27	6.49	1.71	3.46
	Median	0.90	0.46	35.76	1.74	0.29	0.53
	Standard deviation	23.45	13.26	1,246.74	37.20	10.11	19.70
	Coefficient of variation	6.07	6.62	6.69	5.73	5.91	5.69
1997							
	Minimum	0.01	0.02	0.58	0.01	-0.86	-1.18
	Maximum	543.29	281.68	32,952.66	823.65	224.41	481.82
	Mean	4.08	2.19	217.19	6.65	1.93	4.00
	Median	0.91	0.46	37.16	1.70	0.31	0.55
	Standard deviation	24.87	13.91	1,520.77	37.59	11.64	24.22
	Coefficient of variation	6.09	6.36	7.00	5.66	6.03	6.05
1998							
	Minimum	0.01	0.01	0.74	0.01	0.00	0.00
	Maximum	588.59	261.37	30,967.64	800.86	247.07	868.50
	Mean	4.34	2.37	229.51	6.63	2.24	5.16
	Median	0.95	0.49	38.74	1.70	0.37	0.61
	Standard deviation	26.57	14.39	1,506.82	36.78	13.12	38.10
	Coefficient of variation	6.13	6.07	6.57	5.55	5.86	7.38
1999							
	Minimum	0.01	0.01	0.74	0.01	0.00	-0.01
	Maximum	679.77	243.28	33,875.82	719.57	257.74	929.22
	Mean	4.53	2.45	252.45	6.50	2.52	5.53
	Median	0.95	0.52	41.02	1.70	0.43	0.70
	Standard deviation	29.06	13.93	1,643.76	33.90	13.59	39.98
	Coefficient of variation	6.41	5.69	6.51	5.21	5.39	7.23
2000							
	Minimum	0.01	0.02	0.69	0.02	0.00	0.00
	Maximum	698.36	351.73	38,779.44	754.33	324.60	872.49
	Mean	4.68	2.71	278.63	6.96	2.95	6.03
	Median	0.97	0.53	43.75	1.94	0.51	0.76
	Standard deviation	29.75	16.83	1,839.37	35.28	16.11	39.91
	Coefficient of variation	6.35	6.22	6.60	5.07	5.46	6.62
2001							
	Minimum	0.01	0.02	0.70	-1.56	0.00	0.01
	Maximum	765.78	326.14	36,570.80	764.73	292.11	1,125.82
	Mean	4.79	2.81	297.05	7.09	2.84	6.41
	Median	1.00	0.59	46.17	1.85	0.50	0.75
	Standard deviation	31.98	16.05	1,895.68	36.40	15.57	47.60
	Coefficient of variation	6.67	5.71	6.38	5.13	5.49	7.42
2002							
	Minimum	0.01	0.02	0.68	-0.21	0.00	0.02
	Maximum	994.87	547.49	50,383.65	1,171.29	551.09	1,011.94
	Mean	5.16	3.20	325.96	7.63	3.09	6.36
	Median	1.00	0.62	46.98	1.84	0.47	0.81
	Standard deviation	39.58	22.93	2,299.62	47.78	22.74	44.31
	Coefficient of variation	7.67	7.16	7.05	6.26	7.36	6.96

Source: OeNB; WIFO computations.

Table A.4: Summary statistics– Unbalanced Sample

		Employee expenses	Non-interest expenses	Risk-weighted assets	Net interest revenue	Net commission revenue	Other income
1996							
	Minimum	0.0	0.0	0.0	-5.2	-4.9	-14.0
	Maximum	559.2	305.3	29,883.6	891.5	214.4	101.9
	Mean	3.9	2.3	199.6	6.5	1.9	0.6
	Standard deviation	24.2	14.5	1,418.7	37.6	11.2	5.3
1997							
	Minimum	0.0	0.0	0.0	-5.7	-7.7	-18.8
	Maximum	543.3	281.7	32,952.7	823.7	227.4	98.1
	Mean	4.1	2.4	220.2	6.4	2.1	0.6
	Standard deviation	25.5	15.1	1,666.9	38.0	12.7	5.5
1998							
	Minimum	0.0	0.0	0.0	-2.8	-10.6	-18.5
	Maximum	588.6	261.4	30,967.6	800.9	247.1	130.1
	Mean	4.3	2.6	231.7	6.4	2.4	0.6
	Standard deviation	26.0	15.3	1,521.0	35.8	13.9	6.2
1999							
	Minimum	0.0	0.0	0.0	-3.0	-15.4	-53.4
	Maximum	679.8	313.1	33,875.8	719.6	257.7	90.5
	Mean	4.5	2.8	260.0	6.4	2.7	0.5
	Standard deviation	27.6	16.3	1,696.2	33.7	14.6	5.4
2000							
	Minimum	0.0	0.0	0.0	-3.9	-22.8	-2.7
	Maximum	698.4	351.7	38,779.4	754.3	324.6	93.0
	Mean	4.7	3.0	278.8	7.0	3.2	0.5
	Standard deviation	28.6	18.4	1,834.6	37.1	17.2	4.7
2001							
	Minimum	0.0	0.0	0.0	-20.2	-27.3	-1.8
	Maximum	765.8	334.1	36,570.8	764.7	292.1	79.6
	Mean	4.8	3.3	302.1	7.3	3.2	0.5
	Standard deviation	30.8	18.7	1,908.0	38.6	17.0	5.1
2002							
	Minimum	0.0	0.0	0.2	-20.7	-29.0	-1.2
	Maximum	994.9	547.5	50,383.7	1,171.3	551.1	138.1
	Mean	4.9	3.3	305.6	7.2	3.2	0.6
	Standard deviation	36.7	21.4	2,137.1	44.6	21.3	6.2

Source: OeNB; WIFO computations.

Table B.1: Structure and performance indicators of the Austrian banking sector: Joint stock banks and private banks

	1995	1996	1997	1998	1999	2000	2001	2002
	As a percentage of balance sheet total							
Assets								
Cash and balance with Central bank	10.2	10.8	9.2	8.7	7.0	7.1	6.3	5.9
Interbank deposits	32.2	30.0	28.5	21.3	18.0	16.6	19.5	19.3
Loans	48.2	48.4	50.0	57.3	59.0	61.1	58.9	54.7
Securities	7.9	9.2	10.5	10.5	13.6	12.8	13.3	17.6
Other assets	1.4	1.6	1.9	2.1	2.4	2.4	2.1	2.5
Claims on non-residents	*32.3*	*33.2*	*36.7*	*27.9*	*31.3*	*25.9*	*26.4*	*29.6*
Liabilities								
Capital and reserves	4.3	4.3	4.3	4.9	4.8	4.5	4.4	4.8
Interbank deposits	37.3	37.5	36.5	35.5	35.5	29.2	30.7	23.7
Non-bank deposits	40.0	40.2	39.1	42.0	41.8	46.7	47.4	52.1
Bonds	14.4	13.9	15.9	13.1	12.4	13.9	12.4	14.6
Other liabilities	3.9	4.1	4.1	4.6	5.4	5.7	5.1	4.7
Liabilities to non-residents	*31.2*	*34.1*	*38.8*	*19.3*	*18.5*	*20.5*	*19.7*	*21.8*
Income statement	As a percentage of gross income							
Interest income	233.0	209.2	209.9	167.9	171.8	161.0	176.7	157.8
Interest expenses	177.9	153.9	154.8	117.2	121.2	111.9	122.9	106.0
Fees and commissions receivable	22.5	23.3	24.7	26.5	29.4	29.7	31.0	27.4
Fees and commissions payable	4.3	4.2	4.3	4.4	5.0	5.2	4.9	3.4
Other non-interest income	26.6	25.6	24.5	27.2	25.1	26.4	20.1	24.2
Performance ratios								
Cost-income ratio	0.69	0.69	0.69	0.69	0.72	0.64	0.67	0.66
Return on assets	0.27	0.23	0.36	0.40	0.36	0.64	0.62	0.38
Return on equity	6.4	5.3	8.4	8.3	7.4	14.1	13.9	7.9
Risk-based capital ratio [1])	12.4	12.4	11.7	12.5	11.9	13.6	11.8	13.8
	1,000 € (real terms, at 1995 prices)							
Staff costs per employee	53.7	56.1	58.8	64.8	59.0	59.6	61.2	54.1
Return per employee	16.6	14.7	25.4	30.0	26.9	47.0	50.9	28.8
Bank concentration	As a percentage of balance sheet total							
5 largest banks	81.5	81.5	83.4	80.1	80.8	82.4	84.5	82.2

Source: OeNB; WIFO computations. – 1) According to Basel I.

Table B.2: Structure and performance indicators of the Austrian banking sector: Savings banks

	1995	1996	1997	1998	1999	2000	2001	2002
	As a percentage of balance sheet total							
Assets								
Cash and balance with Central bank	7.6	8.6	8.1	5.8	6.2	5.6	5.3	5.3
Interbank deposits	27.5	27.8	26.8	36.5	35.0	32.8	33.3	23.7
Loans	52.7	51.7	51.0	42.8	41.4	41.9	42.8	50.8
Securities	8.3	8.5	10.7	11.9	14.2	16.9	14.8	16.5
Other assets	3.9	3.4	3.4	3.1	3.3	2.9	3.8	3.7
Claims on non-residents	*24.9*	*27.3*	*29.0*	*32.4*	*33.8*	*43.0*	*38.3*	*36.3*
Liabilities								
Capital and reserves	4.7	4.9	5.3	4.7	4.6	4.3	4.8	4.8
Interbank deposits	29.4	30.9	32.0	38.5	40.5	39.9	38.3	34.9
Non-bank deposits	46.8	44.2	42.5	36.8	33.5	32.3	33.9	36.6
Bonds	12.9	13.5	12.8	13.8	15.4	17.3	15.2	14.9
Other liabilities	6.2	6.5	7.4	6.2	6.0	6.2	7.8	8.7
Liabilities to non-residents	*22.8*	*26.3*	*29.7*	*38.9*	*44.0*	*46.8*	*42.3*	*36.4*
Income statement	As a percentage of gross income							
Interest income	226.0	202.0	209.2	217.4	207.1	261.4	199.0	171.2
Interest expenses	157.4	136.2	146.3	163.5	156.4	210.2	150.4	117.9
Fees and commissions receivable	18.8	20.0	21.9	21.5	24.3	28.7	24.6	29.8
Fees and commissions payable	2.9	3.0	3.8	3.4	4.5	6.4	4.5	5.3
Other non-interest income	15.5	17.2	19.0	28.1	29.4	26.4	31.4	22.2
Performance ratios								
Cost-income ratio	0.71	0.69	0.70	0.64	0.66	0.70	0.67	0.75
Return on assets	0.49	0.42	0.35	0.36	0.36	0.48	0.40	0.20
Return on equity	8.9	7.4	6.3	6.3	6.5	8.3	7.2	3.6
Risk-based capital ratio [1])	11.5	12.5	15.1	17.2	16.4	16.9	18.1	14.6
	1,000 € (real terms, at 1995 prices)							
Staff costs per employee	64.4	64.6	64.0	67.3	73.7	74.6	77.4	78.2
Return per employee	16.6	14.5	12.0	23.2	35.7	26.5	27.6	9.0
Bank concentration	As a percentage of balance sheet total							
5 largest banks	80.2	80.9	83.8	86.9	87.2	88.1	87.1	87.3

Source: OeNB; WIFO computations. – 1) According to Basel I.

Table B.3: Structure and performance indicators of the Austrian banking sector: State mortgage banks

	1995	1996	1997	1998	1999	2000	2001	2002
	As a percentage of balance sheet total							
Assets								
Cash and balance with Central bank	6.4	6.1	6.0	6.0	6.0	5.3	4.9	4.4
Interbank deposits	4.5	4.2	5.3	6.4	7.1	9.3	13.1	14.5
Loans	80.4	81.1	79.5	76.3	73.1	70.4	67.4	64.6
Securities	7.1	6.9	7.3	9.5	12.0	12.7	12.7	14.4
Other assets	1.5	1.7	1.8	1.8	1.9	2.3	2.0	2.1
Claims on non-residents	*7.2*	*7.9*	*9.2*	*11.3*	*16.6*	*19.7*	*23.4*	*26.7*
Liabilities								
Capital and reserves	3.4	3.7	3.7	3.9	3.8	3.7	3.5	3.3
Interbank deposits	7.8	8.8	11.3	15.3	15.5	13.9	9.9	7.2
Non-bank deposits	28.3	29.7	28.3	27.8	26.2	23.5	25.1	23.3
Bonds	57.4	54.4	53.1	49.7	51.2	55.1	57.9	62.3
Other liabilities	3.0	3.4	3.6	3.3	3.4	3.7	3.6	3.9
Liabilities to non-residents	*6.6*	*7.4*	*10.2*	*12.5*	*13.6*	*16.7*	*20.1*	*27.1*
Income statement	As a percentage of gross income							
Interest income	368.3	321.2	303.5	310.7	279.9	336.1	342.2	320.4
Interest expenses	291.1	246.0	231.5	240.0	210.4	267.9	276.2	251.3
Fees and commissions receivable	13.9	13.0	13.9	16.0	16.5	17.9	16.7	15.8
Fees and commissions payable	2.0	1.5	1.8	2.8	2.7	2.3	1.9	2.2
Other non-interest income	10.9	13.4	16.0	16.0	16.7	16.2	19.2	17.3
Performance ratios								
Cost-income ratio	0.60	0.56	0.55	0.59	0.56	0.56	0.58	0.60
Return on assets	0.30	0.32	0.29	0.28	0.27	0.30	0.25	0.23
Return on equity	8.8	8.7	7.9	7.3	7.3	8.1	7.3	7.1
Risk-based capital ratio [1])	11.1	12.0	12.2	12.1	12.2	11.9	11.5	11.1
	1,000 € (real terms, at 1995 prices)							
Staff costs per employee	55.9	57.5	56.2	54.6	54.9	54.4	53.4	54.0
Return per employee	23.0	24.8	23.2	23.7	24.9	28.9	25.5	24.5
Bank concentration	As a percentage of balance sheet total							
5 largest banks	68.4	68.8	69.1	69.7	70.1	72.3	74.2	75.4

Source: OeNB; WIFO computations. – 1) According to Basel I.

Table B.4: Structure and performance indicators of the Austrian banking sector: Raiffeisen credit cooperatives

	1995	1996	1997	1998	1999	2000	2001	2002
	As a percentage of balance sheet total							
Assets								
Cash and balance with Central bank	7.5	7.7	7.1	6.8	5.8	4.8	5.2	3.7
Interbank deposits	34.2	32.5	29.6	30.3	30.2	30.6	32.4	32.0
Loans	47.2	47.7	49.2	48.3	48.5	48.6	46.5	46.8
Securities	7.6	8.6	10.4	10.9	12.0	12.2	12.2	14.3
Other assets	3.4	3.5	3.7	3.8	3.5	3.8	3.7	3.3
Claims on non-residents	*8.7*	*9.2*	*11.2*	*11.5*	*13.3*	*15.0*	*16.6*	*17.5*
Liabilities								
Capital and reserves	5.5	5.6	5.5	5.5	5.3	5.4	5.7	6.1
Interbank deposits	30.5	31.0	30.9	33.0	35.5	39.2	39.8	38.9
Non-bank deposits	53.0	52.0	50.6	48.5	45.9	41.7	41.4	42.3
Bonds	7.8	8.2	9.2	9.6	9.8	9.6	8.8	8.4
Other liabilities	3.2	3.2	3.8	3.4	3.5	4.1	4.2	4.2
Liabilities to non-residents	*8.9*	*9.8*	*12.0*	*12.9*	*12.9*	*15.9*	*16.9*	*15.6*
Income statement	As a percentage of gross income							
Interest income	227.4	182.6	174.8	173.3	165.5	182.5	176.0	146.6
Interest expenses	157.6	115.8	112.0	111.8	105.8	124.3	120.6	93.0
Fees and commissions receivable	17.9	19.2	21.2	23.8	26.1	27.4	25.2	23.5
Fees and commissions payable	2.9	3.2	3.8	4.4	4.7	4.7	4.6	4.5
Other non-interest income	15.2	17.1	19.8	19.1	18.9	19.1	23.9	27.4
Performance ratios								
Cost-income ratio	0.65	0.65	0.67	0.69	0.69	0.65	0.65	0.65
Return on assets	0.36	0.35	0.32	0.32	0.29	0.40	0.63	0.39
Return on equity	6.5	6.3	5.8	5.9	5.6	7.5	11.1	6.4
Risk-based capital ratio [1])	12.9	12.8	12.4	12.4	12.4	12.9	13.2	13.7
	1,000 € (real terms, at 1995 prices)							
Staff costs per employee	48.4	49.1	50.2	52.6	53.8	54.1	54.4	55.3
Return per employee	15.7	16.0	15.2	16.6	16.5	24.3	39.6	25.0
Bank concentration	As a percentage of balance sheet total							
5 largest banks	41.9	43.1	46.2	47.9	49.1	52.1	51.8	50.5

Source: OeNB; WIFO computations. – 1) According to Basel I.

Table B.5: Structure and performance indicators of the Austrian banking sector: Volksbank credit cooperatives

	1995	1996	1997	1998	1999	2000	2001	2002
	As a percentage of balance sheet total							
Assets								
Cash and balance with Central bank	9.6	8.9	8.4	7.4	6.3	6.2	7.7	5.8
Interbank deposits	18.8	18.2	18.3	19.3	20.4	21.8	24.4	24.7
Loans	57.1	58.5	58.4	57.7	57.1	54.9	50.5	52.5
Securities	10.1	10.6	11.2	11.9	12.6	12.7	13.2	12.6
Other assets	4.4	3.8	3.8	3.6	3.5	4.4	4.3	4.3
Claims on non-residents	*6.6*	*7.3*	*8.0*	*8.6*	*9.4*	*12.0*	*12.4*	*13.7*
Liabilities								
Capital and reserves	5.4	6.2	6.3	6.2	6.0	5.8	6.1	6.3
Interbank deposits	20.5	23.3	24.6	25.1	30.1	30.8	33.6	26.6
Non-bank deposits	57.7	56.3	55.4	54.0	50.4	47.4	44.1	44.7
Bonds	11.2	9.8	9.5	10.5	9.6	12.0	12.0	17.6
Other liabilities	5.2	4.4	4.2	4.1	3.8	3.8	3.8	4.3
Liabilities to non-residents	*9.2*	*10.0*	*11.5*	*13.1*	*12.7*	*11.8*	*14.1*	*8.6*
Income statement	As a percentage of gross income							
Interest income	186.5	168.8	160.5	161.1	148.4	164.4	186.0	199.0
Interest expenses	120.0	104.6	97.5	100.3	91.7	108.1	130.1	142.8
Fees and commissions receivable	18.0	20.3	21.7	23.9	26.8	27.7	24.7	24.5
Fees and commissions payable	1.8	2.0	2.2	3.0	3.2	3.1	2.9	3.0
Other non-interest income	17.4	17.5	17.6	18.4	19.7	19.1	22.3	22.4
Performance ratios								
Cost-income ratio	0.66	0.67	0.69	0.68	0.68	0.63	0.67	0.67
Return on assets	0.50	0.42	0.34	0.39	0.40	0.51	0.47	0.31
Return on equity	9.2	6.8	5.4	6.2	6.7	8.8	7.7	4.9
Risk-based capital ratio [1])	11.2	12.1	12.3	12.1	11.4	12.5	13.5	13.6
	1,000 € (real terms, at 1995 prices)							
Staff costs per employee	47.6	51.1	51.4	50.5	49.6	49.7	51.4	52.1
Return per employee	17.5	15.3	13.1	15.9	17.8	23.6	25.3	16.5
Bank concentration	As a percentage of balance sheet total							
5 largest banks	44.3	45.7	46.6	47.4	51.3	54.6	56.6	55.4

Source: OeNB; WIFO computations. – 1) According to Basel I.

Table B.6: Structure and performance indicators of the Austrian banking sector: Building and loan associations

	1995	1996	1997	1998	1999	2000	2001	2002
	As a percentage of balance sheet total							
Assets								
Cash and balance with Central bank	2.7	3.6	4.8	5.4	4.7	4.1	3.6	3.5
Interbank deposits	8.4	9.9	10.4	10.0	10.9	8.4	8.5	7.5
Loans	84.7	80.6	76.4	71.4	63.2	69.0	71.3	71.2
Securities	2.8	4.5	6.8	11.2	18.8	16.0	13.9	14.9
Other assets	1.5	1.4	1.5	2.0	2.5	2.5	2.7	3.0
Claims on non-residents	*0.4*	*0.5*	*1.0*	*1.3*	*3.6*	*3.4*	*3.7*	*3.7*
Liabilities								
Capital and reserves	3.2	3.2	2.7	3.8	3.6	3.7	3.7	3.3
Interbank deposits	1.3	0.7	0.7	0.5	1.1	5.6	2.9	2.5
Non-bank deposits	90.5	91.6	92.4	92.1	90.9	87.2	86.7	87.9
Bonds	2.3	2.0	1.6	1.1	1.0	0.9	3.6	2.9
Other liabilities	2.5	2.3	2.5	2.6	3.4	2.5	3.1	3.4
Liabilities to non-residents	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.1*
Income statement	As a percentage of gross income							
Interest income	228.1	230.5	245.0	245.4	232.5	222.3	237.8	222.7
Interest expenses	153.5	160.8	180.8	187.2	184.9	172.1	180.6	163.5
Fees and commissions receivable	7.9	8.6	8.7	13.5	14.2	14.6	15.3	14.7
Fees and commissions payable	8.3	6.0	5.5	5.3	5.8	5.4	5.6	5.6
Other non-interest income	25.7	27.7	32.6	33.6	44.0	40.6	33.1	31.7
Performance ratios								
Cost-income ratio	0.82	0.83	0.85	0.84	0.82	0.84	0.85	0.80
Return on assets	0.34	0.30	0.27	0.21	0.12	0.22	0.12	-0.21
Return on equity	10.6	9.2	9.9	5.7	3.3	5.9	3.3	-6.3
Risk-based capital ratio [1])	7.8	8.2	8.8	9.9	9.8	9.3	9.8	10.0
	1,000 € (real terms, at 1995 prices)							
Staff costs per employee	47.7	47.1	49.2	51.2	49.5	48.9	53.6	52.4
Return per employee	22.1	20.0	19.7	16.7	9.4	17.4	10.3	-17.5

Source: OeNB; WIFO computations. – 1) According to Basel I.

Table B.7: Structure and performance indicators of the Austrian banking sector: Special purpose banks

	1995	1996	1997	1998	1999	2000	2001	2002
	As a percentage of balance sheet total							
Assets								
Cash and balance with Central bank	7.2	7.7	5.3	3.8	2.4	3.4	2.9	1.5
Interbank deposits	57.9	55.6	57.2	58.4	58.9	57.5	56.1	54.9
Loans	24.2	25.2	26.5	26.6	24.6	24.9	26.0	28.0
Securities	4.6	4.9	5.0	5.9	8.8	8.8	10.4	11.3
Other assets	6.1	6.4	6.0	5.4	5.3	5.3	4.5	4.3
Claims on non-residents	*23.5*	*23.7*	*24.1*	*22.4*	*23.1*	*24.9*	*26.0*	*26.4*
Liabilities								
Capital and reserves	4.2	4.2	4.3	6.3	5.9	5.4	5.5	4.3
Interbank deposits	29.2	28.9	26.4	27.2	26.3	22.0	22.8	18.4
Non-bank deposits	7.1	7.3	7.9	7.0	6.2	5.9	6.5	6.6
Bonds	53.1	53.1	54.9	53.4	55.4	60.8	58.7	64.2
Other liabilities	6.5	6.5	6.5	6.0	6.1	5.9	6.4	6.6
Liabilities to non-residents	*48.6*	*50.7*	*52.7*	*52.1*	*54.2*	*59.7*	*59.1*	*62.6*
Income statement	As a percentage of gross income							
Interest income	156.2	133.0	138.5	145.1	141.9	172.1	192.4	185.7
Interest expenses	137.6	113.4	117.8	120.8	116.1	151.6	168.3	160.7
Fees and commissions receivable	35.2	39.3	46.7	48.5	52.1	57.4	62.5	62.2
Fees and commissions payable	11.8	15.1	18.6	20.0	23.6	28.1	33.9	33.7
Other non-interest income	57.9	56.1	51.2	47.1	45.7	50.1	47.2	46.5
Performance ratios								
Cost-income ratio	0.75	0.79	0.75	0.72	0.71	0.71	0.73	0.73
Return on assets	0.24	0.36	0.41	0.36	0.56	0.57	0.50	0.37
Return on equity	5.6	8.5	9.4	5.7	9.5	10.5	9.1	8.7
Risk-based capital ratio [1])	18.0	20.4	20.3	29.5	28.0	26.0	25.4	18.8
	1,000 € (real terms, at 1995 prices)							
Staff costs per employee	50.5	50.6	51.5	56.5	53.2	53.7	53.5	53.9
Return per employee	20.8	31.4	36.3	34.9	59.1	68.1	57.5	42.1
Bank concentration	As a percentage of balance sheet total							
5 largest banks	78.5	76.3	74.9	75.1	76.1	76.7	78.3	77.6

Source: OeNB; WIFO computations. – 1) According to Basel I.

Table B.8: Structure and performance indicators of the Austrian banking sector: Human capital intensive regions

	1995	1996	1997	1998	1999	2000	2001	2002
	As a percentage of balance sheet total							
Assets								
Cash and balance with Central bank	8.2	8.7	7.8	6.6	5.9	5.6	5.4	4.7
Interbank deposits	31.1	30.2	29.2	31.5	30.3	29.6	30.9	27.6
Loans	50.3	50.0	50.3	48.2	47.3	47.4	46.9	48.8
Securities	7.4	8.1	9.8	10.7	13.3	14.2	13.4	15.5
Other assets	3.0	2.9	3.0	3.0	3.1	3.1	3.3	3.4
Claims on non-residents	*23.2*	*24.4*	*26.6*	*25.4*	*27.7*	*31.1*	*29.3*	*29.9*
Liabilities								
Capital and reserves	4.4	4.5	4.7	4.8	4.7	4.4	4.7	4.8
Interbank deposits	32.6	33.1	32.9	35.5	36.7	35.4	34.9	31.2
Non-bank deposits	39.1	38.4	37.4	35.7	33.7	33.0	33.7	34.7
Bonds	19.0	18.8	19.5	18.8	19.6	21.6	20.6	22.7
Other liabilities	4.9	5.0	5.5	5.2	5.4	5.6	6.1	6.6
Liabilities to non-residents	*23.7*	*26.3*	*29.7*	*28.3*	*30.6*	*34.0*	*31.7*	*31.0*
Income statement	As a percentage of gross income							
Interest income	236.5	206.5	208.6	200.5	195.2	222.7	206.3	185.2
Interest expenses	178.3	149.8	153.9	150.2	146.7	175.6	158.6	136.3
Fees and commissions receivable	21.6	23.0	25.2	26.4	29.2	32.1	30.6	31.4
Fees and commissions payable	4.7	5.1	5.9	6.1	7.3	8.6	8.2	8.4
Other non-interest income	25.0	25.4	25.9	29.4	29.5	29.4	30.0	28.1
Performance ratios								
Cost-income ratio	0.70	0.70	0.70	0.68	0.69	0.68	0.68	0.71
Return on assets	0.28	0.26	0.28	0.32	0.37	0.39	0.46	0.23
Return on equity	6.4	5.7	6.0	6.6	7.8	8.8	9.7	4.7
Risk-based capital ratio [1])	12.2	12.7	13.4	14.8	14.1	15.0	15.1	14.2
	1,000 € (real terms, at 1995 prices)							
Staff costs per employee	57.3	59.2	59.7	63.2	64.2	65.0	66.5	66.8
Return per employee	17.2	16.6	19.0	24.9	30.9	35.2	41.7	19.8
Bank concentration	As a percentage of balance sheet total							
5 largest banks	45.3	45.1	50.3	50.0	50.2	52.5	52.2	53.3

Source: OeNB; WIFO computations. – 1) According to Basel I.

Table B.9: Structure and performance indicators of the Austrian banking sector: Physical capital intensive regions

	1995	1996	1997	1998	1999	2000	2001	2002
	As a percentage of balance sheet total							
Assets								
Cash and balance with Central bank	6.6	7.1	6.4	5.4	5.1	4.4	3.8	3.4
Interbank deposits	23.1	19.8	18.4	19.0	18.1	17.2	19.2	18.2
Loans	56.9	58.8	60.3	60.3	60.3	61.4	60.5	61.1
Securities	9.6	10.5	11.0	11.8	13.0	13.2	12.9	13.8
Other assets	3.8	3.7	3.9	3.6	3.5	3.7	3.5	3.5
Claims on non-residents	*9.0*	*8.4*	*9.0*	*9.7*	*10.3*	*9.7*	*10.4*	*11.5*
Liabilities								
Capital and reserves	6.1	6.3	6.4	6.5	6.3	6.6	6.4	6.4
Interbank deposits	7.4	9.1	11.6	15.1	18.0	20.2	19.2	19.4
Non-bank deposits	74.1	72.8	71.1	68.2	64.7	60.7	59.3	58.1
Bonds	9.3	8.6	7.7	7.0	8.0	9.6	12.2	13.0
Other liabilities	3.1	3.2	3.1	3.0	2.9	2.9	2.8	2.9
Liabilities to non-residents	*16.7*	*16.0*	*16.5*	*17.2*	*16.5*	*16.8*	*17.5*	*17.7*
Income statement	As a percentage of gross income							
Interest income	167.2	151.0	143.4	141.6	128.2	131.3	138.1	128.6
Interest expenses	96.5	82.3	76.8	76.5	66.6	70.4	77.3	66.9
Fees and commissions receivable	17.7	18.9	20.9	22.6	25.7	26.7	24.9	23.5
Fees and commissions payable	1.9	1.9	2.3	2.5	2.5	2.7	3.3	3.4
Other non-interest income	13.5	14.4	14.9	14.7	15.3	15.1	17.7	18.2
Performance ratios								
Cost-income ratio	0.63	0.62	0.64	0.66	0.66	0.60	0.64	0.67
Return on assets	0.57	0.51	0.44	0.46	0.40	0.59	0.47	0.36
Return on equity	9.5	8.1	6.9	7.0	6.3	8.9	7.3	5.6
Risk-based capital ratio [1])	11.5	12.2	12.5	12.7	12.5	12.4	12.5	12.4
	1,000 € (real terms, at 1995 prices)							
Staff costs per employee	48.5	48.7	49.9	51.3	51.1	51.0	51.6	52.2
Return per employee	19.8	17.9	16.0	18.0	16.6	24.8	20.8	16.3
Bank concentration	As a percentage of balance sheet total							
5 largest banks	22.5	22.9	23.8	24.8	26.2	27.7	29.4	30.0

Source: OeNB; WIFO computations. – 1) According to Basel I.

Table B.10: Structure and performance indicators of the Austrian banking sector: Rural regions

	1995	1996	1997	1998	1999	2000	2001	2002
	As a percentage of balance sheet total							
Assets								
Cash and balance with Central bank	9.4	9.7	8.8	7.6	6.8	6.0	5.4	4.5
Interbank deposits	25.2	22.9	21.2	20.2	19.4	19.5	20.7	20.3
Loans	53.5	54.7	56.8	58.1	59.0	59.8	58.7	58.3
Securities	7.8	8.8	9.3	10.4	11.3	11.2	11.8	13.6
Other assets	4.1	3.9	3.8	3.7	3.5	3.5	3.4	3.4
Claims on non-residents	*1.5*	*1.9*	*2.2*	*2.3*	*2.9*	*3.3*	*4.2*	*4.7*
Liabilities								
Capital and reserves	6.3	6.6	6.7	6.8	6.7	6.9	6.8	6.8
Interbank deposits	1.6	2.3	3.3	4.8	7.0	8.4	8.9	9.4
Non-bank deposits	87.3	86.2	85.3	84.1	82.5	81.0	80.6	79.8
Bonds	2.2	2.2	1.9	1.7	1.3	1.2	1.1	1.4
Other liabilities	2.7	2.7	2.7	2.6	2.5	2.5	2.5	2.5
Liabilities to non-residents	*4.0*	*4.1*	*4.0*	*3.8*	*3.8*	*3.6*	*4.0*	*3.9*
Income statement	As a percentage of gross income							
Interest income	163.2	148.9	142.7	138.8	126.3	126.9	132.6	120.9
Interest expenses	84.8	73.5	68.7	67.6	57.9	57.9	64.1	55.9
Fees and commissions receivable	12.7	13.7	14.8	17.2	19.1	20.3	20.0	19.5
Fees and commissions payable	1.2	1.3	1.3	1.4	1.4	1.4	1.8	2.0
Other non-interest income	10.2	12.2	12.4	13.0	13.9	12.1	13.3	17.6
Performance ratios								
Cost-income ratio	0.67	0.67	0.70	0.70	0.69	0.64	0.67	0.67
Return on assets	0.44	0.45	0.41	0.40	0.36	0.51	0.44	0.45
Return on equity	7.1	6.8	6.2	5.9	5.3	7.3	6.5	6.6
Risk-based capital ratio [1])	12.3	12.9	13.1	13.2	13.3	13.4	13.3	13.5
	1,000 € (real terms, at 1995 prices)							
Staff costs per employee	47.2	48.2	50.0	50.9	52.1	52.7	52.3	52.2
Return per employee	13.1	13.4	12.9	13.0	12.2	17.6	15.9	16.6
Bank concentration	As a percentage of balance sheet total							
5 largest banks	8.0	8.3	8.4	8.6	8.6	8.6	8.8	9.2

Source: OeNB; WIFO computations. – 1) According to Basel I.

Table B.11: Structure and performance indicators of the Austrian banking sector: Eastern Austria

	1995	1996	1997	1998	1999	2000	2001	2002
	As a percentage of balance sheet total							
Assets								
Cash and balance with Central bank	8.3	9.0	8.0	6.6	6.0	5.8	5.6	4.8
Interbank deposits	33.6	32.9	31.7	34.5	33.1	32.3	33.9	29.8
Loans	47.9	47.3	47.5	45.2	44.0	43.9	43.3	45.6
Securities	7.3	8.0	9.9	10.8	13.8	14.9	13.9	16.4
Other assets	2.9	2.8	3.0	3.0	3.1	3.1	3.3	3.4
Claims on non-residents	*26.4*	*27.9*	*30.4*	*28.8*	*31.1*	*35.1*	*32.7*	*33.3*
Liabilities								
Capital and reserves	4.2	4.4	4.6	4.7	4.6	4.2	4.6	4.7
Interbank deposits	35.2	35.7	35.0	37.5	38.6	36.5	36.5	32.2
Non-bank deposits	37.4	36.6	35.6	33.9	31.8	31.6	32.2	33.6
Bonds	18.1	18.2	19.2	18.5	19.6	21.9	20.3	22.5
Other liabilities	4.9	5.1	5.6	5.3	5.5	5.8	6.3	7.0
Liabilities to non-residents	*26.7*	*29.7*	*33.7*	*31.9*	*34.7*	*38.9*	*36.2*	*35.7*
Income statement	As a percentage of gross income							
Interest income	252.3	219.0	223.6	212.5	211.6	243.3	219.8	195.7
Interest expenses	193.4	161.5	168.3	162.7	163.8	196.6	172.6	147.7
Fees and commissions receivable	21.8	23.0	25.2	26.3	28.7	31.7	31.0	32.3
Fees and commissions payable	5.2	5.6	6.6	6.7	8.0	9.5	9.4	9.5
Other non-interest income	24.5	25.1	26.0	30.6	31.4	31.1	31.2	29.2
Performance ratios								
Cost-income ratio	0.70	0.70	0.70	0.67	0.69	0.68	0.68	0.72
Return on assets	0.26	0.24	0.28	0.32	0.37	0.39	0.48	0.24
Return on equity	6.0	5.5	6.1	6.7	8.1	9.1	10.4	5.2
Risk-based capital ratio [1])	12.1	12.7	13.7	15.5	14.7	16.1	16.0	14.9
	1,000 € (real terms, at 1995 prices)							
Staff costs per employee	58.5	61.1	61.8	64.1	67.4	68.5	71.3	71.4
Return per employee	17.5	17.5	21.0	27.3	35.8	40.7	50.5	24.3
Bank concentration	As a percentage of balance sheet total							
5 largest banks	55.8	55.5	61.8	61.1	61.4	64.6	65.1	68.1
Bank density								
Residents per institution	8,857	9,056	9,421	9,646	9,728	10,196	10,328	10,489
Residents per institution and branch	1,465	1,465	1,466	1,506	1,517	1,544	1,548	1,590
Institutions and branches per 100 km^2	9.7	9.7	9.7	9.4	9.4	9.2	9.3	9.1

Source: OeNB; WIFO computations. – 1) According to Basel I.

Table B.12: Structure and performance indicators of the Austrian banking sector: Southern Austria

	1995	1996	1997	1998	1999	2000	2001	2002
	As a percentage of balance sheet total							
Assets								
Cash and balance with Central bank	7.6	7.3	6.7	6.4	5.7	4.9	4.8	3.9
Interbank deposits	22.6	21.7	20.1	19.9	19.3	18.9	20.1	20.5
Loans	58.8	59.6	61.6	61.5	61.9	62.5	61.2	60.4
Securities	7.6	8.1	8.4	9.2	10.1	10.4	10.6	12.0
Other assets	3.4	3.4	3.2	3.1	3.0	3.2	3.4	3.1
Claims on non-residents	*4.9*	*5.5*	*6.5*	*7.1*	*9.5*	*11.4*	*13.3*	*15.2*
Liabilities								
Capital and reserves	5.7	5.8	5.8	5.9	6.0	5.9	5.7	5.8
Interbank deposits	14.7	15.9	17.7	20.6	22.1	24.0	22.6	21.5
Non-bank deposits	62.6	61.5	59.5	56.8	54.8	52.1	51.7	49.9
Bonds	13.4	13.1	13.3	13.1	13.6	14.4	16.3	19.1
Other liabilities	3.6	3.7	3.7	3.6	3.6	3.7	3.7	3.7
Liabilities to non-residents	*6.2*	*6.8*	*7.2*	*7.7*	*7.3*	*8.1*	*9.4*	*9.5*
Income statement	As a percentage of gross income							
Interest income	185.2	167.6	158.6	156.0	143.6	153.6	164.7	155.2
Interest expenses	114.2	97.5	90.8	90.4	79.2	90.2	101.9	93.0
Fees and commissions receivable	16.3	17.5	18.4	20.6	23.3	24.8	23.0	22.6
Fees and commissions payable	1.8	1.9	1.8	2.1	2.6	2.9	2.5	3.0
Other non-interest income	14.4	14.3	15.7	15.9	14.9	14.8	16.7	18.2
Performance ratios								
Cost-income ratio	0.69	0.67	0.68	0.68	0.67	0.64	0.66	0.67
Return on assets	0.33	0.33	0.35	0.39	0.37	0.41	0.40	0.36
Return on equity	5.8	5.8	6.0	6.6	6.2	7.0	7.0	6.3
Risk-based capital ratio [1])	12.9	13.1	12.8	13.1	13.3	13.1	13.1	13.4
	1,000 € (real terms, at 1995 prices)							
Staff costs per employee	52.3	53.2	53.7	54.2	56.0	56.0	55.1	55.6
Return per employee	11.8	12.3	13.5	16.1	16.3	19.0	19.3	18.5
Bank concentration	As a percentage of balance sheet total							
5 largest banks	43.0	43.3	43.6	46.0	46.6	49.1	51.7	52.8
Bank density								
Residents per institution	6,115	6,309	6,453	6,662	6,972	7,224	7,447	7,584
Residents per institution and branch	1,260	1,268	1,281	1,312	1,322	1,332	1,350	1,376
Institutions and branches per 100 km^2	6.6	6.6	6.5	6.4	6.4	6.3	6.3	6.2

Source: OeNB; WIFO computations. – 1) According to Basel I.

Table B.13: Structure and performance indicators of the Austrian banking sector: Western Austria

	1995	1996	1997	1998	1999	2000	2001	2002
	As a percentage of balance sheet total							
Assets								
Cash and balance with Central bank	7.7	7.9	7.4	6.8	5.7	4.8	4.6	4.3
Interbank deposits	21.4	18.8	18.0	17.8	17.5	17.6	19.0	18.8
Loans	58.5	60.0	60.6	60.7	61.0	61.7	60.7	60.2
Securities	8.6	9.6	10.4	11.3	12.3	12.2	12.1	13.2
Other assets	3.7	3.6	3.6	3.3	3.4	3.7	3.6	3.4
Claims on non-residents	*8.7*	*8.6*	*9.1*	*9.3*	*10.5*	*11.1*	*12.3*	*13.8*
Liabilities								
Capital and reserves	5.5	5.6	5.6	5.8	5.6	5.7	5.6	5.5
Interbank deposits	14.1	15.4	17.1	19.7	22.3	24.5	23.1	23.4
Non-bank deposits	59.6	59.1	58.0	56.5	54.0	50.6	50.6	49.4
Bonds	16.7	15.7	15.1	13.9	13.9	15.0	16.0	17.1
Other liabilities	4.1	4.1	4.2	4.1	4.2	4.2	4.5	4.5
Liabilities to non-residents	*12.7*	*12.7*	*13.6*	*13.8*	*13.6*	*13.8*	*14.4*	*14.8*
Income statement	As a percentage of gross income							
Interest income	173.0	156.1	150.4	149.8	135.7	145.9	149.5	138.2
Interest expenses	111.4	96.9	92.7	93.6	82.0	93.5	97.1	84.2
Fees and commissions receivable	19.3	21.0	23.6	25.1	28.7	30.7	27.9	27.2
Fees and commissions payable	2.8	2.9	3.3	3.6	4.4	4.9	4.6	4.9
Other non-interest income	21.9	22.7	22.1	22.2	22.0	21.8	24.2	23.7
Performance ratios								
Cost-income ratio	0.69	0.68	0.69	0.69	0.69	0.65	0.66	0.67
Return on assets	0.49	0.42	0.35	0.36	0.36	0.48	0.40	0.20
Return on equity	8.9	7.4	6.3	6.3	6.5	8.3	7.2	3.6
Risk-based capital ratio [1])	11.8	12.3	12.3	12.4	12.1	12.0	12.2	12.3
	1,000 € (real terms, at 1995 prices)							
Staff costs per employee	50.5	50.6	51.5	56.5	53.2	53.7	53.5	53.9
Return per employee	18.6	16.2	14.3	17.1	17.0	23.2	20.5	10.5
Bank concentration	As a percentage of balance sheet total							
5 largest banks	28.3	29.2	30.0	30.6	30.7	32.3	33.1	34.0
Bank density								
Residents per institution	8,914	8,958	8,998	9,134	9,131	9,125	9,291	9,412
Residents per institution and branch	1,487	1,496	1,509	1,551	1,549	1,557	1,576	1,594
Institutions and branches per 100 km^2	4.5	4.5	4.5	4.3	4.3	4.3	4.3	4.2

Source: OeNB; WIFO computations. – 1) According to Basel I.

Table C.1: Cost-income ratio of banks sectors

Summary statistics	1995	1996	1997	1998	1999	2000	2001	2002
Joint stock banks and private banks								
Minimum	0.35	0.27	0.29	0.34	0.37	0.16	0.24	0.24
Maximum	6.76	2.09	4.27	1.89	4.60	0.82	1.17	1.11
Mean	0.87	0.80	0.88	0.71	0.91	0.58	0.64	0.63
Median	0.71	0.70	0.72	0.67	0.69	0.59	0.63	0.62
Standard deviation	0.97	0.41	0.70	0.27	0.81	0.14	0.16	0.18
Coefficient of variation	1.12	0.51	0.79	0.38	0.89	0.24	0.26	0.29
Savings banks								
Minimum	0.37	0.31	0.27	0.28	0.31	0.23	0.34	0.50
Maximum	0.85	0.99	0.97	0.95	0.90	0.82	0.90	0.94
Mean	0.67	0.65	0.66	0.67	0.67	0.64	0.67	0.69
Median	0.67	0.65	0.66	0.68	0.67	0.64	0.66	0.69
Standard deviation	0.09	0.10	0.11	0.11	0.10	0.09	0.10	0.08
Coefficient of variation	0.13	0.16	0.16	0.17	0.16	0.14	0.15	0.12
State mortgage banks								
Minimum	0.50	0.47	0.48	0.47	0.43	0.44	0.44	0.48
Maximum	0.80	0.70	0.67	0.80	0.76	0.67	0.80	0.77
Mean	0.61	0.57	0.56	0.60	0.58	0.58	0.62	0.63
Median	0.59	0.57	0.55	0.58	0.57	0.57	0.58	0.60
Standard deviation	0.09	0.07	0.06	0.10	0.10	0.07	0.11	0.10
Coefficient of variation	0.15	0.12	0.10	0.16	0.18	0.12	0.18	0.16
Raiffeisen credit cooperatives								
Minimum	0.36	0.10	0.07	0.09	0.29	0.28	0.18	0.03
Maximum	1.49	5.45	4.31	1.64	1.50	1.06	1.05	1.16
Mean	0.68	0.69	0.71	0.72	0.71	0.65	0.68	0.69
Median	0.67	0.68	0.71	0.71	0.71	0.65	0.68	0.69
Standard deviation	0.10	0.21	0.17	0.11	0.10	0.10	0.10	0.11
Coefficient of variation	0.14	0.30	0.24	0.15	0.15	0.15	0.15	0.16
Volksbank credit cooperatives								
Minimum	0.06	0.07	0.02	0.02	0.02	0.02	0.02	0.04
Maximum	1.45	1.76	1.00	4.88	1.00	1.00	1.00	1.26
Mean	0.68	0.70	0.71	0.76	0.70	0.63	0.69	0.71
Median	0.69	0.70	0.73	0.72	0.71	0.63	0.71	0.72
Standard deviation	0.17	0.19	0.14	0.52	0.14	0.13	0.13	0.14
Coefficient of variation	0.25	0.27	0.20	0.68	0.20	0.20	0.18	0.20
Building and loan associations								
Minimum	0.78	0.79	0.80	0.79	0.72	0.76	0.78	0.71
Maximum	3.25	1.68	1.23	1.14	0.97	0.96	1.38	1.96
Mean	1.30	1.01	0.94	0.91	0.87	0.86	0.96	1.05
Median	0.81	0.87	0.87	0.87	0.92	0.85	0.90	0.83
Standard deviation	0.98	0.34	0.16	0.13	0.09	0.07	0.22	0.46
Coefficient of variation	0.75	0.34	0.17	0.14	0.11	0.09	0.23	0.44
Special purpose banks								
Minimum	0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.00
Maximum	2.00	3.02	2.20	3.25	4.00	5.33	4.58	5.75
Mean	0.67	0.68	0.67	0.70	0.71	0.72	0.74	0.82
Median	0.66	0.64	0.70	0.70	0.68	0.64	0.70	0.69
Standard deviation	0.32	0.40	0.34	0.43	0.50	0.66	0.56	0.79
Coefficient of variation	0.47	0.59	0.50	0.61	0.71	0.93	0.76	0.96
All banks								
Minimum	0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.00
Maximum	6.76	5.45	4.31	4.88	4.60	5.33	4.58	5.75
Mean	0.68	0.69	0.71	0.72	0.72	0.65	0.69	0.71
Median	0.67	0.68	0.70	0.71	0.70	0.65	0.68	0.69
Standard deviation	0.25	0.24	0.24	0.23	0.25	0.23	0.21	0.28
Coefficient of variation	0.37	0.35	0.33	0.31	0.35	0.36	0.30	0.40

Source: OeNB; WIFO computations.

Table C.2: Cost-income ratio of banks headquartered in economic regions

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Human capital intensive								
Minimum	0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.00
Maximum	6.76	5.45	4.31	4.88	4.60	5.33	4.58	5.75
Mean	0.70	0.71	0.72	0.73	0.73	0.67	0.70	0.72
Median	0.68	0.68	0.70	0.72	0.71	0.65	0.69	0.68
Standard deviation	0.38	0.36	0.35	0.33	0.37	0.35	0.30	0.42
Coefficient of variation	0.54	0.50	0.49	0.46	0.51	0.52	0.44	0.59
Physical capital intensive								
Minimum	0.21	0.31	0.27	0.28	0.31	0.23	0.34	0.48
Maximum	0.92	0.93	0.92	1.01	1.02	0.95	0.99	0.96
Mean	0.66	0.66	0.68	0.70	0.70	0.64	0.67	0.70
Median	0.66	0.66	0.69	0.69	0.70	0.63	0.67	0.70
Standard deviation	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Coefficient of variation	0.15	0.16	0.15	0.14	0.14	0.16	0.15	0.14
Rural								
Minimum	0.44	0.27	0.47	0.50	0.47	0.44	0.41	0.43
Maximum	1.49	1.05	1.37	1.07	1.50	1.06	1.03	1.16
Mean	0.69	0.69	0.72	0.72	0.72	0.66	0.69	0.70
Median	0.68	0.68	0.71	0.71	0.70	0.65	0.69	0.70
Standard deviation	0.10	0.09	0.10	0.10	0.11	0.09	0.09	0.11
Coefficient of variation	0.15	0.14	0.14	0.13	0.16	0.14	0.13	0.15

Source: OeNB; WIFO computations.

Table C.3: Cost-income ratio of banks headquartered in NUTS-I-regions

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Eastern Austria								
Minimum	0.04	0.06	0.02	0.02	0.02	0.02	0.02	0.03
Maximum	6.76	5.45	4.31	4.88	4.60	5.33	2.63	5.75
Mean	0.72	0.71	0.74	0.74	0.73	0.66	0.69	0.69
Median	0.68	0.68	0.71	0.73	0.70	0.65	0.69	0.65
Standard deviation	0.39	0.35	0.36	0.33	0.37	0.31	0.22	0.39
Coefficient of variation	0.55	0.49	0.49	0.44	0.51	0.47	0.32	0.57
Southern Austria								
Minimum	0.23	0.16	0.30	0.46	0.44	0.44	0.41	0.45
Maximum	0.91	3.02	1.11	2.25	3.28	4.10	4.58	4.70
Mean	0.67	0.68	0.69	0.71	0.70	0.66	0.71	0.73
Median	0.67	0.67	0.70	0.70	0.69	0.63	0.68	0.70
Standard deviation	0.09	0.20	0.10	0.17	0.21	0.27	0.30	0.31
Coefficient of variation	0.14	0.29	0.15	0.24	0.30	0.40	0.42	0.42
Western Austria								
Minimum	0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.00
Maximum	1.25	1.25	1.37	1.20	1.14	1.00	1.22	1.30
Mean	0.67	0.68	0.70	0.71	0.71	0.65	0.67	0.71
Median	0.66	0.68	0.71	0.71	0.71	0.65	0.67	0.71
Standard deviation	0.11	0.12	0.13	0.13	0.13	0.12	0.12	0.12
Coefficient of variation	0.17	0.18	0.19	0.18	0.18	0.19	0.19	0.17

Source: OeNB; WIFO computations.

Table C.4: Return on assets of banks sectors

Summary statistics	1995	1996	1997	1998	1999	2000	2001	2002
Joint stock banks and private banks								
Minimum	-7.13	-7.83	-9.29	-5.48	-9.52	0.07	-2.46	-2.25
Maximum	7.71	4.55	4.38	2.07	4.70	7.27	3.86	6.84
Mean	0.26	-0.03	-0.11	0.13	-0.01	1.28	0.88	0.89
Median	0.27	0.26	0.28	0.30	0.33	0.53	0.60	0.64
Standard deviation	1.74	1.83	2.13	1.44	2.45	1.66	1.10	1.38
Coefficient of variation	6.70	-57.30	-19.24	11.39	-251.03	1.29	1.25	1.55
Savings banks								
Minimum	-1.94	-0.64	-0.75	0.00	0.00	-0.92	-1.07	-2.10
Maximum	2.06	1.83	1.26	1.95	1.77	1.62	1.36	1.54
Mean	0.56	0.46	0.49	0.52	0.45	0.48	0.38	0.32
Median	0.56	0.43	0.46	0.44	0.39	0.50	0.41	0.33
Standard deviation	0.46	0.33	0.33	0.34	0.33	0.34	0.32	0.41
Coefficient of variation	0.82	0.72	0.68	0.65	0.73	0.71	0.83	1.27
State mortgage banks								
Minimum	0.10	0.07	0.13	0.07	0.07	0.08	0.01	0.04
Maximum	0.58	0.69	0.56	0.59	0.54	0.60	0.39	0.43
Mean	0.27	0.31	0.29	0.28	0.26	0.27	0.22	0.20
Median	0.22	0.21	0.20	0.22	0.24	0.27	0.26	0.21
Standard deviation	0.17	0.20	0.15	0.18	0.15	0.15	0.13	0.12
Coefficient of variation	0.64	0.65	0.53	0.65	0.57	0.56	0.59	0.59
Raiffeisen credit cooperatives								
Minimum	-20.38	-3.22	-5.85	-8.92	-2.57	-1.50	-2.58	-1.23
Maximum	2.97	6.83	9.77	9.45	3.41	6.14	30.96	2.30
Mean	0.44	0.45	0.35	0.38	0.34	0.55	0.50	0.51
Median	0.49	0.44	0.35	0.37	0.33	0.53	0.45	0.40
Standard deviation	1.10	0.50	0.64	0.72	0.42	0.44	1.29	0.49
Coefficient of variation	2.49	1.12	1.83	1.91	1.24	0.81	2.60	0.96
Volksbank credit cooperatives								
Minimum	-2.88	-3.98	-3.39	-0.99	-0.53	-0.30	-0.98	-1.82
Maximum	1.43	1.52	1.76	2.92	3.93	3.78	4.01	2.87
Mean	0.47	0.34	0.30	0.36	0.36	0.58	0.73	0.25
Median	0.53	0.41	0.30	0.30	0.30	0.50	0.47	0.23
Standard deviation	0.63	0.59	0.60	0.44	0.51	0.55	0.79	0.46
Coefficient of variation	1.34	1.77	2.01	1.23	1.41	0.96	1.08	1.82
Building and loan associations								
Minimum	-4.33	-1.28	0.01	0.02	0.00	0.00	-1.00	-1.88
Maximum	0.54	0.49	0.40	0.36	0.27	0.27	0.27	0.36
Mean	-0.58	-0.03	0.21	0.18	0.11	0.18	-0.09	-0.51
Median	0.26	0.12	0.16	0.13	0.10	0.23	0.06	0.00
Standard deviation	1.87	0.65	0.15	0.12	0.10	0.09	0.46	0.85
Coefficient of variation	-3.21	-23.63	0.73	0.70	0.96	0.52	-4.93	-1.67
Special purpose banks								
Minimum	-267.66	-23.61	-9.62	-148.64	-4.75	-13.87	-39.09	-41.83
Maximum	22.50	14.54	14.05	14.31	10.77	30.50	28.15	12.72
Mean	1.56	5.18	6.18	4.04	7.06	8.01	5.38	4.38
Median	1.07	0.92	1.09	0.89	1.08	0.92	0.71	0.54
Standard deviation	27.81	11.45	12.91	21.82	14.33	16.02	15.66	13.55
Coefficient of variation	17.88	2.21	2.09	5.40	2.03	2.00	2.91	3.10
All banks								
Minimum	-267.66	-23.61	-9.62	-148.64	-9.52	-13.87	-39.09	-41.83
Maximum	53.47	43.30	58.01	82.52	69.26	69.19	61.60	54.40
Mean	0.55	0.91	0.95	0.76	1.01	1.31	1.01	0.89
Median	0.51	0.43	0.36	0.39	0.35	0.52	0.44	0.37
Standard deviation	8.91	4.03	4.62	7.16	5.03	5.58	5.31	4.57
Coefficient of variation	16.09	4.41	4.85	9.45	4.96	4.24	5.27	5.16

Source: OeNB; WIFO computations.

Table C.5: Return on assets of banks headquartered in economic regions

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Human capital intensive								
Minimum	-267.66	-23.61	-9.62	-148.64	-9.52	-13.87	-39.09	-41.83
Maximum	53.47	43.30	58.01	82.52	69.26	69.19	61.60	54.40
Mean	0.71	1.54	1.81	1.31	1.95	2.46	1.78	1.52
Median	0.49	0.40	0.35	0.37	0.34	0.53	0.40	0.40
Standard deviation	14.04	6.12	7.13	11.18	7.73	8.64	8.23	7.07
Coefficient of variation	19.67	3.98	3.94	8.52	3.97	3.52	4.62	4.65
Physical capital intensive								
Minimum	-3.42	-3.22	-4.21	-2.91	-1.66	-0.31	-1.41	-1.82
Maximum	2.97	2.57	1.66	2.01	2.07	1.82	2.17	2.30
Mean	0.53	0.48	0.35	0.39	0.38	0.58	0.50	0.43
Median	0.53	0.46	0.37	0.39	0.37	0.57	0.49	0.37
Standard deviation	0.53	0.44	0.51	0.53	0.39	0.38	0.39	0.40
Coefficient of variation	0.99	0.93	1.44	1.34	1.02	0.65	0.78	0.94
Rural								
Minimum	-20.38	-1.66	-2.83	-8.92	-2.07	-1.48	-2.12	-0.81
Maximum	1.71	24.97	1.37	1.69	1.65	6.14	1.73	2.10
Mean	0.38	0.49	0.37	0.36	0.34	0.51	0.45	0.46
Median	0.49	0.43	0.38	0.43	0.34	0.49	0.43	0.36
Standard deviation	1.51	1.43	0.42	0.70	0.38	0.49	0.39	0.48
Coefficient of variation	4.01	2.91	1.12	1.92	1.13	0.97	0.87	1.02

Source: OeNB; WIFO computations.

Table C.6: Return on assets of banks headquartered in NUTS-I-regions

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Eastern Austria								
Minimum	-267.66	-23.61	-9.29	-148.64	-9.52	-3.45	-39.09	-41.83
Maximum	53.47	43.30	50.47	65.78	69.26	69.19	60.74	54.40
Mean	0.41	1.28	1.43	0.87	1.60	2.10	1.48	1.56
Median	0.44	0.36	0.34	0.33	0.31	0.49	0.38	0.55
Standard deviation	14.75	5.66	6.04	10.40	6.74	7.51	7.13	6.65
Coefficient of variation	36.13	4.41	4.22	11.98	4.21	3.57	4.81	4.26
Southern Austria								
Minimum	-4.85	-3.22	-2.83	-28.71	-4.75	-13.87	-19.35	-17.29
Maximum	10.59	8.14	8.71	9.17	7.52	6.35	5.05	4.36
Mean	0.48	0.48	0.47	0.32	0.46	0.54	0.44	0.31
Median	0.42	0.40	0.43	0.44	0.43	0.61	0.49	0.34
Standard deviation	1.11	0.90	0.75	2.26	0.72	1.19	1.54	1.38
Coefficient of variation	2.29	1.87	1.59	7.17	1.59	2.20	3.50	4.38
Western Austria								
Minimum	-3.99	-7.95	-9.62	-9.14	-3.51	-3.86	-7.32	-9.11
Maximum	27.45	41.07	58.01	82.52	56.94	62.08	61.60	50.98
Mean	0.70	0.81	0.79	0.87	0.80	1.07	0.90	0.63
Median	0.57	0.49	0.36	0.39	0.31	0.52	0.46	0.33
Standard deviation	1.67	3.18	4.29	5.25	4.50	4.97	4.72	3.31
Coefficient of variation	2.40	3.95	5.41	6.05	5.60	4.64	5.24	5.28

Source: OeNB; WIFO computations.

Table C.7: Return on equity of banks sectors

Summary statistics	1995	1996	1997	1998	1999	2000	2001	2002
Joint stock banks and private banks								
Minimum	-83.1	-114.1	-120.2	-40.9	-61.6	1.6	-26.0	-16.8
Maximum	30.2	45.9	41.0	29.7	29.0	71.0	32.2	24.7
Mean	3.4	1.3	1.5	4.8	4.6	14.6	10.2	9.7
Median	4.6	5.0	6.0	5.1	6.9	9.0	9.0	8.7
Standard deviation	16.1	22.9	24.4	11.6	14.8	14.8	10.2	8.3
Coefficient of variation	4.66	18.00	16.63	2.40	3.24	1.02	1.00	0.86
Savings banks								
Minimum	-61.7	-14.0	-15.5	0.0	0.0	-11.3	-15.0	-46.5
Maximum	21.2	19.9	24.1	37.9	25.2	26.2	19.9	18.6
Mean	7.7	6.5	6.7	7.4	6.3	6.6	5.3	4.0
Median	8.3	6.4	6.9	6.7	5.9	6.8	5.8	5.2
Standard deviation	9.3	4.5	4.6	5.3	4.4	4.3	4.0	7.1
Coefficient of variation	1.20	0.69	0.69	0.72	0.70	0.66	0.76	1.77
State mortgage banks								
Minimum	3.2	2.1	3.0	1.7	2.4	2.7	0.5	1.3
Maximum	13.2	14.5	15.9	15.6	10.9	10.8	11.5	16.3
Mean	7.7	8.1	8.1	7.2	6.6	7.3	6.5	6.5
Median	7.0	7.2	5.9	7.2	6.4	8.4	7.6	6.2
Standard deviation	3.6	4.1	4.1	3.9	2.7	2.8	3.8	4.5
Coefficient of variation	0.46	0.51	0.50	0.54	0.41	0.38	0.59	0.70
Raiffeisen credit cooperatives								
Minimum	-488.8	-74.8	-73.4	-68.1	-49.3	-24.3	-37.8	-29.5
Maximum	38.5	25.0	29.3	93.4	25.3	79.4	97.4	48.5
Mean	6.8	6.5	4.8	5.5	5.0	8.0	6.8	7.8
Median	8.0	7.2	5.5	5.9	5.3	8.1	6.9	6.0
Standard deviation	21.7	6.9	8.1	8.6	6.4	6.1	6.6	8.2
Coefficient of variation	3.19	1.05	1.69	1.56	1.29	0.76	0.97	1.04
Volksbank credit cooperatives								
Minimum	-31.1	-28.8	-287.8	-14.2	-5.8	-4.7	-26.3	-34.3
Maximum	1.4	1.8	1.0	4.9	1.0	1.0	1.0	1.3
Mean	7.8	5.3	0.7	4.9	4.6	7.6	8.8	2.9
Median	9.0	5.9	4.5	4.9	4.6	8.1	5.7	2.8
Standard deviation	7.7	5.8	34.5	4.4	3.4	4.8	9.0	5.6
Coefficient of variation	0.99	1.10	48.60	0.90	0.72	0.63	1.03	1.91
Building and loan associations								
Minimum	-48.1	-18.0	0.1	1.0	0.1	0.1	-23.6	-44.7
Maximum	17.7	15.4	14.6	13.6	10.7	10.4	7.4	14.6
Mean	-0.2	3.2	7.3	5.1	3.1	5.6	-1.8	-9.0
Median	10.2	5.8	7.6	3.9	2.1	4.1	2.8	0.1
Standard deviation	24.2	11.4	4.9	4.4	3.9	3.9	11.1	20.9
Coefficient of variation	-109.01	3.55	0.66	0.86	1.26	0.70	-6.14	-2.32
Special purpose banks								
Minimum	-978.0	-114.9	-20.7	-204.7	-47.8	-21.5	-90.5	-126.4
Maximum	22.5	14.5	14.0	14.3	10.8	30.5	28.2	12.7
Mean	5.4	16.6	23.1	21.6	31.2	43.1	28.8	26.4
Median	7.2	5.5	8.4	6.1	7.8	7.7	5.5	4.6
Standard deviation	101.6	40.9	54.3	78.2	99.9	131.7	93.5	82.1
Coefficient of variation	18.64	2.46	2.35	3.62	3.20	3.06	3.24	3.11
All banks								
Minimum	-978.0	-114.9	-287.8	-204.7	-61.6	-24.3	-90.5	-126.4
Maximum	232.2	236.4	422.5	653.6	849.3	895.8	585.9	482.4
Mean	6.7	7.3	6.5	7.2	7.7	11.6	9.1	9.1
Median	7.9	6.8	5.7	5.9	5.4	7.9	6.7	5.6
Standard deviation	37.4	15.6	22.5	26.8	33.3	43.5	31.2	28.3
Coefficient of variation	5.61	2.15	3.47	3.70	4.34	3.75	3.42	3.12

Source: OeNB; WIFO computations.

Table C.8: Return on equity of banks headquartered in economic regions

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Human capital intensive								
Minimum	-978.0	-114.9	-287.8	-204.7	-61.6	-23.9	-90.5	-126.4
Maximum	232.2	236.4	422.5	653.6	849.3	895.8	585.9	482.4
Mean	6.5	8.3	8.5	9.7	11.3	17.4	12.6	12.7
Median	7.6	6.2	5.6	5.8	5.4	8.3	6.6	6.0
Standard deviation	52.0	22.9	33.8	40.8	51.3	67.7	48.1	43.2
Coefficient of variation	7.99	2.74	3.98	4.20	4.54	3.90	3.82	3.39
Physical capital intensive								
Minimum	-133.6	-74.8	-73.4	-68.1	-27.6	-4.0	-26.7	-34.3
Maximum	29.9	24.9	24.1	37.9	25.2	26.2	27.4	31.2
Mean	7.8	6.8	4.6	5.4	5.4	8.1	6.9	6.0
Median	8.2	7.3	5.5	5.7	5.7	7.9	6.8	5.3
Standard deviation	10.9	7.5	8.8	8.2	5.4	4.9	5.3	5.8
Coefficient of variation	1.40	1.09	1.91	1.52	1.00	0.61	0.77	0.98
Rural								
Minimum	-488.8	-32.4	-54.2	-52.8	-49.3	-24.3	-25.4	-12.9
Maximum	38.5	33.9	29.3	39.0	25.3	79.4	23.2	47.9
Mean	5.9	6.3	5.5	5.7	4.9	7.3	6.6	7.0
Median	8.1	7.0	5.9	6.2	5.3	7.4	6.8	5.6
Standard deviation	29.7	6.9	6.7	7.8	6.2	6.6	5.4	7.3
Coefficient of variation	5.04	1.09	1.23	1.38	1.27	0.91	0.82	1.03

Source: OeNB; WIFO computations.

Table C.9: Return on equity of banks headquartered in NUTS-I-regions

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Eastern Austria								
Minimum	-978.0	-114.9	-287.8	-204.7	-61.6	-24.3	-90.5	-126.4
Maximum	232.2	236.4	422.5	653.6	849.3	895.8	585.9	482.4
Mean	4.1	7.4	7.8	9.2	10.7	16.9	12.5	15.7
Median	7.1	5.7	5.6	5.1	5.0	7.4	6.4	8.4
Standard deviation	60.6	23.9	35.8	43.0	54.0	71.3	49.3	43.8
Coefficient of variation	14.89	3.25	4.59	4.69	5.04	4.21	3.93	2.80
Southern Austria								
Minimum	-133.6	-74.8	-54.2	-29.2	-41.1	-21.5	-27.7	-34.3
Maximum	32.4	19.3	15.9	39.0	25.3	19.8	27.4	28.3
Mean	5.8	5.8	6.0	6.2	6.1	7.9	6.7	5.0
Median	6.7	6.9	6.8	6.9	6.3	8.2	6.9	5.0
Standard deviation	12.6	8.2	6.3	5.7	5.1	4.5	5.4	5.6
Coefficient of variation	2.18	1.43	1.05	0.92	0.83	0.58	0.81	1.13
Western Austria								
Minimum	-80.4	-32.4	-56.6	-68.1	-44.6	-11.3	-37.8	-46.5
Maximum	75.1	71.4	99.9	121.5	158.2	221.1	216.8	228.0
Mean	9.1	7.9	5.7	6.2	5.9	9.2	7.6	5.8
Median	9.3	7.7	5.4	6.1	5.2	8.1	6.9	5.1
Standard deviation	10.0	7.7	10.1	12.1	12.6	16.3	15.9	15.1
Coefficient of variation	1.10	0.97	1.79	1.95	2.11	1.77	2.10	2.60

Source: OeNB; WIFO computations.

Table C.10: Return per employee of banks sectors

Summary statistics	1995	1996	1997	1998	1999	2000	2001	2002
Joint stock banks and private banks								
Minimum	-827.0	-424.1	-146.4	-122.1	-232.8	4.0	-78.7	-71.9
Maximum	519.1	360.5	231.5	100.5	194.9	660.8	378.1	907.0
Mean	1.8	10.2	16.3	23.2	20.4	79.6	58.6	73.2
Median	10.4	16.0	16.7	21.3	21.6	36.7	35.5	37.1
Standard deviation	170.3	99.4	55.8	43.9	74.4	122.5	77.8	161.6
Coefficient of variation	93.6	9.8	3.4	1.9	3.6	1.5	1.3	2.2
Savings banks								
Minimum	-57.6	-31.9	-25.8	0.0	1.0	-35.3	-41.3	-114.2
Maximum	162.7	180.5	278.8	389.8	327.7	335.1	267.4	72.4
Mean	22.3	18.8	22.4	25.6	23.6	24.7	20.5	14.1
Median	20.7	15.7	18.4	19.3	17.1	21.0	17.7	15.9
Standard deviation	23.1	22.6	33.1	45.7	40.2	40.1	33.5	20.6
Coefficient of variation	1.0	1.2	1.5	1.8	1.7	1.6	1.6	1.5
State mortgage banks								
Minimum	7.6	6.4	10.5	5.7	6.7	5.4	0.9	2.5
Maximum	48.0	57.8	48.4	51.9	51.6	63.0	41.1	46.2
Mean	21.2	24.2	23.3	23.6	23.4	27.3	24.0	22.2
Median	15.7	14.1	13.0	13.1	12.9	19.4	18.0	15.3
Standard deviation	14.0	17.1	12.9	15.5	13.7	16.2	14.3	13.2
Coefficient of variation	0.7	0.7	0.6	0.7	0.6	0.6	0.6	0.6
Raiffeisen credit cooperatives								
Minimum	-883.1	-79.2	-1,490.0	-868.0	-114.1	-73.6	-97.3	-83.6
Maximum	113.8	94.2	77.0	205.0	480.0	1,569.0	5,249.9	3,313.0
Mean	12.9	13.6	8.7	11.0	13.0	22.5	30.9	25.8
Median	14.1	13.1	10.2	12.0	11.3	17.2	15.9	15.0
Standard deviation	42.4	13.4	59.8	41.3	24.0	64.7	247.1	135.4
Coefficient of variation	3.3	1.0	6.8	3.8	1.9	2.9	8.0	5.2
Volksbank credit cooperatives								
Minimum	-23.4	-101.7	-192.8	-31.9	-9.2	-8.7	-30.4	-61.8
Maximum	49.0	53.0	53.0	55.0	69.1	75.5	71.9	66.2
Mean	16.4	10.8	7.8	11.6	12.0	18.0	25.0	9.7
Median	17.2	9.9	8.5	8.9	10.3	15.1	16.9	7.3
Standard deviation	12.7	17.5	27.3	12.2	12.9	14.2	23.1	15.5
Coefficient of variation	0.8	1.6	3.5	1.1	1.1	0.8	0.9	1.6
Building and loan associations								
Minimum	-92.0	-36.3	0.3	1.4	0.2	0.2	-47.9	-106.1
Maximum	52.6	48.5	50.1	52.4	42.2	41.0	30.3	60.6
Mean	3.0	10.0	18.5	17.2	11.0	19.8	1.0	-16.4
Median	14.6	17.0	17.8	12.8	6.1	24.0	7.2	-24.6
Standard deviation	49.6	27.4	17.4	18.1	15.8	16.4	26.2	56.9
Coefficient of variation	16.5	2.7	0.9	1.0	1.4	0.8	26.9	-3.5
Special purpose banks								
Minimum	-1,344.6	-755.0	-125.8	-280.9	-755.0	-38.7	-2,076.0	-245.7
Maximum	1,080.5	1,166.0	1,041.0	1,926.0	1,520.0	2,609.4	4,482.0	3,835.0
Mean	49.7	64.0	92.8	112.8	122.8	170.5	130.3	130.5
Median	33.0	32.8	36.6	26.6	37.2	42.7	18.8	15.7
Standard deviation	204.5	186.8	183.4	321.8	314.5	408.5	634.2	505.4
Coefficient of variation	4.1	2.9	2.0	2.9	2.6	2.4	4.9	3.9
All banks								
Minimum	-1,344.6	-755.0	-1,490.0	-868.0	-755.0	-73.6	-2,076.0	-245.7
Maximum	1,080.5	1,166.0	1,041.0	1,926.0	1,520.0	2,609.4	5,249.9	3,835.0
Mean	16.7	18.4	18.0	21.9	23.5	36.9	39.0	34.6
Median	15.0	13.7	11.3	13.0	12.1	18.6	17.0	14.8
Standard deviation	79.2	63.4	80.8	107.9	101.1	139.8	281.3	195.3
Coefficient of variation	4.7	3.4	4.5	4.9	4.3	3.8	7.2	5.6

Source: OeNB; WIFO computations.

Table C.11: Return per employee of banks headquartered in economic regions

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Human capital intensive								
Minimum	-1,344.6	-755.0	-1,490.0	-868.0	-755.0	-46.9	-2,076.0	-245.7
Maximum	1,080.5	877.5	1,041.0	1,926.0	1,520.0	2,609.4	5,249.9	3,835.0
Mean	21.9	22.1	26.8	35.3	38.7	63.1	70.7	60.5
Median	16.4	14.4	12.1	13.2	13.3	21.5	17.5	17.0
Standard deviation	113.2	79.9	125.8	167.6	157.3	220.1	445.1	307.8
Coefficient of variation	5.2	3.6	4.7	4.7	4.1	3.5	6.3	5.1
Physical capital intensive								
Minimum	-90.0	-79.2	-151.6	-115.7	-54.2	-9.1	-53.0	-61.8
Maximum	179.2	180.5	278.8	389.8	327.7	335.1	267.4	93.6
Mean	17.4	15.8	12.6	15.0	15.5	23.0	20.4	17.2
Median	15.2	13.8	11.3	13.0	12.5	18.6	17.7	14.6
Standard deviation	21.0	17.6	23.9	29.9	24.7	26.1	23.0	16.2
Coefficient of variation	1.2	1.1	1.9	2.0	1.6	1.1	1.1	0.9
Rural								
Minimum	-883.1	-42.8	-82.6	-339.2	-65.2	-73.6	-97.3	-29.7
Maximum	57.6	1,166.0	45.0	53.2	62.6	237.8	63.8	109.0
Mean	10.0	16.2	12.0	11.6	11.8	17.8	16.4	18.1
Median	13.6	12.3	10.3	12.7	10.7	15.4	15.2	13.2
Standard deviation	59.6	65.5	13.4	26.3	13.8	19.4	15.3	20.3
Coefficient of variation	6.0	4.0	1.1	2.3	1.2	1.1	0.9	1.1

Source: OeNB; WIFO computations.

Table C.12: Return per employee of banks headquartered in NUTS-I-regions

Summary statistics

	1995	1996	1997	1998	1999	2000	2001	2002
Eastern Austria								
Minimum	-1,344.6	-424.1	-1,490.0	-868.0	-755.0	-73.6	-2,076.0	-245.7
Maximum	524.6	1,166.0	1,041.0	1,926.0	1,520.0	2,609.4	5,249.9	3,835.0
Mean	12.8	22.3	23.2	34.4	37.2	63.9	74.6	73.0
Median	15.0	13.6	11.9	13.0	12.2	19.4	17.4	26.6
Standard deviation	118.0	82.2	127.5	178.2	163.6	231.8	477.0	329.2
Coefficient of variation	9.2	3.7	5.5	5.2	4.4	3.6	6.4	4.5
Southern Austria								
Minimum	-90.0	-79.2	-82.6	-36.9	-67.3	-38.7	-59.1	-125.8
Maximum	128.0	104.0	87.2	91.9	71.5	61.6	71.9	72.4
Mean	14.2	13.6	14.5	15.6	16.1	20.6	18.9	14.1
Median	12.6	12.0	14.0	14.2	15.6	20.6	18.4	12.6
Standard deviation	19.4	16.0	14.3	13.8	14.0	13.6	15.4	17.8
Coefficient of variation	1.4	1.2	1.0	0.9	0.9	0.7	0.8	1.3
Western Austria								
Minimum	-82.2	-755.0	-125.8	-191.3	-114.1	-36.7	-80.8	-114.2
Maximum	1,080.5	877.5	646.5	489.5	636.0	834.0	780.5	423.7
Mean	20.8	17.5	15.6	15.3	16.4	24.7	21.4	15.1
Median	16.2	14.3	10.2	12.1	10.6	16.1	15.5	12.6
Standard deviation	53.9	59.2	43.5	38.5	42.5	50.4	47.1	30.6
Coefficient of variation	2.6	3.4	2.8	2.5	2.6	2.0	2.2	2.0

Source: OeNB; WIFO computations.

Table D.1: Structure and performance indicators of the banking sector for Austria

	1990	1995	2000	2001
	As a percentage of balance sheet total			
Assets				
Cash and balance with Central bank	1.8	1.4	1.1	1.8
Interbank deposits	30.6	30.3	28.5	29.8
Loans	50.7	50.9	48.8	48.3
Securities	11.6	14.3	18.4	16.7
Other assets	5.3	3.1	3.2	3.4
Foreign assets	*20.9*	*21.0*	*28.4*	*26.8*
Liabilities				
Capital and reserves	4.6	4.6	4.4	4.7
Borrowing from Central bank	0.0	0.0	1.3	0.4
Interbank deposits	31.7	29.3	32.0	32.3
Non-bank deposits	42.7	44.0	36.9	37.5
Bonds	17.1	17.4	19.9	19.1
Other liabilities	3.8	4.7	5.5	5.9
Foreign liabilities	*23.1*	*22.1*	*31.4*	*29.5*
Income statement	As a percentage of gross income			
Interest income	318.5	223.2	205.3	193.5
Interest expenses	249.4	162.5	155.5	143.5
Fees and commissions receivable	22.7	20.5	30.6	29.3
Fees and commissions payable	5.9	4.2	7.5	7.3
Other non-interest income (net)	14.2	23.0	27.0	28.0
Performance ratios				
Cost-income ratio	0.65	0.69	0.67	0.68
Profit before tax as a percentage of balance sheet total	0.40	0.39	0.51	0.55
Profit before tax as a percentage of equity	8.6	8.1	11.3	11.3
Risk-based capital ratio [1])	–	13.2	14.9	15.2
Staff costs per employee (1,000 USD)	50.4	75.8	59.4	59.4
Profit before tax per employee (1,000 USD)	20.5	28.4	37.7	39.8
Bank concentration	As a percentage of balance sheet total			
5 largest banks	34.7	39.9	46.9	46.5
Bank density				
Residents per institution	6,345	7,635	8,680	8,855
Residents per institution and branch	1,345	1,388	1,462	1,473
Institutions and branches per 100 km^2	6.81	6.83	6.53	6.50
Institutions and branches per 100 km^2 populated area	34.03	34.15	32.67	32.51
Number of ATM [2]) per 1,000 residents	0.13	0.25	0.33	0.33
Cards with cash function per resident	–	–	–	–
Cards with debit function per resident	–	–	–	–
Cards with credit function per resident	–	–	–	–
Foreign direct investment of the finance sector				
Inflows, as a percentage of total direct investment	–	–	70.7	-4.0
Outflows, as a percentage of total direct investment	–	–	19.4	25.6
Inward stock, as a percentage of capital and reserves	–	10.3	23.8	23.3
Outward stock, as a percentage of balance sheet total	0.1	0.4	1.0	1.2

Source: BIS; EUROSTAT; OECD; UNCTAD; WIFO calculations. – 1) According to Basel I. – 2) Automatic teller machines with cash dispensing function with open access.

Table D.2: Structure and performance indicators of the banking sector for Belgium

	1990	1995	2000	2001
	As a percentage of balance sheet total			
Assets				
Cash and balance with Central bank	0.2	0.2	1.1	1.0
Interbank deposits	32.1	32.8	22.0	23.1
Loans	34.1	32.7	37.4	34.5
Securities	28.6	29.1	31.5	31.7
Other assets	4.9	5.1	7.9	9.8
Foreign assets	*34.5*	*38.7*	*49.3*	*51.5*
Liabilities				
Capital and reserves	3.4	2.5	3.5	3.7
Borrowing from Central bank	0.0	0.0	0.1	0.0
Interbank deposits	42.9	40.7	33.7	31.8
Non-bank deposits	34.1	33.2	38.7	40.7
Bonds	14.1	16.4	13.2	11.2
Other liabilities	5.6	7.1	10.8	12.6
Foreign liabilities	*41.2*	*43.5*	*47.6*	*48.9*
Income statement	As a percentage of gross income			
Interest income	570.3	527.9	442.6	400.4
Interest expenses	488.7	457.1	393.1	349.1
Fees and commissions receivable	–	13.7	27.7	25.7
Fees and commissions payable	–	8.4	12.2	10.9
Other non-interest income (net)	–	23.9	35.0	34.0
Performance ratios				
Cost-income ratio	0.72	0.68	0.60	0.63
Profit before tax as a percentage of balance sheet total	0.29	0.33	0.69	0.57
Profit before tax as a percentage of equity	8.3	12.9	20.5	15.3
Risk-based capital ratio [1])	–	13.3	13.7	13.9
Staff costs per employee (1,000 USD)	46.2	78.4	63.1	61.9
Profit before tax per employee (1,000 USD)	19.9	35.9	68.4	55.7
Bank concentration	As a percentage of balance sheet total			
5 largest banks	48.0	51.2	75.3	78.3
Bank density				
Residents per institution	86,678	70,888	86,831	91,795
Residents per institution and branch	539	550	742	837
Institutions and branches per 100 km^2	60.63	60.45	45.27	40.25
Institutions and branches per 100 km^2 populated area	178.33	177.78	133.13	118.40
Number of ATM [2]) per 1,000 residents	–	–	0.13	0.13
Cards with cash function per resident	–	–	1.36	1.36
Cards with debit function per resident	–	–	1.22	1.22
Cards with credit function per resident	–	–	–	–
Foreign direct investment of the finance sector				
Inflows, as a percentage of total direct investment	–	–	–	–
Outflows, as a percentage of total direct investment	–	–	–	–
Inward stock, as a percentage of capital and reserves	–	–	–	–
Outward stock, as a percentage of balance sheet total	–	–	–	–

Source: BIS; EUROSTAT; OECD; UNCTAD; WIFO calculations. – 1) According to Basel I. – 2) Automatic teller machines with cash dispensing function with open access.

Table D.3: Structure and performance indicators of the banking sector for Denmark

	1990	1995	2000	2001
	As a percentage of balance sheet total			
Assets (commercial banks and savings banks)				
Cash and balance with Central bank	1.3	4.1	3.8	4.1
Interbank deposits	15.2	19.1	16.2	14.1
Loans	44.2	43.3	44.6	44.9
Securities	19.0	29.0	26.4	28.6
Other assets	20.4	4.5	9.0	8.4
Foreign assets	*32.6*	*30.9*	*32.6*	*25.7*
Liabilities (commercial banks and savings banks)				
Capital and reserves	7.9	6.9	6.7	6.2
Borrowing from Central bank	0.4	4.7	3.0	4.4
Interbank deposits	26.1	23.2	24.3	24.5
Non-bank deposits	46.9	55.7	43.5	40.7
Bonds	–	2.0	6.3	10.2
Other liabilities	18.6	7.5	16.2	14.1
Foreign liabilities	*37.5*	*18.1*	*28.7*	*25.0*
Income statement (commercial banks and savings banks)	As a percentage of gross income			
Interest income	320.1	159.7	166.7	170.3
Interest expenses	232.5	92.5	111.0	109.7
Fees and commissions receivable	–	16.7	28.0	25.4
Fees and commissions payable	–	1.9	4.5	4.3
Other non-interest income (net)	–	17.9	20.9	18.3
Performance ratios (commercial banks and savings banks)				
Cost-income ratio	0.69	0.54	0.60	0.53
Profit before tax as a percentage of balance sheet total	-0.27	1.41	1.03	1.12
Profit before tax as a percentage of equity	-3.3	18.5	15.2	16.5
Risk-based capital ratio [1])	–	–	–	–
Staff costs per employee (1,000 USD)	40.6	55.0	52.7	51.3
Profit before tax per employee (1,000 USD)	-8.7	49.5	51.2	55.1
Bank concentration	As a percentage of balance sheet total			
5 largest banks	–	–	–	–
Bank density				
Residents per institution	–	25,637	26,690	27,056
Residents per institution and branch	–	2,361	2,223	2,426
Institutions and branches per 100 km^2	–	5.14	5.57	5.12
Institutions and branches per 100 km^2 populated area	–	20.56	22.29	20.49
Number of ATM [2]) per 1,000 residents	–	–	–	0.52
Cards with cash function per resident	–	–	–	–
Cards with debit function per resident	–	–	–	–
Cards with credit function per resident	–	–	–	–
Foreign direct investment of the financial sector				
Inflows, as a percentage of total direct investment	6.7	11.5	–	10.5
Outflows, as a percentage of total direct investment	37.7	10.5	–	10.3
Inward stock, as a percentage of capital and reserves	–	–	–	–
Outward stock, as a percentage of balance sheet total	–	–	–	–

Source: BIS; EUROSTAT; OECD; UNCTAD; WIFO calculations. – 1) According to Basel I. – 2) Automatic teller machines with cash dispensing function with open access.

Table D.4: Structure and performance indicators of the banking sector for Finland

	1990	1995	2000	2001
	As a percentage of balance sheet total			
Assets				
Cash and balance with Central bank	3.3	2.7	2.2	0.9
Interbank deposits	3.3	2.9	2.8	2.9
Loans	65.8	49.7	61.3	54.6
Securities	13.0	26.5	14.6	17.6
Other assets	14.6	18.2	19.1	23.9
Foreign assets	*13.9*	*16.3*	*29.4*	*34.6*
Liabilities				
Capital and reserves	6.9	4.8	5.8	4.1
Borrowing from Central bank	0.5	1.2	0.3	0.8
Interbank deposits	2.4	3.2	2.5	2.4
Non-bank deposits	51.6	56.2	52.1	52.7
Bonds	8.5	7.0	7.8	5.5
Other liabilities	30.1	27.6	31.4	34.5
Foreign liabilities	*29.7*	*19.8*	*28.1*	*31.4*
Income statement	As a percentage of gross income			
Interest income	291.6	187.3	143.4	98.9
Interest expenses	237.6	130.5	86.6	63.1
Non-interest income (net)	46.0	43.2	43.2	64.2
Performance ratios				
Cost-income ratio	0.81	1.12	0.57	0.38
Profit before tax as a percentage of balance sheet total	0.40	-0.37	1.35	2.92
Profit before tax as a percentage of equity	–	–	–	–
Risk-based capital ratio [1])	–	–	–	–
Staff costs per employee (1,000 USD)	45.5	42.7	35.1	37.5
Profit before tax per employee (1,000 USD)	16.1	-18.2	66.4	155.1
Bank concentration	As a percentage of balance sheet total			
5 largest banks	64.6	76,6[3])	79.3	78.1
Bank density				
Residents per institution	9,533	14,553	15,135	15,170
Residents per institution and branch	1,491	2,602	3,312	3,195
Institutions and branches per 100 km^2	0.99	0.58	0.46	0.48
Institutions and branches per 100 km^2 populated area	6.18	3.63	2.89	3.00
Number of ATM[2]) per 1,000 residents	–	–	–	0.84
Cards with cash function per resident	–	–	–	–
Cards with debit function per resident	–	–	–	–
Cards with credit function per resident	–	–	–	–
Foreign direct investment of the banking sector				
Inflows, as a percentage of total direct investment	3.4	3.6	61.4	81.4
Outflows, as a percentage of total direct investment	15.5	-37.9	11.1	24.3
Inward stock, as a percentage of capital and reserves	2.0	4.3	101.7	148.6
Outward stock, as a percentage of balance sheet total	0.8	0.3	3.5	4.6

Source: BIS; EUROSTAT; OECD; UNCTAD; UNCTAD; WIFO calculations. – 1) According to Basel I. – 2) Automatic teller machines with cash dispensing function with open access. – 3) 1997.

Table D.5: Structure and performance indicators of the banking sector for France

	1990	1995	2000	2001
	As a percentage of balance sheet total			
Assets				
Cash and balance with Central bank	0.8	0.2	0.8	1.1
Interbank deposits	40.3	38.9	32.2	33.0
Loans	40.2	38.5	36.8	35.7
Securities	7.9	16.3	20.2	19.7
Other assets	10.7	6.0	10.0	10.6
Foreign assets	*24.7*	*18.8*	*22.4*	*22.7*
Liabilities				
Capital and reserves	3.4	4.4	4.6	4.7
Borrowing from Central bank	1.6	0.1	0.1	0.3
Interbank deposits	41.7	38.6	36.8	34.9
Non-bank deposits	22.7	28.2	28.3	28.8
Bonds	19.4	21.3	17.2	17.8
Other liabilities	11.3	7.5	13.0	13.5
Foreign liabilities	*25.2*	*17.6*	*23.4*	*24.7*
Income statement	As a percentage of gross income			
Interest income	415.7	332.9	290.5	287.4
Interest expenses	338.3	278.5	251.4	250.5
Fees and commissions receivable	–	22.6	33.5	33.3
Fees and commissions payable	–	6.8	9.1	9.0
Other non-interest income (net)	–	29.7	36.5	38.8
Performance ratios				
Cost-income ratio	0.72	0.66	0.66	0.62
Profit before tax as a percentage of balance sheet total	0.36	0.15	0.67	0.72
Profit before tax as a percentage of equity	10.1	3.6	12.1	11.8
Risk-based capital ratio [1])	–	–	–	–
Staff costs per employee (1,000 USD)	52.5	69.9	–	–
Profit before tax per employee (1,000 USD)	21.6	14.0	44.8	47.1
Bank concentration	As a percentage of balance sheet total			
5 largest banks	51.9	47.4	46.8	47.0
Bank density				
Residents per institution	29,364	40,901	54,683	57,087
Residents per institution and branch	2,070	2,118	2,216	2,261
Institutions and branches per 100 km^2	5.17	5.16	5.03	4.95
Institutions and branches per 100 km^2 populated area	28.70	28.66	27.92	27.52
Number of ATM[2]) per 1,000 residents	–	–	0.58	0.61
Cards with cash function per resident	–	–	0.68	0.71
Cards with debit function per resident	–	–	0.61	0.65
Cards with credit function per resident	–	–	–	–
Foreign direct investment of the finance sector				
Inflows, as a percentage of total direct investment	18.8	13.3	19.6	7.7
Outflows, as a percentage of total direct investment	21.7	12.5	8.6	22.6
Inward stock, as a percentage of capital and reserves	16.9	39.9	–	24.7
Outward stock, as a percentage of balance sheet total	1.0	2.0	3.1	3.0

Source: BIS; EUROSTAT; OECD; UNCTAD; WIFO calculations. – 1) According to Basel I. – 2) Automatic teller machines with cash dispensing function with open access.

Table D.6: Structure and performance indicators of the banking sector for Germany

	1990	1995	2000	2001
	As a percentage of balance sheet total			
Assets				
Cash and balance with Central bank	2.4	1.3	1.2	1.2
Interbank deposits	24.4	21.9	21.6	22.7
Loans	54.5	54.6	48.4	47.6
Securities	16.3	19.7	23.6	24.0
Other assets	2.5	2.5	5.2	4.5
Foreign assets	*19.3*	*17.0*	*28.5*	*31.7*
Liabilities				
Capital and reserves	3.8	4.2	4.0	4.1
Borrowing from Central bank	4.2	3.0	2.1	1.7
Interbank deposits	23.7	26.2	28.1	28.4
Non-bank deposits	52.1	47.1	42.5	42.9
Bonds	12.4	14.9	17.4	17.6
Other liabilities	3.8	4.6	6.0	5.3
Foreign liabilities	*11.4*	*13.4*	*23.5*	*25.1*
Income statement	As a percentage of gross income			
Interest income	280.1	258.0	269.8	270.2
Interest expenses	206.9	179.0	205.7	205.7
Fees and commissions receivable	–	18.6	30.2	27.1
Fees and commissions payable	–	1.9	4.8	4.8
Other non-interest income (net)	–	4.2	10.4	13.2
Performance ratios				
Cost-income ratio	0.65	0.64	0.69	0.70
Profit before tax as a percentage of balance sheet total	0.48	0.57	0.32	0.21
Profit before tax as a percentage of equity	11.9	12.6	7.9	5.1
Risk-based capital ratio [1])	–	–	–	–
Staff costs per employee (1,000 USD)	37.4	56.7	51.7	52.1
Profit before tax per employee (1,000 USD)	16.3	32.4	21.7	14.9
Bank concentration	As a percentage of balance sheet total			
5 largest banks	17.1	16.7	19.9	20.2
Bank density				
Residents per institution	20,282	23,332	31,918	34,743
Residents per institution and branch	1,825	1,719	1,961	2,078
Institutions and branches per 100 km^2	12.18	13.31	11.74	11.10
Institutions and branches per 100 km^2 populated area	60.91	66.55	58.69	55.51
Number of ATM [2]) per 1,000 residents	–	–	0.58	0.60
Cards with cash function per resident	–	–	1.29	1.48
Cards with debit function per resident	–	–	1.21	1.41
Cards with credit function per resident	–	–	0.21	0.23
Foreign direct investment of the banking sector				
Inflows, as a percentage of total direct investment	145.3	4.3	3.0	-10.1
Outflows, as a percentage of total direct investment	34.3	9.5	53.4	8.3
Inward stock, as a percentage of capital and reserves	8.9	7.9	18.0	13.5
Outward stock, as a percentage of balance sheet total	0.5	0.7	1.9	2.0

Source: BIS; EUROSTAT; OECD; UNCTAD; WIFO calculations. – 1) According to Basel I. – 2) Automatic teller machines with cash dispensing function with open access.

Table D.7: Structure and performance indicators of the banking sector for Greece

	1990	1995	2000	2001
	As a percentage of balance sheet total			
Assets (commercial banks)				
Cash and balance with Central bank	17.5	21.8	12.0	6.6
Interbank deposits	5.3	11.4	9.4	9.5
Loans	28.5	28.1	43.8	47.7
Securities	38.7	34.8	30.6	31.8
Other assets	10.0	3.9	4.2	4.4
Foreign assets	–	–	–	–
Liabilities (commercial banks)				
Capital and reserves	3.9	4.8	8.9	9.3
Borrowing from Central bank	0.4	1.5	0.5	0.0
Interbank deposits	1.3	8.9	7.7	6.4
Non-bank deposits	81.0	73.5	63.6	64.2
Bonds	–	0.7	0.1	0.1
Other liabilities	13.3	10.6	19.2	20.0
Foreign liabilities	–	–	–	–
Income statement (commercial banks)	As a percentage of gross income			
Interest income	354.8	258.8	174.5	142.7
Interest expenses	310.5	209.4	119.0	78.7
Fees and commissions receivable	–	29.7	19.7	15.4
Fees and commissions payable	–	1.7	4.2	3.9
Other non-interest income (net)	–	22.6	29.0	24.6
Performance ratios (commercial banks)				
Cost-income ratio	0.64	0.64	0.53	0.58
Profit before tax as a percentage of balance sheet total	0.87	1.26	1.86	1.39
Profit before tax as a percentage of equity	20.8	24.4	19.2	14.3
Risk-based capital ratio [1])	–	13.2	14.2	12.5
Staff costs per employee (1,000 USD)	25.2	32.8	34.7	35.7
Profit before tax per employee (1,000 USD)	12.1	21.8	41.9	34.8
Bank concentration	As a percentage of balance sheet total			
5 largest banks	–	–	–	–
Bank density				
Residents per institution	–	–	202,188	188,581
Residents per institution and branch	–	–	3,803	3,403
Institutions and branches per 100 km^2	–	–	2.18	2.44
Institutions and branches per 100 km^2 populated area	–	–	18.13	20.30
Number of ATM[2]) per 1,000 residents	–	–	–	0.40
Cards with cash function per resident	–	–	–	–
Cards with debit function per resident	–	–	–	–
Cards with credit function per resident	–	–	–	–
Foreign direct investment of the financial sector				
Inflows, as a percentage of total direct investment	21.9	–	–	55.0
Outflows, as a percentage of total direct investment	–	–	–	0.0
Inward stock, as a percentage of capital and reserves	–	–	–	–
Outward stock, as a percentage of balance sheet total	–	–	–	–

Source: BIS; EUROSTAT; OECD; UNCTAD; WIFO calculations. – 1) According to Basel I. – 2) Automatic teller machines with cash dispensing function with open access.

Table D.8: Structure and performance indicators of the banking sector for Ireland

	1990	1995	2000	2001
	As a percentage of balance sheet total			
Assets				
Cash and balance with Central bank	–	0.6	0.7	0.9
Interbank deposits	–	18.7	16.0	15.5
Loans	–	55.1	49.1	49.6
Securities	–	18.7	22.3	23.5
Other assets	–	6.9	12.0	10.5
Foreign assets	–	*51.3*	*72.3*	*65.2*
Liabilities				
Capital and reserves	–	6.7	6.3	6.6
Borrowing from Central bank	–	–	–	–
Interbank deposits	–	22.6	30.6	31.2
Non-bank deposits	–	56.2	39.2	38.7
Bonds	–	7.6	12.2	12.8
Other liabilities	–	6.9	11.7	10.7
Foreign liabilities	–	*53.0*	*66.5*	*60.2*
Income statement	As a percentage of gross income			
Interest income	–	180.3	248.7	257.2
Interest expenses	–	110.1	187.6	191.4
Fees and commissions receivable	–	24.0	28.9	31.2
Fees and commissions payable	–	2.3	3.6	4.4
Other non-interest income (net)	–	8.1	13.5	7.3
Performance ratios				
Cost-income ratio	–	0.59	0.50	0.56
Profit before tax as a percentage of balance sheet total	–	1.50	1.21	0.87
Profit before tax as a percentage of equity	–	20.2	17.9	12.3
Risk-based capital ratio [1])	–	13.9	13.6	13.8
Staff costs per employee (1,000 USD)	–	40.4	65.0	40.2
Profit before tax per employee (1,000 USD)	–	41.0	110.4	76.1
Bank concentration	As a percentage of balance sheet total			
5 largest banks	–	–	–	–
Bank density				
Residents per institution	–	81,847	70,358	70,046
Residents per institution and branch	–	2,680	4,068	3,759
Institutions and branches per 100 km^2	–	1.91	1.33	1.46
Institutions and branches per 100 km^2 populated area	–	13.66	9.49	10.42
Number of ATM[2]) per 1,000 residents	–	–	–	0.35
Cards with cash function per resident	–	–	–	–
Cards with debit function per resident	–	–	–	–
Cards with credit function per resident	–	–	–	–
Foreign direct investment of the financial sector				
Inflows, as a percentage of total direct investment	0.0	0.0	56.3	48.2
Outflows, as a percentage of total direct investment	–	–	–	5.8
Inward stock, as a percentage of capital and reserves	–	–	–	–
Outward stock, as a percentage of balance sheet total	–	–	–	–

Source: BIS; EUROSTAT; OECD; UNCTAD; WIFO calculations. – 1) According to Basel I. – 2) Automatic teller machines with cash dispensing function with open access.

Table D.9: Structure and performance indicators of the banking sector for Italy

	1990	1995	2000	2001
	As a percentage of balance sheet total			
Assets				
Cash and balance with Central bank	7.2	3.0	0.7	1.4
Interbank deposits	5.8	6.4	8.9	7.9
Loans	44.7	41.8	45.2	47.2
Securities	13.6	14.6	8.9	8.1
Other assets	28.6	34.2	36.2	35.4
Foreign assets	*6.6*	*9.0*	*9.1*	*8.1*
Liabilities				
Capital and reserves	5.8	6.8	6.8	6.8
Borrowing from Central bank	0.4	0.3	0.0	0.0
Interbank deposits	5.9	6.5	8.4	7.6
Non-bank deposits	44.9	37.5	26.7	27.4
Bonds	7.7	8.1	14.3	15.1
Other liabilities	35.4	40.9	43.7	43.1
Foreign liabilities	*13.5*	*13.5*	*15.5*	*15.3*
Income statement	As a percentage of gross income			
Interest income	220.9	233.9	135.1	143.8
Interest expenses	142.9	153.7	71.1	73.6
Fees and commissions receivable	9.4	10.6	26.8	23.4
Fees and commissions payable	4.7	2.7	4.7	5.0
Other non-interest income (net)	17.3	11.8	14.0	11.3
Performance ratios				
Cost-income ratio	0.62	0.68	0.56	0.55
Profit before tax as a percentage of balance sheet total	1.04	0.42	1.27	0.99
Profit before tax as a percentage of equity	16.4	5.9	17.6	14.0
Risk-based capital ratio [1])	–	12.6	13.6	14.0
Staff costs per employee (1,000 USD)	99.2	62.9	85.8	99.3
Profit before tax per employee (1,000 USD)	58.2	16.9	93.0	88.0
Bank concentration	As a percentage of balance sheet total			
5 largest banks	24.2	25.9	24,7[3])	–
Bank density				
Residents per institution	49,488	58,996	68,444	69,086
Residents per institution and branch	3,176	2,325	1,954	1,886
Institutions and branches per 100 km^2	5.89	8.07	9.63	9.98
Institutions and branches per 100 km^2 populated area	28.03	38.45	45.84	47.54
Number of ATM[2]) per 1,000 residents	–	–	0.55	0.59
Cards with cash function per resident	–	–	0.37	0.40
Cards with debit function per resident	–	–	0.36	0.38
Cards with credit function per resident	–	–	0.30	0.35
Foreign direct investment of the financial sector				
Inflows, as a percentage of total direct investment	94.1	18.1	29.5	12.4
Outflows, as a percentage of total direct investment	62.3	61.2	10.8	3.3
Inward stock, as a percentage of capital and reserves	26.1	22.5	30.1	26.4
Outward stock, as a percentage of balance sheet total	1.6	2.4	3.3	3.1

Source: BIS; EUROSTAT; OECD; UNCTAD; WIFO calculations. – 1) According to Basel I. – 2) Automatic teller machines with cash dispensing function with open access. – 3) 1997.

Table D.10: Structure and performance indicators of the banking sector for Luxembourg

	1990	1995	2000	2001
	As a percentage of balance sheet total			
Assets (commercial banks)				
Cash and balance with Central bank	0.2	0.2	1.0	1.0
Interbank deposits	60.4	58.3	48.1	47.8
Loans	24.0	18.9	20.3	20.9
Securities	7.6	18.9	24.1	23.4
Other assets	7.8	3.7	6.5	6.9
Foreign assets	*88.5*	*80.8*	*84.6*	*84.6*
Liabilities (commercial banks)				
Capital and reserves	3.5	2.5	2.7	2.7
Borrowing from Central bank	–	–	–	–
Interbank deposits	47.0	46.9	44.8	46.4
Non-bank deposits	40.2	39.3	35.0	32.1
Bonds	4.5	6.2	9.2	10.1
Other liabilities	4.8	5.1	8.3	8.6
Foreign liabilities	*82.2*	*72.4*	*69.8*	*69.8*
Income statement (commercial banks)	As a percentage of gross income			
Interest income	818.0	698.1	643.1	647.7
Interest expenses	753.0	632.6	597.0	593.0
Non-interest income (net)	31.5	31.1	48.5	40.8
Performance ratios (commercial banks)				
Cost-income ratio	0.37	0.47	0.45	0.47
Profit before tax as a percentage of balance sheet total	0.22	0.51	0.56	0.53
Profit before tax as a percentage of equity	6.2	19.9	20.5	18.5
Risk-based capital ratio [1])	–	–	–	–
Staff costs per employee (1,000 USD)	51.9	86.0	68.8	67.6
Profit before tax per employee (1,000 USD)	49.6	170.0	141.1	135.8
Bank concentration	As a percentage of balance sheet total			
5 largest banks	–	–	–	–
Bank density				
Residents per institution	2,158	1,862	2,171	2,336
Residents per institution and branch	806	711	868	983
Institutions and branches per 100 km^2	18.33	22.27	19.53	17.36
Institutions and branches per 100 km^2 populated area	53.91	65.51	57.44	51.07
Number of ATM[2]) per 1,000 residents	–	–	–	–
Cards with cash function per resident	–	–	–	–
Cards with debit function per resident	–	–	–	–
Cards with credit function per resident	–	–	–	–
Foreign direct investment of the finance sector				
Inflows, as a percentage of total direct investment	–	–	–	–
Outflows, as a percentage of total direct investment	–	–	–	–
Inward stock, as a percentage of capital and reserves	–	–	–	–
Outward stock, as a percentage of balance sheet total	–	–	–	–

Source: BIS; EUROSTAT; OECD; UNCTAD; WIFO calculations. – 1) According to Basel I. – 2) Automatic teller machines with cash dispensing function with open access.

Table D.11: Structure and performance indicators of the banking sector for the Netherlan

	1990	1995	2000	2001
	As a percentage of balance sheet total			
Assets				
Cash and balance with Central bank	2.3	0.5	1.0	1.9
Interbank deposits	23.3	19.5	11.5	11.4
Loans	61.1	60.5	59.5	58.7
Securities	10.6	15.3	23.3	23.2
Other assets	2.7	4.3	4.7	4.8
Foreign assets	*28.0*	*25.0*	*19.0*	*21.9*
Liabilities				
Capital and reserves	4.0	4.6	4.0	3.8
Borrowing from Central bank	0.8	0.7	0.5	0.2
Interbank deposits	23.6	22.1	22.4	21.6
Non-bank deposits	45.5	52.2	45.1	46.4
Bonds	14.9	12.8	16.3	17.3
Other liabilities	11.1	7.7	11.7	10.6
Foreign liabilities	*23.1*	*23.6*	*16.8*	*19.3*
Income statement	As a percentage of gross income			
Interest income	–	248.2	225.1	218.1
Interest expenses	–	181.5	172.2	163.5
Fees and commissions receivable	–	–	32.9	28.5
Fees and commissions payable	–	–	3.9	3.4
Other non-interest income (net)	–	–	18.0	20.4
Performance ratios				
Cost-income ratio	0.69	0.67	0.71	0.70
Profit before tax as a percentage of balance sheet total	0.55	0.75	0.75	0.61
Profit before tax as a percentage of equity	12.3	15.8	17.2	15.2
Risk-based capital ratio [1])	11.7	11.9	10.7	10.7
Staff costs per employee (1,000 USD)	45.5	84.1	104.6	106.3
Profit before tax per employee (1,000 USD)	24.7	60.8	67.0	59.6
Bank concentration	As a percentage of balance sheet total			
5 largest banks	73.7	76.1	81.1	82.5
Bank density				
Residents per institution	83,039	88,851	144,745	145,845
Residents per institution and branch	1,829	2,240	4,402	4,435
Institutions and branches per 100 km^2	19.52	16.49	8.64	8.64
Institutions and branches per 100 km^2 populated area	50.05	42.28	22.15	22.15
Number of ATM[2]) per 1,000 residents	–	–	0.43	0.45
Cards with cash function per resident	–	–	1.63	1.61
Cards with debit function per resident	–	–	1.32	1.32
Cards with credit function per resident	–	–	0.31	0.31
Foreign direct investment of the financial sector				
Inflows, as a percentage of total direct investment	17.9	8.0	6.6	1.8
Outflows, as a percentage of total direct investment	22.9	27.7	28.8	28.2
Inward stock, as a percentage of capital and reserves	22.9	22.2	28.9	25.0
Outward stock, as a percentage of balance sheet total	2.5	3.3	3.5	3.8

Source: BIS; EUROSTAT; OECD; UNCTAD; WIFO calculations. – 1) According to Basel I. – 2) Automatic teller machines with cash dispensing function with open access.

Table D.12: Structure and performance indicators of the banking sector for Portugal

	1990	1995	2000	2001
	As a percentage of balance sheet total			
Assets (commercial banks)				
Cash and balance with Central bank	12.1	6.7	3.2	3.1
Interbank deposits	19.8	23.7	22.6	22.4
Loans	40.5	33.3	53.5	55.3
Securities	18.9	23.2	15.2	13.6
Other assets	8.6	13.1	5.5	5.6
Foreign assets	*6.9*	*21.2*	*21.4*	*21.1*
Liabilities (commercial banks)				
Capital and reserves	11.0	8.2	11.3	11.8
Borrowing from Central bank	0.4	1.9	0.7	0.2
Interbank deposits	10.5	23.9	30.6	29.9
Non-bank deposits	68.4	52.5	46.7	45.5
Bonds	1.1	1.0	7.5	9.6
Other liabilities	8.6	12.5	3.2	3.0
Foreign liabilities	*6.6*	*19.5*	*30.9*	*34.0*
Income statement (commercial banks)	As a percentage of gross income			
Interest income	228.8	284.6	224.7	240.8
Interest expenses	147.6	208.5	157.9	170.6
Fees and commissions receivable	–	11.7	21.2	20.1
Fees and commissions payable	–	2.0	3.5	3.6
Other non-interest income (net)	–	14.2	15.5	13.3
Performance ratios (commercial banks)				
Cost-income ratio	0.42	0.65	0.59	0.57
Profit before tax as a percentage of balance sheet total	1.47	0.65	1.03	0.78
Profit before tax as a percentage of equity	12.5	7.7	8.8	6.3
Risk-based capital ratio [1])	–	11.3	10.7	11.7
Staff costs per employee (1,000 USD)	20.5	36.0	36.2	34.3
Profit before tax per employee (1,000 USD)	19.2	21.6	44.7	36.6
Bank concentration	As a percentage of balance sheet total			
5 largest banks	–	–	–	–
Bank density				
Residents per institution	–	–	46,908	49,249
Residents per institution and branch	–	–	1,739	1,773
Institutions and branches per 100 km^2	–	–	6.37	6.29
Institutions and branches per 100 km^2 populated area	–	–	31.86	31.46
Number of ATM [2]) per 1,000 residents	–	–	–	1.00
Cards with cash function per resident	–	–	–	–
Cards with debit function per resident	–	–	–	–
Cards with credit function per resident	–	–	–	–
Foreign direct investment of the finance sector				
Inflows, as a percentage of total direct investment	65.5	-54.5	34.2	4.7
Outflows, as a percentage of total direct investment	62.4	53.4	7.2	24.7
Inward stock, as a percentage of capital and reserves	–	–	–	–
Outward stock, as a percentage of balance sheet total	–	–	–	–

Source: BIS; EUROSTAT; OECD; UNCTAD; WIFO calculations. – 1) According to Basel I. – 2) Automatic teller machines with cash dispensing function with open access.

Table D.13: Structure and performance indicators of the banking sector for Spain

	1990	1995	2000	2001
	As a percentage of balance sheet total			
Assets				
Cash and balance with Central bank	7.2	3.1	1.3	1.7
Interbank deposits	13.9	16.0	11.3	11.0
Loans	44.9	43.6	53.4	53.6
Securities	22.1	19.5	19.9	20.6
Other assets	12.1	17.9	14.2	13.1
Foreign assets	*5.4*	*14.8*	*13.6*	*13.9*
Liabilities				
Capital and reserves	9.2	8.6	8.8	8.8
Borrowing from Central bank	2.3	5.5	1.5	0.9
Interbank deposits	10.8	16.2	11.5	10.6
Non-bank deposits	63.4	56.3	55.3	56.9
Bonds	1.4	2.7	6.1	7.0
Other liabilities	12.9	10.6	16.8	15.8
Foreign liabilities	*9.2*	*11.0*	*21.5*	*21.5*
Income statement	As a percentage of gross income			
Interest income	238.0	243.5	146.0	160.7
Interest expenses	156.2	166.6	81.8	88.4
Fees and commissions receivable	14.5	18.5	25.3	23.8
Fees and commissions payable	4.1	3.5	4.3	4.3
Other non-interest income (net)	7.9	8.1	14.7	8.1
Performance ratios				
Cost-income ratio	0.61	0.63	0.61	0.56
Profit before tax as a percentage of balance sheet total	1.31	0.82	0.96	0.86
Profit before tax as a percentage of equity	13.6	9.2	10.4	9.3
Risk-based capital ratio [1])	–	–	11.6	12.2
Staff costs per employee (1,000 USD)	47.8	52.7	50.4	47.5
Profit before tax per employee (1,000 USD)	34.1	31.1	37.0	35.5
Bank concentration	As a percentage of balance sheet total			
5 largest banks	38.3	48.2	46,0[3])	55,0[4])
Bank density				
Residents per institution	118,829	123,343	142,090	143,294
Residents per institution and branch	1,093	1,073	1,017	1,034
Institutions and branches per 100 km^2	7.03	7.23	7.76	7.70
Institutions and branches per 100 km^2 populated area	87.85	90.34	96.96	96.24
Number of ATM[2]) per 1,000 residents	–	–	–	1.16
Cards with cash function per resident	–	–	–	–
Cards with debit function per resident	–	–	–	–
Cards with credit function per resident	–	–	–	–
Foreign direct investment of the financial sector				
Inflows, as a percentage of total direct investment	58.9	15.6	4.8	2.7
Outflows, as a percentage of total direct investment	87.5	43.6	27.4	15.2
Inward stock, as a percentage of capital and reserves	–	–	–	–
Outward stock, as a percentage of balance sheet total	–	–	–	–

Source: BIS; EUROSTAT; OECD; UNCTAD; WIFO calculations. – 1) According to Basel I. – 2) Automatic teller machines with cash dispensing function with open access. – 3) 1998. – 4) 2003.

Table D.14: Structure and performance indicators of the banking sector for Sweden

	1990	1995	2000	2001
	As a percentage of balance sheet total			
Assets (commercial banks)				
Cash and balance with Central bank	2.3	0.6	0.5	0.8
Interbank deposits	18.8	15.1	17.4	16.6
Loans	53.5	43.6	36.8	37.7
Securities	11.7	35.6	34.7	34.8
Other assets	13.7	5.1	10.6	10.1
Foreign assets	*8.2*	*33.0*	*34.5*	*36.6*
Liabilities (commercial banks)				
Capital and reserves	5.6	5.9	5.3	5.6
Borrowing from Central bank	1.1	0.0	1.1	1.8
Interbank deposits	41.7	23.4	24.0	24.7
Non-bank deposits	34.9	51.7	39.1	38.1
Bonds	6.8	6.1	16.2	17.2
Other liabilities	9.9	12.9	14.3	12.6
Foreign liabilities	*8.2*	*41.9*	*49.2*	*43.2*
Income statement (commercial banks)	As a percentage of gross income			
Interest income	385.6	205.1	185.3	163.4
Interest expenses	311.8	140.8	144.6	121.0
Fees and commissions receivable	–	–	35.6	28.7
Fees and commissions payable	–	–	5.3	5.2
Other non-interest income (net)	–	–	29.0	34.1
Performance ratios (commercial banks)				
Cost-income ratio	0.78	0.72	0.67	0.64
Profit before tax as a percentage of balance sheet total	0.22	1.33	1.11	1.07
Profit before tax as a percentage of equity	3.6	22.1	19.5	19.5
Risk-based capital ratio [1])	–	19.2	18.0	18.4
Staff costs per employee (1,000 USD)	56.1	59.6	64.0	57.4
Profit before tax per employee (1,000 USD)	17.6	68.3	79.7	80.6
Bank concentration	As a percentage of balance sheet total			
5 largest banks	70.0	86.0	88.6	87.5
Bank density				
Residents per institution	–	–	70,413	68,961
Residents per institution and branch	–	–	4,060	4,101
Institutions and branches per 100 km^2	–	–	0.49	0.48
Institutions and branches per 100 km^2 populated area	–	–	2.02	2.01
Number of ATM[2]) per 1,000 residents	–	–	0.29	0.29
Cards with cash function per resident	–	–	10.87	10.60
Cards with debit function per resident	–	–	42.32	44.61
Cards with credit function per resident	–	–	5.28	5.17
Foreign direct investment of the banking sector				
Inflows, as a percentage of total direct investment	9.7	-0.4	3.8	6.2
Outflows, as a percentage of total direct investment	13.9	2.1	27.7	5.0
Inward stock, as a percentage of capital and reserves	–	–	–	–
Outward stock, as a percentage of balance sheet total	–	–	–	–

Source: BIS; EUROSTAT; OECD; UNCTAD; WIFO calculations. – 1) According to Basel I. – 2) Automatic teller machines with cash dispensing function with open access.

Table D.15: Structure and performance indicators of the banking sector for the United Kingdom

	1990	1995	2000	2001
	As a percentage of balance sheet total			
Assets (commercial banks)				
Cash and balance with Central bank	1.4	0.7	0.6	0.5
Interbank deposits	14.6	13.8	9.1	9.0
Loans	66.1	52.1	53.9	52.5
Securities	8.4	18.5	19.7	21.1
Other assets	9.4	15.0	16.8	16.8
Foreign assets	–	–	*44.2*	*43.5*
Liabilities (commercial banks)				
Capital and reserves	4.8	3.9	5.2	5.1
Borrowing from Central bank	–	–	–	–
Interbank deposits	–	16.3	12.2	12.3
Non-bank deposits	87.9	52.2	49.6	48.3
Bonds	2.9	11.2	15.8	16.9
Other liabilities	4.4	16.5	17.3	17.4
Foreign liabilities	–	–	*39.9*	*40.0*
Income statement (commercial banks)	As a percentage of gross income			
Interest income	260.8	157.7	166.1	151.6
Interest expenses	199.6	100.4	109.3	95.2
Fees and commissions receivable	–	34.5	34.2	34.6
Fees and commissions payable	–	4.0	5.9	6.4
Other non-interest income (net)	–	12.2	14.8	15.4
Performance ratios (commercial banks)				
Cost-income ratio	0.66	0.64	0.56	0.57
Profit before tax as a percentage of balance sheet total	0.72	1.17	1.30	1.09
Profit before tax as a percentage of equity	14.4	28.6	21.5	20.1
Risk-based capital ratio [1])	–	10.9	11.2	11.2
Staff costs per employee (1,000 USD)	39.3	45.6	48.8	48.9
Profit before tax per employee (1,000 USD)	15.3	36.9	67.1	60.5
Bank concentration	As a percentage of balance sheet total			
5 largest banks	49.2	46,7[3])	–	41,0[4])
Bank density				
Residents per institution	–	–	–	122,981
Residents per institution and branch	–	–	–	3,893
Institutions and branches per 100 km^2	–	–	–	6.27
Institutions and branches per 100 km^2 populated area	–	–	–	33.01
Number of ATM[2]) per 1,000 residents	–	–	0.56	0.62
Cards with cash function per resident	–	–	2.02	2.16
Cards with debit function per resident	–	–	0.85	0.92
Cards with credit function per resident	–	–	0.80	0.88
Foreign direct investment of the financial sector				
Inflows, as a percentage of total direct investment	23.4	29.6	17.7	20.9
Outflows, as a percentage of total direct investment	4.7	20.2	9.1	23.5
Inward stock, as a percentage of capital and reserves	–	–	–	–
Outward stock, as a percentage of balance sheet total	–	–	–	–

Source: BIS; EUROSTAT; OECD; UNCTAD; WIFO calculations. – 1) According to Basel I. – 2) Automatic teller machines with cash dispensing function with open access. – 3) 1997. – 4) 2002.

Table D.16: Structure and performance indicators of the banking sector for Iceland

	1990	1995	2000	2001
	As a percentage of balance sheet total			
Assets (commercial banks and savings banks)				
Cash and balance with Central bank	7.1	4.0	3.1	2.2
Interbank deposits	3.0	5.7	10.9	11.7
Loans	74.4	75.1	68.9	68.8
Securities	10.6	10.2	13.5	14.7
Other assets	5.0	5.0	3.7	2.6
Foreign assets	*2.1*	*2.0*	2.6	*3.3*
Liabilities (commercial banks and savings banks)				
Capital and reserves	7.6	8.0	6.4	6.7
Borrowing from Central bank	1.7	1.8	4.3	4.9
Interbank deposits	1.0	3.1	3.7	4.0
Non-bank deposits	58.4	62.4	33.5	32.9
Bonds	8.2	8.9	19.6	19.5
Other liabilities	23.1	15.8	32.5	32.0
Foreign liabilities	*18.3*	*10.6*	*40.4*	*41.0*
Income statement (commercial banks and savings banks)	As a percentage of gross income			
Interest income	197.3	138.2	211.2	258.8
Interest expenses	125.9	69.9	149.6	184.2
Fees and commissions receivable	23.7	26.1	27.9	31.9
Fees and commissions payable	0.0	1.3	6.5	5.8
Other non-interest income (net)	4.9	6.9	17.0	-0.7
Performance ratios (commercial banks and savings banks)				
Cost-income ratio	0.74	0.73	0.63	0.63
Profit before tax as a percentage of balance sheet total	0.63	0.70	0.96	0.67
Profit before tax as a percentage of equity	8.0	8.6	12.7	9.2
Risk-based capital ratio [1])	–	11.5	10.4	12.5
Staff costs per employee (1,000 USD)	31.3	33.5	47.8	44.5
Profit before tax per employee (1,000 USD)	7.4	9.3	29.7	21.6
Bank concentration	As a percentage of balance sheet total			
5 largest banks	–	–	–	–
Bank density				
Residents per institution	–	6,366	7,399	7,704
Residents per institution and branch	–	998	1,222	1,245
Institutions and branches per 100 km^2	–	0.26	0.22	0.22
Institutions and branches per 100 km^2 populated area	–	0.37	0.32	0.32
Number of ATM[2]) per 1,000 residents	–	–	–	0.80
Cards with cash function per resident	–	–	–	–
Cards with debit function per resident	–	–	–	–
Cards with credit function per resident	–	–	–	–
Foreign direct investment of the banking sector				
Inflows, as a percentage of total direct investment	-5.7	-4.9	3.7	–
Outflows, as a percentage of total direct investment	0.0	0.0	18.3	–
Inward stock, as a percentage of capital and reserves	–	–	–	–
Outward stock, as a percentage of balance sheet total	–	–	–	–

Source: BIS; EUROSTAT; OECD; UNCTAD; WIFO calculations. – 1) According to Basel I. – 2) Automatic teller machines with cash dispensing function with open access.

Table D.17: Structure and performance indicators of the banking sector for Norway

	1990	1995	2000	2001
	As a percentage of balance sheet total			
Assets				
Cash and balance with Central bank	0.5	0.8	2.1	2.0
Interbank deposits	3.4	3.1	4.9	4.0
Loans	77.2	78.1	79.0	79.9
Securities	13.7	13.7	8.7	8.9
Other assets	5.1	4.4	5.3	5.1
Foreign assets	*7.7*	*6.7*	*10.3*	*9.5*
Liabilities				
Capital and reserves	3.9	7.3	7.0	6.8
Borrowing from Central bank	9.1	1.5	1.6	1.1
Interbank deposits	12.2	5.4	10.8	10.4
Non-bank deposits	60.6	70.2	53.0	53.6
Bonds	8.2	8.5	15.9	16.9
Other liabilities	6.0	7.1	11.7	11.2
Foreign liabilities	*21.0*	*8.1*	*24.1*	*24.2*
Income statement	As a percentage of gross income			
Interest income	295.7	172.8	222.9	252.0
Interest expenses	216.0	98.9	151.6	177.9
Fees and commissions receivable	12.7	17.5	20.4	21.3
Fees and commissions payable	0.0	0.3	3.7	4.7
Other non-interest income (net)	7.6	9.0	12.0	9.3
Performance ratios				
Cost-income ratio	0.71	0.69	0.60	0.61
Profit before tax as a percentage of balance sheet total	-0.66	1.44	1.40	0.94
Profit before tax as a percentage of equity	-17.7	19.6	18.9	13.5
Risk-based capital ratio [1])	–	13.4	12.1	12.6
Staff costs per employee (1,000 USD)	44.1	57.6	63.9	66.5
Profit before tax per employee (1,000 USD)	-21.7	64.1	87.5	63.9
Bank concentration	As a percentage of balance sheet total			
5 largest banks	67.6	50.2	60.5	59.6
Bank density				
Residents per institution	25,860	28,490	29,546	29,894
Residents per institution and branch	2,164	2,497	3,152	2,929
Institutions and branches per 100 km^2	0.61	0.54	0.44	0.48
Institutions and branches per 100 km^2 populated area	0.86	0.77	0.63	0.68
Number of ATM[2]) per 1,000 residents	–	–	–	–
Cards with cash function per resident	–	–	–	–
Cards with debit function per resident	–	–	–	–
Cards with credit function per resident	–	–	–	–
Foreign direct investment of the financial sector				
Inflows, as a percentage of total direct investment	–	37.6	46.6	4.4
Outflows, as a percentage of total direct investment	–	5.0	-2.2	-9.4
Inward stock, as a percentage of capital and reserves	59.3	49.9	73.9	74.1
Outward stock, as a percentage of balance sheet total	2.0	5.0	5.6	–

Source: BIS; EUROSTAT; OECD; UNCTAD; WIFO calculations. – 1) According to Basel I. – 2) Automatic teller machines with cash dispensing function with open access.

Table D.18: Structure and performance indicators of the banking sector for Switzerland

	1990	1995	2000	2001
	As a percentage of balance sheet total			
Assets				
Cash and balance with Central bank	1.1	0.9	0.7	1.5
Interbank deposits	19.0	17.8	25.0	24.2
Loans	64.9	56.2	44.1	43.0
Securities	10.2	14.5	19.8	20.2
Other assets	4.7	10.7	10.3	11.1
Foreign assets	*34.4*	*38.6*	*56.4*	*58.6*
Liabilities				
Capital and reserves	6.5	6.4	6.0	5.9
Borrowing from Central bank	–	–	–	–
Interbank deposits	20.4	18.7	28.1	26.6
Non-bank deposits	49.4	48.2	41.8	42.1
Bonds	17.6	13.4	8.8	9.9
Other liabilities	6.1	13.3	15.3	15.4
Foreign liabilities	*28.4*	*33.0*	*52.4*	*54.8*
Income statement	As a percentage of gross income			
Interest income	265.3	153.2	137.7	149.3
Interest expenses	214.1	109.9	100.4	108.1
Fees and commissions receivable	34.4	33.7	43.9	42.7
Fees and commissions payable	2.4	2.3	4.9	5.0
Other non-interest income (net)	16.8	25.3	23.7	21.1
Performance ratios				
Cost-income ratio	0.60	0.56	0.56	0.60
Profit before tax as a percentage of balance sheet total	0.52	0.56	1.01	0.63
Profit before tax as a percentage of equity	7.8	8.4	17.2	10.4
Risk-based capital ratio [1])	–	10.5	12.7	11.8
Staff costs per employee (1,000 USD)	62.2	97.7	111.9	114.0
Profit before tax per employee (1,000 USD)	31.2	50.8	106.6	69.3
Bank concentration	As a percentage of balance sheet total			
5 largest banks	53.7	65.8	76.7	77.8
Bank density				
Residents per institution	14,872	18,536	21,519	22,203
Residents per institution and branch	1,462	1,723	2,264	2,312
Institutions and branches per 100 km^2	11.26	9.95	7.71	7.60
Institutions and branches per 100 km^2 populated area	40.20	35.54	27.54	27.16
Number of ATM[2]) per 1,000 residents	–	–	0.67	0.69
Cards with cash function per resident	–	–	1.15	1.19
Cards with debit function per resident	–	–	0.73	0.75
Cards with credit function per resident	–	–	0.43	0.45
Foreign direct investment of the banking sector				
Inflows, as a percentage of total direct investment	–	-38.4	23.9	54.6
Outflows, as a percentage of total direct investment	–	8.8	47.5	29.8
Inward stock, as a percentage of capital and reserves	–	53.5	67.5	66.6
Outward stock, as a percentage of balance sheet total	–	3.4	6.9	7.1

Source: BIS; EUROSTAT; OECD; UNCTAD; WIFO calculations. – 1) According to Basel I. – 2) Automatic teller machines with cash dispensing function with open access.

Table D.19: Structure and performance indicators of the banking sector for Turkey

	1990	1995	2000	2001
	As a percentage of balance sheet total			
Assets (commercial banks)				
Cash and balance with Central bank	6.8	5.3	2.3	2.9
Interbank deposits	9.6	15.5	15.9	15.6
Loans	45.1	40.8	30.0	20.1
Securities	11.2	11.1	22.3	39.6
Other assets	27.2	27.3	29.5	21.8
Foreign assets	*9.1*	*17.8*	*10.8*	*12.9*
Liabilities (commercial banks)				
Capital and reserves	4.6	4.3	6.1	9.3
Borrowing from Central bank	2.1	0.3	0.6	0.1
Interbank deposits	4.5	4.8	23.6	13.6
Non-bank deposits	58.1	65.4	59.2	66.9
Bonds	0.3	1.0	0.2	0.3
Other liabilities	30.5	24.2	10.3	9.9
Foreign liabilities	*8.4*	*8.7*	*15.5*	*12.9*
Income statement (commercial banks)	As a percentage of gross income			
Interest income	291.5	330.1	432.0	606.2
Interest expenses	208.7	234.4	341.7	410.7
Fees and commissions receivable	47.9	122.9	256.5	1,069.9
Fees and commissions payable	40.4	130.5	277.1	1,152.3
Other non-interest income (net)	9.7	11.9	30.2	-13.1
Performance ratios (commercial banks)				
Cost-income ratio	0.52	0.41	1.01	0.53
Profit before tax as a percentage of balance sheet total	3.30	4.59	-3.23	-2.07
Profit before tax as a percentage of equity	58.9	78.8	-44.7	-17.9
Risk-based capital ratio [1])	–	13.0	7.6	9.0
Staff costs per employee (1,000 USD)	12.2	12.7	19.5	15.7
Profit before tax per employee (1,000 USD)	10.4	20.4	-26.3	-16.7
Bank concentration	As a percentage of balance sheet total			
5 largest banks	–	–	–	–
Bank density				
Residents per institution	–	–	–	–
Residents per institution and branch	–	–	–	–
Institutions and branches per 100 km^2	–	–	–	–
Institutions and branches per 100 km^2 populated area	–	–	–	–
Number of ATM[2]) per 1,000 residents	–	–	–	–
Cards with cash function per resident	–	–	–	–
Cards with debit function per resident	–	–	–	–
Cards with credit function per resident	–	–	–	–
Foreign direct investment of the financial sector				
Inflows, as a percentage of total direct investment	–	–	1.7	–
Outflows, as a percentage of total direct investment	–	–	10.6	–
Inward stock, as a percentage of capital and reserves	–	–	–	–
Outward stock, as a percentage of balance sheet total	–	–	–	–

Source: BIS; EUROSTAT; OECD; UNCTAD; WIFO calculations. – 1) According to Basel I. – 2) Automatic teller machines with cash dispensing function with open access.

Table D.20: Structure and performance indicators of the banking sector for Australia

	1990	1995	2000	2001
	As a percentage of balance sheet total			
Assets				
Cash and balance with Central bank	1.0	1.3	0.4	0.7
Interbank deposits	8.2	4.6	3.2	3.5
Loans	57.1	58.6	59.1	57.5
Securities	7.4	8.3	4.9	3.5
Other assets	26.2	27.1	32.3	34.9
Foreign assets	*3.5*	*4.4*	*6.2*	*8.3*
Liabilities				
Capital and reserves	9.4	9.9	12.3	11.5
Borrowing from Central bank	–	–	–	–
Interbank deposits	8.7	6.4	5.9	7.4
Non-bank deposits	54.7	55.9	53.1	52.4
Bonds	–	–	–	–
Other liabilities	27.3	27.8	28.7	28.7
Foreign liabilities	*10.5*	*13.0*	*19.3*	*26.3*
Income statement	As a percentage of gross income			
Interest income	270.4	176.5	156.7	163.7
Interest expenses	210.5	112.2	108.3	114.9
Non-interest income (net)	40.1	35.8	51.6	51.2
Performance ratios				
Cost-income ratio	0.66	0.65	0.52	0.52
Profit before tax as a percentage of balance sheet total	0.67	1.25	1.39	1.25
Profit before tax as a percentage of equity	6.7	12.1	10.5	11.7
Risk-based capital ratio [1])	9.3	12.1	9.9	10.4
Staff costs per employee (1,000 USD)	–	–	–	–
Profit before tax per employee (1,000 USD)	5.8	14.5	19.3	14.6
Bank concentration	As a percentage of balance sheet total			
5 largest banks	65.3	66.1	72.6	74.8
Bank density				
Residents per institution	464,243	535,147	770,840	722,481
Residents per institution and branch	2,469	2,729	3,883	4,127
Institutions and branches per 100 km^2	0.09	0.09	0.06	0.06
Institutions and branches per 100 km^2 populated area	0.43	0.41	0.31	0.29
Number of ATM [2]) per 1,000 residents	–	–	–	–
Cards with cash function per resident	–	–	–	–
Cards with debit function per resident	–	–	–	–
Cards with credit function per resident	–	–	–	–
Foreign direct investment of the financial sector				
Inflows, as a percentage of total direct investment	-12.8	30.4	9.5	18.7
Outflows, as a percentage of total direct investment	-52.6	45.1	343.6	14.8
Inward stock, as a percentage of capital and reserves	48.1	39.5	28.1	34.5
Outward stock, as a percentage of balance sheet total	3.4	3.8	5.0	5.7

Source: BIS; EUROSTAT; OECD; UNCTAD; WIFO calculations. – 1) According to Basel I. – 2) Automatic teller machines with cash dispensing function with open access.

Table D.21: Structure and performance indicators of the banking sector for Canada

	1990	1995	2000	2001
	As a percentage of balance sheet total			
Assets (commercial banks)				
Cash and balance with Central bank	1.2	0.5	0.4	0.4
Interbank deposits	6.8	9.4	5.4	4.7
Loans	77.7	66.5	60.4	58.1
Securities	10.2	19.6	23.5	24.1
Other assets	4.2	3.9	10.4	12.7
Foreign assets	–	–	–	–
Liabilities (commercial banks)				
Capital and reserves	5.7	5.2	5.3	5.3
Borrowing from Central bank	0.0	0.0	0.0	0.0
Interbank deposits	12.5	14.2	9.3	8.7
Non-bank deposits	73.4	64.4	62.1	59.8
Bonds	1.9	2.1	2.0	1.8
Other liabilities	6.6	14.1	21.2	24.4
Foreign liabilities	–	–	–	–
Income statement (commercial banks)	As a percentage of gross income			
Interest income	264.9	188.4	144.3	126.9
Interest expenses	195.9	123.2	100.5	78.0
Non-interest income (net)	31.0	34.7	56.2	51.2
Performance ratios (commercial banks)				
Cost-income ratio	0.64	0.64	0.67	0.68
Profit before tax as a percentage of balance sheet total	1.22	1.09	1.14	0.86
Profit before tax as a percentage of equity	21.0	20.0	20.5	15.4
Risk-based capital ratio [1])	–	–	–	–
Staff costs per employee (1,000 USD)	–	–	–	–
Profit before tax per employee (1,000 USD)	–	–	–	–
Bank concentration	As a percentage of balance sheet total			
5 largest banks	82.9	85.3	88.0	88.2
Bank density				
Residents per institution	–	–	579,917	646,980
Residents per institution and branch	–	–	3,146	3,006
Institutions and branches per 100 km^2	–	–	0.10	0.10
Institutions and branches per 100 km^2 populated area	–	–	0.26	0.27
Number of ATM[2]) per 1,000 residents	–	–	1.04	1.15
Cards with cash function per resident	–	–	2.11	–
Cards with debit function per resident	–	–	1.17	–
Cards with credit function per resident	–	–	1.37	1.51
Foreign direct investment of the financial sector				
Inflows, as a percentage of total direct investment	38.1	8.5	4.6	2.4
Outflows, as a percentage of total direct investment	22.0	5.2	6.1	41.4
Inward stock, as a percentage of capital and reserves	–	–	–	–
Outward stock, as a percentage of balance sheet total	–	–	–	–

Source: BIS; EUROSTAT; OECD; UNCTAD; WIFO calculations. – 1) According to Basel I. – 2) Automatic teller machines with cash dispensing function with open access.

Table D.22: Structure and performance indicators of the banking sector for Japan

	1990	1995	2000	2001
	As a percentage of balance sheet total			
Assets (commercial banks)				
Cash and balance with Central bank	–	–	–	–
Interbank deposits	13.4	8.6	5.1	6.4
Loans	57.5	66.8	60.3	62.0
Securities	13.6	14.3	21.5	20.2
Other assets	15.5	10.2	13.1	11.4
Foreign assets	–	–	–	–
Liabilities (commercial banks)				
Capital and reserves	3.2	3.3	4.5	3.9
Borrowing from Central bank	0.5	0.1	0.1	0.0
Interbank deposits	–	–	–	–
Non-bank deposits	76.2	77.8	74.4	78.1
Bonds	0.7	1.0	0.6	0.4
Other liabilities	19.5	17.8	20.5	17.5
Foreign liabilities	–	–	–	–
Income statement (commercial banks)	As a percentage of gross income			
Interest income	536.1	272.9	160.1	214.2
Interest expenses	460.2	174.9	58.4	58.1
Fees and commissions receivable	–	14.7	18.8	28.8
Fees and commissions payable	–	5.4	6.5	10.5
Other non-interest income (net)	–	-7.3	-14.0	-74.4
Performance ratios (commercial banks)				
Cost-income ratio	0.68	0.67	0.73	1.07
Profit before tax as a percentage of balance sheet total	0.36	-0.17	-0.03	-0.67
Profit before tax as a percentage of equity	11.3	-5.0	-0.6	-17.7
Risk-based capital ratio [1])	–	9.2	11.6	11.0
Staff costs per employee (1,000 USD)	55.8	94.7	86.6	77.6
Profit before tax per employee (1,000 USD)	46.8	-31.0	-5.4	-121.2
Bank concentration	As a percentage of balance sheet total			
5 largest banks	42.0	38.4	40.5	39.0
Bank density				
Residents per institution	–	–	–	–
Residents per institution and branch	–	–	–	–
Institutions and branches per 100 km^2	–	–	–	–
Institutions and branches per 100 km^2 populated area	–	–	–	–
Number of ATM[2]) per 1,000 residents	–	–	0.92	0.92
Cards with cash function per resident	–	–	2.52	2.56
Cards with debit function per resident	–	–	–	–
Cards with credit function per resident	–	–	1.76	1.82
Foreign direct investment of the financial sector				
Inflows, as a percentage of total direct investment	3.9	27.1	32.9	30.3
Outflows, as a percentage of total direct investment	14.1	10.6	17.3	34.0
Inward stock, as a percentage of capital and reserves	–	–	–	–
Outward stock, as a percentage of balance sheet total	–	–	–	–

Source: BIS; EUROSTAT; OECD; UNCTAD; WIFO calculations. – 1) According to Basel I. – 2) Automatic teller machines with cash dispensing function with open access.

Table D.23: Structure and performance indicators of the banking sector for New Zealand

	1990	1995	2000	2001
	As a percentage of balance sheet total			
Assets				
Cash and balance with Central bank	0.4	0.5	1.1	0.9
Interbank deposits	12.2	8.6	2.8	3.5
Loans	63.3	77.2	72.5	75.4
Securities	19.4	9.7	9.5	9.2
Other assets	4.8	3.9	14.1	11.0
Foreign assets	*2.4*	*2.2*	*8.7*	*11.3*
Liabilities				
Capital and reserves	6.2	4.7	5.3	5.7
Borrowing from Central bank	–	–	–	–
Interbank deposits	–	–	–	–
Non-bank deposits	91.2	91.0	88.7	90.2
Bonds	–	–	–	–
Other liabilities	2.5	4.2	6.1	4.1
Foreign liabilities	*13.8*	*21.2*	*30.8*	*33.5*
Income statement	As a percentage of gross income			
Interest income	250.8	213.9	206.8	200.5
Interest expenses	187.2	150.3	144.5	137.2
Non-interest income (net)	36.4	36.4	37.8	36.7
Performance ratios				
Cost-income ratio	0.73	0.66	0.55	0.49
Profit before tax as a percentage of balance sheet total	0.78	1.51	1.44	1.57
Profit before tax as a percentage of equity	11.5	30.2	25.5	27.9
Risk-based capital ratio [1])	11.0	10.5	11.2	10.8
Staff costs per employee (1,000 USD)	–	–	–	–
Profit before tax per employee (1,000 USD)	–	–	–	0.1
Bank concentration	As a percentage of balance sheet total			
5 largest banks	–	–	–	–
Bank density				
Residents per institution	168,150	244,867	214,389	228,294
Residents per institution and branch	–	–	–	4,435
Institutions and branches per 100 km^2	–	–	–	0.32
Institutions and branches per 100 km^2 populated area	–	–	–	4.04
Number of ATM[2]) per 1,000 residents	–	–	–	–
Cards with cash function per resident	–	–	–	–
Cards with debit function per resident	–	–	–	–
Cards with credit function per resident	–	–	–	–
Foreign direct investment of the financial sector				
Inflows, as a percentage of total direct investment	–	–	–	–
Outflows, as a percentage of total direct investment	–	–	–	–
Inward stock, as a percentage of capital and reserves	–	–	–	–
Outward stock, as a percentage of balance sheet total	–	–	–	–

Source: BIS; EUROSTAT; OECD; UNCTAD; WIFO calculations. – 1) According to Basel I. – 2) Automatic teller machines with cash dispensing function with open access.

Table D.24: Structure and performance indicators of the banking sector for the USA

	1990	1995	2000	2001
	As a percentage of balance sheet total			
Assets (commercial banks and savings institutions)				
Cash and balance with Central bank	3.1	3.1	2.4	2.8
Interbank deposits	3.4	2.9	2.8	2.4
Loans	64.0	63.2	64.8	63.5
Securities	21.7	22.5	20.5	21.0
Other assets	7.9	8.3	9.4	10.3
Foreign assets	–	–	–	–
Liabilities (commercial banks and savings institutions)				
Capital and reserves	5.7	8.1	8.5	8.9
Borrowing from Central bank	0.0	0.0	0.0	0.0
Interbank deposits	3.0	1.5	1.7	1.8
Non-bank deposits	75.6	70.6	66.1	65.6
Bonds	0.6	0.9	1.2	1.3
Other liabilities	15.1	19.0	22.6	22.4
Foreign liabilities	–	–	–	–
Income statement (commercial banks and savings institutions)	As a percentage of gross income			
Interest income	215.3	133.1	126.8	113.8
Interest expenses	147.3	65.9	67.6	55.0
Fees and commissions receivable	3.7	1.7	1.4	16.0
Fees and commissions payable	0.0	0.0	0.0	0.0
Other non-interest income (net)	28.3	31.1	39.3	25.2
Performance ratios (commercial banks and savings institutions)				
Cost-income ratio	0.70	0.64	0.61	0.59
Profit before tax as a percentage of balance sheet total	0.67	1.62	1.72	1.71
Profit before tax as a percentage of equity	11.6	19.6	19.4	18.6
Risk-based capital ratio [1])	–	13.2	12.5	12.6
Staff costs per employee (1,000 USD)	–	41.9	52.7	54.5
Profit before tax per employee (1,000 USD)	–	47.5	63.3	65.7
Bank concentration	As a percentage of balance sheet total			
5 largest banks	13.2	15.8	28.2	23.4
Bank density				
Residents per institution	16,334	–	–	14,095
Residents per institution and branch	2,852	–	–	2,915
Institutions and branches per 100 km^2	0.89	–	–	1.00
Institutions and branches per 100 km^2 populated area	3.44	–	–	3.85
Number of ATM [2]) per 1,000 residents	–	–	0.97	1.13
Cards with cash function per resident	–	–	2.69	2.88
Cards with debit function per resident	–	–	0.83	0.89
Cards with credit function per resident	–	–	4.42	4.32
Foreign direct investment of the financial sector				
Inflows, as a percentage of total direct investment	5.4	25.0	18.1	18.0
Outflows, as a percentage of total direct investment	9.1	25.5	14.3	15.0
Inward stock, as a percentage of capital and reserves	–	–	–	–
Outward stock, as a percentage of balance sheet total	–	–	–	–

Source: BIS; EUROSTAT; OECD; UNCTAD; WIFO calculations. – 1) According to Basel I. – 2) Automatic teller machines with cash dispensing function with open access.

Table E.1: Data on chosen market delineation

	Home district	2 districts	3districts	4 to 10 districts	More than 10 districts	Total
	1996 as a percentage of total					
Bank sectors						
Joint stock banks and private banks	45.9	5.4	8.1	13.5	27.0	100.0
Savings banks	53.3	26.7	6.7	8.0	5.3	100.0
State mortgage banks	–	–	–	87.5	12.5	100.0
Raiffeisen credit cooperatives	86.6	11.9	1.0	0.3	0.1	100.0
Volksbank credit cooperatives	44.7	21.1	17.1	15.8	1.3	100.0
Building and loan associations	40.0	–	–	40.0	20.0	100.0
Special purpose banks	94.2	1.0	1.9	1.0	1.9	100.0
All banks	79.3	12.2	3.0	3.5	2.0	100.0
Aggregated economic regions						
Human capital intensive	70.9	11.9	4.7	7.7	4.9	100.0
Physical capital intensive	88.6	9.2	1.1	1.1	–	100.0
Rural	81.9	15.3	2.5	0.3	–	100.0
NUTS-I-regions						
Eastern Austria	72.8	14.0	5.6	3.4	4.2	100.0
Southern Austria	76.8	14.4	4.6	3.6	0.5	100.0
Western Austria	85.5	9.8	0.2	3.6	0.9	100.0
	2002 as a percentage of total					
Bank sectors						
Joint stock banks and private banks	46.7	10.0	3.3	13.3	26.7	100.0
Savings banks	50.0	25.8	11.3	8.1	4.8	100.0
State mortgage banks	–	–	–	75.0	25.0	100.0
Raiffeisen credit cooperatives	86.0	11.6	1.9	0.3	0.2	100.0
Volksbank credit cooperatives	40.3	22.4	11.9	23.9	1.5	100.0
Building and loan associations	20.0	20.0	–	20.0	40.0	100.0
Special purpose banks	88.5	5.7	3.4	2.3	–	100.0
All banks	77.5	12.8	3.5	4.2	2.0	100.0
Aggregated economic regions						
Human capital intensive	68.1	13.5	5.2	8.3	4.9	100.0
Physical capital intensive	88.7	8.8	1.3	1.3	–	100.0
Rural	79.7	15.4	3.4	1.5	–	100.0
NUTS-I-regions						
Eastern Austria	70.6	14.7	6.8	4.4	3.4	100.0
Southern Austria	76.6	14.1	3.8	4.9	0.5	100.0
Western Austria	83.2	10.7	0.8	3.7	1.6	100.0

Source: OeNB, WIFO computations.

Table E.2: Number of banks headquartered in districts with high, medium and low market concentration

	1996	2002	1996	2002	1996	2002
	High concentration[1])		Medium concentration[1])		Low concentration[1])	
Bank sectors						
Joint stock banks and private banks	0	2	10	6	28	22
Savings banks	6	7	34	38	35	18
State mortgage banks	0	0	4	4	4	4
Raiffeisen credit cooperatives	31	43	256	324	412	240
Volksbank credit cooperatives	3	4	29	36	44	28
Building and loan associations	0	0	2	1	3	4
Special purpose banks	1	3	28	21	77	67
All banks	41	59	363	430	603	383
Aggregated economic regions						
Human capital intensive	8	15	132	149	271	193
Physical capital intensive	0	2	73	106	201	137
Rural	33	42	158	175	131	53
NUTS-I-regions						
Eastern Austria	21	33	127	159	213	112
Southern Austria	20	22	92	105	82	58
Western Austria	0	4	144	166	308	213

Source: OeNB, WIFO computations. – 1) Hirschman-Herfindahl index, calculated from institutions and branches (HHIB); high concentration <0,2, low concentration >0,1.

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