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Efficiency and Profitability of European Banks – How Important Is Operational Efficiency?

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Abstract

Most previous research on efficiency in banking takes a regulatory perspective. In contrast, this paper investigates the empirical relation between efficiency and profitability in five large economies of the European Union during the period 1998-2005 and discusses the results from the perspective of corporate bank strategy. Methodologically the existing literature is expanded by the use of DEA super-efficiency values to regress profitability, the incorporation of risk by calculative costs of capital, and a model specification built on the modern understanding of banks as centers of value creation. The results of the conducted static and dynamic regression analyses show that profitable banks operate with higher technical efficiency than their competitors. Furthermore, the strategic environment and in this regard the structure and concentration of the national financial sector have a considerable impact on a bank's financial performance. Both issues proved to be statistically and economically significant. Thus, the results support the appropriateness of the generic strategy of cost leadership for the European banking market. Banks following this strategic position were able to achieve higher excess returns during the analyzed period.

Key words: Banks, Corporate Strategy, Efficiency, Operational Efficiency, Profitability

JEL classification: C14, G21, L25, M21

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Table of Symbols

$\beta_0, \ldots, \beta_m$	Coefficients to be estimated
β_{it}	Beta of the Capital Asset Pricing Model
θ_i	Efficiency of bank i (DEA calculation)
σ	Variance
e_i	Normally distributed error term
EFF1	Efficiency1 (DEA efficiency value; calculation including capital costs)
EFF2	Efficiency2 (DEA efficiency value; calculation excluding capital costs; production frontier based on all banks of the respective country)
EFF3	Efficiency3 (DEA efficiency value; calculation excluding capital costs; production frontier based on all banks of Euro5)
EXRET	Exchange Return, return of the stock market index of the respective country
GROWTH	Growth of the value creation capacity of the respective bank
HHI	Index of market concentration
i	Running index of the individual banks
IMR	Inverse Mills Ratio; intermediate step of Heckman Procedure; measure for selection
k	Running index of the different efficiency measures
λ	Vector of weights (DEA calculation)
MS	Market Share
N	Number
NIM	Net Interest Margin
RNOR	Real Net Output Ratio
OBS	Percentage of the Off-Balance-Sheet business
π_t	Net Return on Equity (excess return over capital costs) of period t
$\pi_{(t-1)}$	Net Return on Equity (excess return over capital costs) of previous period
PUB	Affiliation to the cooperative or savings banks sector; dummy variable
r_f	Ten-year average risk-free rate of return
r_m	Average stock market return
rho	Intermediate result of the Maximum-Likelihood-Heckman Procedure; measure for selection
R^2	R-squared

SIZE	Logarithm of the size variable Value Creation Capacity
SPEZ	Measure for horizontal specialization
t	Running index of individual years
$\mathbf{X_{2i}}$	Control variables for the national banking sector
$\mathbf{x_i}$	Input vector of bank i (DEA calculation)
$\mathbf{X}$	Input vector of all banks except bank i (DEA calculation)
$\mathbf{y_i}$	Output vector of bank i (DEA calculation)
$\mathbf{Y}$	Output vector of all banks except bank i (DEA calculation)

Table of Abbreviations

CapCo	Capital Costs (expected Return on Equity)
CIR	Cost Income Ratio
DE	Germany
DEA	Data Envelopment Analysis
DFA	Distribution Free Approach
DMU	Decision Making Unit
Euro5	Germany, France, UK, Italy, Spain
ES	Spain
FDH	Free Disposal Hull
FR	France
UK	United Kingdom
FGLS	Feasible Generalized Least Squares
HHI	Herfindahl-Hirschman Index
IT	Italy
IPO	Initial Public Offering
NRoE	Net Return on Equity (excess return over capital costs)
OLS	Ordinary Least Squares
OBS	Off-Balance-Sheet business
RNOR	Real Net Output Ratio
RoE	Return on Equity (before tax)
SCP	Structure Conduct Performance

SFA	Stochastic Frontier Analysis
TEUR	Thousand Euro
TFA	Thick Frontier Approach
x-efficiency	Technical efficiency

1. Introduction

The financial services sector in Europe has altered fundamentally in recent years. The change has been caused by the increasing weight of the capital markets in mediating offer and demand for capital (disintermediation), the enforced diffusion of IT in sales, development and processing of financial services, fierce competition in national markets as well as the rising globalization of the entire industry. The transformation of the banking sector will be accelerated by the current financial market crisis. Additionally, the regulatory environment has changed dramatically. This holds especially true for Europe. Economic and political target of the process of deregulation and harmonization is to intensify competition in a single and homogeneous European market for financial services (EU Commission 2005).

These developments lead to a profound change of bank business. Particularly large market players earn a considerable part of their total revenues with commission-based business which is not reflected in the balance sheet (Bikker 2004). Today's banks have practically very little in common with the traditional role as an intermediator between deposits and loans. The pivotal consequence of deregulation however has been to shift European bank managers' attention to issues of efficiency and cost control in order to prepare for the competition in a single European market (Gardener, Molyneux, and Moore 1998).

Surveys on the efficiency of banks can be found on both sides – the academic one and the business side as well. Regulatory and methodical issues still dominate the academic discussion and the empirical investigation of efficiency in banking and its relation to other parameters (Berger and Humphrey 1997). In the practical world many surveys compare national financial sectors or individual banks with each other based on rather simple ratios (e.g. Deutsche Bank Research 2004). Typically, profitability is represented by Return on Equity figures and the efficiency or productivity of a bank is represented by the Cost Income Ratio (CIR) which is incorrect as Burger and Moormann (2008) state.

Previous research on efficiency in banking mostly takes a regulatory perspective. In contrast, this paper investigates the empirical relation between efficiency and profitability in five large economies of the European Union ("Euro5": Germany, France, Great Britain, Italy, and Spain). The paper discusses the results from the perspective of corporate bank strategy.

The existing research in this field is expanded by this paper in several aspects: It is the first research in Europe to use efficiency values calculated by Data Envelopment Analysis (DEA) to regress profitability. Furthermore, values of the super-efficiency type of DEA were employed deliberately for this analysis to take account of the advantage efficient banks have gained over their competitors. In addition, the risks implied in the operative business model of an individual bank were incorporated in both the computation of its profitability and efficiency by the incorporation of calculative costs of capital. Finally, the entire specification of the regression model was based on the modern understanding of banks as centers of value creation thus taking into consideration the transition from traditional credit institutions to modern financial service providers.

The paper is organized as follows: Section 2 gives an overview on the existing literature on the issues of strategy, efficiency measurement, and performance analysis in banking. The third section describes the specification of the analytical model, whereas section 4 presents the methods and data which were applied. In section 5 we deliver and discuss the empirical results. The paper closes with a conclusion delivered in section 6.

2. Research on profitability, efficiency, and strategy in banking

2.1 Strategy in banking

Independently from the industry in focus there exist two basic approaches for the examination and evaluation of strategic options for a company. Whereas the market-based view pursuant to the tradition of Porter's ideas takes an outside-in perspective and puts industry and competitive analysis at the starting point of strategic thoughts (Porter 1980), the resource-based view inverts the order and begins with the analysis of the specific resources and competencies of the company (Hamel and Prahalad 1990). Empirical research for companies outside the financial sector has shown that 10-20% of the variance in profitability between different business units is explained by industry membership and 30-45% by stable company-specific effects (Gahan and Porter 1997). This means that industry characteristics such as measures of concentration might affect a bank's profitability. But, at the same time, its individual strategy to gain competitive advantages could also play a decisive role in achieving sustainable excess return above industry level.

According to the resource-based view, the existing resources and competences of a company constitute the basis of all strategic considerations. Resources and competences are also supposed to determinate a company's success largely (Grant 1991). Unfortunately, it is impossible to incorporate competences in terms of the resource-based view into regression analysis due to their individual character derived from the historic trajectory of a business. Additionally, this would be fruitless anyway as these competences are per definition not imitable and therefore inapt for generic strategic conclusions and recommendations. Yet their impact can be seen indirectly by the percentage of non-explained variance.

Porter's approach on the contrary starts with an analysis of the environment, the industry, and the competition (Porter 1980). Then a choice has to be made regarding the strategic positioning within the respective industry. Porter suggests two basic types of competitive edge: Cost leadership and differentiation. He also offers a second dimension of strategy in dependence from the scope of the market (industry-wide or with a focus on a certain niche market), thus adding up to three generic corporate strategies: specialization, cost leadership, and differentiation. This framework of three generic strategies can be transferred well into banking and can be observed in banks' current behavior (Canals 1993).

The *strategy of specialization* can be carried out in different ways: Universal banks traditionally offer the entire range of financial services for all potential groups of clients, whereas credit card companies, mortgage banks, consumer credit institutes or investment banks focus

on certain, well-defined target clients and/or product lines. Additionally, even in the context of globalization and European integration the issue of geographic specialization and clearly defined target markets remains pivotal for each player due to existing and persistent heterogeneity of national or even local consumer preferences (Canals 1993). Another dimension of specialization has received high attention by bank executives in recent years: Vertical specialization within the value chain. The active management of outsourcing options, such as payment transactions, securities settlement and so forth, has gained importance and has reduced the real net output ratio in the banking sector in many countries significantly (Weisser 2004).

The *strategy of differentiation* implies the attempt of a company to be perceived as unique in product characteristics relevant to the consumer and thereby realize higher prices. Differentiation in financial services can be obtained by creation of brand names or better service quality.

The third generic business strategy according to Porter is *cost leadership*: A company may attain excess returns through lower costs provided that it can charge the same prices as its competitors. Cost leadership may be achieved by means of economies of scale, economies of scope, experience curve effects, selective outsourcing of production processes, or the establishment of a company culture of cost control (Porter 1980). Previous research has found little evidence to optimize costs through economies of scale or scope (Berger and Humphrey 1994), even though these economies might exist in specific market segments like transaction banking. Therefore, technical efficiency[1] (x-efficiency) is seen as the decisive lever to achieve cost leadership in the financial services sector. Numerous investigations have found an average level of inefficiency of 20-25% in this field compared to less than 5% for economies of scale or scope (Berger and Humphrey 1997). Thus, x-efficiency appears to be the major distinctive feature for cost leadership in banking. The importance of cost leadership is predicted to rise in European banking because of deregulation measures taken by the European Community. Efficiency is expected to play a prominent role in the future European banking market as it is assumed that banks will compete increasingly via lower prices and cross-subsidization of products will be a practice of the past (Gardener, Molyneux, and Moore 1998).

Besides the application of general theories of corporate strategy there exist a number of considerations dedicated to the financial services sector which account for the characteristics of this industry.

Absolute size, for example, measured as total assets, has been a common strategic objective for most banks. The rationale of this mindset is that in addition to general potential advantages of size like economies of scale, experience curve effects or mere market power size may render other benefits in banking. The theory of „too big to fail"-guarantees, for instance, assumes that governments will accept the role of lender of last resort and support a bank in a crisis in case that its insolvency might bear systemic risks on the entire economy because of

[1] Technical efficiency of a company is characterized by the relationship between observed production and the best production possible. The latter is also called efficient production frontier. If a company´s current production point lies on the frontier it is perfectly efficient. Technical efficiency does not relate to technology only but to all operational processes, i.e. including sales, product development, and transaction processes as well.

its sheer size (Walter 2002). The actual financial market crisis confirms this theory in virtually all countries. These implicit guarantees represent indirect subsidies by the government by means of lower funding costs. Furthermore, size is supposed to facilitate risk diversification within a larger loan portfolio and to stabilize revenues through diversification between different types of business such as retail banking and investment banking. On the other hand, large players might suffer from negative economies of scale due to increasing organizational complexity and disproportionate overhead growth (Walter 2002).

Both academics and practitioners have frequently highlighted the benefits of expanding into commission-based business and its risk-reducing impact (Walter 2002). Yet this approach was sharply questioned by investigations of DeYoung and Rice (2004b, 2004c). Another strategic issue of particular attention in banking is the question whether high domestic market shares are indispensable for a bank to become a successful player on the international level. The creation of so-called national champions has been discussed by European politicians in order to provide the export industry with a reliable partner for financial services. But this political claim underlies the assumption that market power related to high market shares is a reliable fundament of successful strategies in banking.

2.2 Previous research using regression analysis in banking

The financial industry stands in the focus of numerous investigations due to its economic relevance. This chapter only provides a short summary of those surveys which are closely related to this paper. Firstly, the hitherto existing application of DEA efficiency values for regression analysis in banking is described. Secondly, the results of selected empiric investigations focusing on the explanation of success in banking – in terms of profitability –are presented.

DEA values can be used in regression analysis as dependent variable. This is done to adjust efficiency values for external factors using the so-called two-step approach (Coelli et al. 2005). Casu and Molyneux (2003) used this method to explain efficiency differences in European banking and found national market characteristics to be the crucial factor. Casu and Girardone (2006) made use of average DEA efficiency values as independent variable to explicate the competitive intensity of European banking markets. Eisenbeis, Ferrier, and Kwan (1999) investigated the relation between efficiency and other bank performance indicators and find out that parametric efficiency measures show higher information content. In contrast, Beccalli, Casu, and Girardone (2006) provided evidence for a positive relationship between the development of the stock price and efficiency measures for European banks with DEA values having more explanatory power than parametric approaches. The same positive correlation between share price development and DEA efficiencies was found for Australian banks by Kirkwood and Nahm (2006) using a multivariate model. Especially those last two surveys suggest the positive impact of high efficiency on a bank's success.

Empirical research into explanatory factors of banks' financial performance as much as efficiency measurement in banking was and still is predominated by an economic point of view. Numerous studies were performed to decide between the efficient structure hypothesis and the

Structure Conduct Performance (SCP) paradigm. While the first suggests that high profitability, high market share, and high market concentration are results of high efficiency, the latter attributes high profitability to anticompetitive collusion among market participants (traditional SCP) or to the abuse of market power of large individual players (relative market power hypothesis). Traditionally, theses hypotheses were tested without any direct efficiency measure (Molyneux and Forbes 1995). This approach was improved in more modern research. Maudos (1998) and Berger (1995) identified a positive impact of both market share and parametric x-efficiency measures (Stochastic Frontier Analysis, SFA) on the profitability of respective Spanish US banks. But Berger himself points at the low economic significance of his results (Berger 1995). In contrast, in an investigation conducted by Papadopoulos (2004) neither x-efficiency measured with SFA nor market share turned out to be statistically significant. Goddard, Molyneux, and Wilson (2004b) included growth and persistence effects into their regression model and detected for European banks a stronger importance of industry parameters than for SFA efficiency measures. Vennet (2002) discovered that universal banks outperform their competitors and that efficiency (however, measured as CIR) is the most decisive parameter for success in European banking. Regarding the steadily increasing weight of commission-based income Goddard, Molyneux, and Wilson (2004a) could not verify any clear relation between a higher share of off-balance-sheet business and profitability for European banks. DeYoung and Rice (2004a) using US data even find a significant negative correlation with risk-adjusted earnings.

To summarize one can say that aspects of corporate strategy have rather been disregarded in previous research of this kind so far. Furthermore, the relevance of efficiency for a bank's success is contestable according to the empirical results.

3. Development of the empirical model

3.1 Specification of the model

In contrast to existing explanatory models the one used for this research focuses clearly on issues of business administration and bank strategy. The research question is which bank strategies would prove to be viable and profitable in retrospective throughout Europe between 1998 and 2005. The results can help bank executives to assess the strategic situation of the European banking market and to avoid substantial strategic failures. Object of the investigation are bank holdings, commercial banks, savings and co-operative banks as far as they are listed at a stock exchange in the Euro5 zone. The following regression analyses are estimated both statically for individual years as well as dynamically for the panel comprising the entire period.

The static regression is based on the following model (A):

$$\pi_{it} = \beta_{0t} + \beta_{1t}\, EFF_{kit} + \beta_{2t}\, SIZE_{it} + \beta_{3t}\, MS_{it} + \beta_{4t}\, SPEZ_{it} + \beta_{5t}\, RNOR_{it} + \beta_{6t}\, OBS_{it} + \beta'_{7t}\, PUB_i + \boldsymbol{\beta}'_{8t}\, \mathbf{X_{2}}_{it} + e_{it}$$

The variables are:

π_{it} = Net return on Equity (excess return over capital costs) of period t

$EFFk_{it}$ = x-efficiency based on DEA-calculation

$SIZE_{it}$ = logarithm of the size variable value creation capacity

MS_{it} = market share

$SPEZ_{it}$ = Measure for horizontal specialization

$RNOR_{it}$ = real net output ratio

OBS_{it} = share of off-balance-sheet business

PUB_{1i} = dummy variable for savings banks / co-operative banks

$\mathbf{X_{2}}_{it}$ = control variables for the national market of bank i

$\beta_0, \ldots, \beta_m$ = coefficients to be estimated

e_{it} = normally distributed error term

For the dynamic model (B) based on the panel data a slightly different specification was used:

$$\pi_{it} = \beta_0 + \beta_1 EFF_{kit} + \beta_2 SIZE_{it} + \beta_3 MS_{it} + \beta_4 SPEZ_{it} + \beta_5 RNOR_{it} + \beta_6 OBS_{it} + \beta_7 \pi_{it-1} + \beta_8 Growth_{it} + \boldsymbol{\beta}'_9 \mathbf{X_{2}}_{it} + e_{it}$$

The additional dynamic variables are:

π_{it-1} = Net return on Equity (excess return over capital costs) of previous period

$Growth_{it}$ = Growth of bank i in percentage

The subsequent subsections describe each variable and discuss its advantages and disadvantages. Furthermore, the relation of the variables to the strategic theories presented in chapter 2 is explained. A summary of the variables is given in Table 1.

Table 1: Variables of the empirical model

Variable	Calculation	Strategic Interpretation
π (NRoE)	NRoE = RoE - CapCosts	Excess return above expected equity return, performance indicator
EFF1 (incl. costs of capital)	DEA-results, incl. CapCosts as input	Generic strategy of cost leadership, banking as commodity
EFF2 (national production frontier)	DEA-results, national banking sector, excl. CapCosts	
EFF3 (European production frontier)	DEA-results, European banking sector, excl. CapCosts	
SIZE (TEUR), logarithmized	Personnel costs + capital costs	SIZE as strategic target due to economies of scale, "Too-big-to-fail"
MS (Market Share)	weighted market share of 4 business segments	Market power as value driver, "National Champions"
SPEZ	Standard deviation of share of each business segment of total revenues	Generic strategy of horizontal specialization
RNOR	(personnel + capital costs)/(personnel costs + cap. costs + other op. costs)	Vertical specialization within the value chain, outsourcing
OBS	Income from OBS business/total revenues	Expansion into commission-based business
PUB	X=1, if cooperative or savings bank	Systematic profitability disadvantage?
HHI	Herfindahl-Hirschman Index, weighted by business segments	Opportunity for collusion, importance of market structure
NIM (Net Interest Margin)	NIM of "home market"	Importance of interest-based business, market-based view
RETEX (stock index return)	Yearly return of respective national stock index	Importance of stock exchange development, market-based view
GROWTH	Capacity growth (compare SIZE) vs. previous year	Trade-off growth vs. profitability
% NPL	NPL / gross credit volume	Auxiliary variable for selection control
Trading income / OBS	Trading income / OBS	Auxiliary variable for selection control
Risk provision / Gross credit volume	Risk provision / Gross credit volume	Auxiliary variable for selection control

3.2 Performance Indicator

Since the 1990ies European Banks have redirected their strategies towards objectives of income growth and profitability whereas pure revenue growth and size on its own sake have become less important (Gardener, Molyneux, and Moore 1998). Especially banks listed at stock exchanges have to act according to market rules and therefore pay more attention to shareholder value concepts.

A traditional performance indicator from financial analysis is Return on Equity (Hempel and Simonson 1999). But a severe disadvantage of this indicator is its disregard of the risks related to the return. According to modern capital market theory a rate of return has to be adjusted by the risks taken to facilitate comparison among different investment options of an investor (Paul, Horsch, and Stein 2005).

Derived from capital market theory the rate of return of the respective (bank) share on the stock exchange is often used as a performance indicator. The advantage of the stock yield compared to ratios from financial analysis like Return on Equity (RoE) is the insertion of both present information and the expectations of the market participants regarding the future development and potential risks of a particular bank in the stock price (Brealey, Stewart, and Myers 2003). The downside of this measure is that the management can only indirectly affect market expectations whereas its control and influence on the rate of return shown in the annual report is higher.

The concept and calculation of efficiency in its current form is only a snap-shot of the present operating processes of a company without information about the future. Therefore, Net Return on Equity before tax[2] (NRoE) was selected as a performance indicator for this study.[3] Thus, the assessment of the capital market regarding potential risks implied in a bank's business strategy is taken into account adequately, whereas fluctuations in market participants' expectations concerning the development of stocks in general are evaded.[4]

$$\pi_{it} = RoE_{it} - CapCo_{it}$$

$$CapCo_{it} = r_f + \beta_{it} (r_m - r_f)$$

The variables are:

$NRoE_{it}$ = Net Return on Equity of bank i in period t

RoE_{it} = Return on Equity (before tax)

$CapCo_{it}$ = Capital Costs (expected Return on Equity)

[2] Return before tax was chosen to facilitate comparison among banks of different countries and therefore different tax systems of Euro5.

[3] This concept is related to Net Return on Investment (Brealey, Stewart, and Myers 2003).

[4] This seems justified as heavy fluctuations of stock prices were observed at European stock exchanges during the observation period due to external effects (Internet hype, financial market crisis).

r_f = ten-year average risk-free rate of return[5]

r_m = ten-year average capital market rate of return

β_{it} = beta of bank i in period t according to the Capital Asset Pricing Model[6]

3.3 Efficiency index

The concept of efficiency describes whether a company utilizes the existing technology and market conditions (input and output prices) optimally in its production process. Thus, it is the comparison of actual usage of resources and the observed optimum in the industry (Farrell 1957). One has to distinguish between the optimal usage of technology and input factors (technical efficiency or x-efficiency), the optimal mix of inputs and outputs (allocative efficiency) and the utilization of the optimal scale (scale efficiency) (Coelli et al. 2005). As x-efficiency is the pivotal lever in banking to gain competitive advantage, in our model x-efficiency measures were calculated to serve as an indicator for the pursuance of a corporate strategy of cost control and efficiency. A statistically significant β_1 would therefore support the assumption that cost leadership according to Porter is a sustainable strategy in European banking and furthermore would – at least – not disprove the statement of Gardener, Molyneux, and Moore (1998) regarding the growing importance of efficiency in the context of an increasingly deregulated European banking sector (which is the case in spite of the financial market crisis). A statistically not significant β_1 would reject the theory of an increasing importance of efficiency in banking as many deregulation policies have been initiated before the observation period.

For calculating the x-efficiency values the super-efficiency method of DEA was used (see section 4). Another important issue is choosing the data. Here, it is common practice for researchers to resort to accounting data to define inputs and outputs for efficiency measurement simply because there are no other consistent data publicly available for comparisons between banks. Beside the correct choice of the method for estimating efficiency and the data to be used is the adequate specification of inputs and outputs which is described in the following.

The specification of inputs and outputs of the model is based on the understanding of a bank as a modern financial service provider which creates added value. Table 2 exhibits the inputs and outputs used in the model.

[5] The average values of the years 1996-2005 for market return and risk-free interest rate are used to avoid extreme fluctuations in capital costs because of events which are not related to the specific bank.

[6] Beta of bank i is defined as the covariance of bank i's stock return and the market return divided by the market return variance (σ_{im}/σ_m).

Table 2: Inputs and outputs of the efficiency index

Inputs	Outputs
Personnel Costs	Total Credit Volume lent to non-banks
Other Operating Costs[7]	Total Other Interest-bearing Assets by non-banks[9]
Costs of Equity Capital[8]	Total Deposit Volume owed to non-banks
	Total Non-interest Operating Revenues

As a basic principle we preferred stock measures – if possible – over flow variables (e.g. interest income). Thereby proportionality between performed service and stock of e.g. credit volume is assumed (Berger and Mester 1997), but the price components resulting from market power included in the latter can be avoided (Adenso-Díaz and Gascón 1997). Therefore, total credit volume and total other interest-bearing assets were applied to measure a bank's lending business.[10] Regarding liabilities total deposit volume was accounted for as an output, following the argumentation of the value-added approach (Berger and Humphrey 1992) which emphasizes the high added value of deposits for a bank's clients.[11] Due to its high and increasing share of operating revenues also off-balance-sheet business (OBS) has to be included into the list of outputs. Following Clark and Siems (2002) non-interest-based operating revenues is used as an estimator for OBS. Nevertheless one should keep in mind, that in contrast to stock variables as deposit volume the information drawn from this flow variable might be distorted by price effects.

As other figures concerning inputs are missing, researches rely on aggregated flow variables. This seems to be the standard in calculating bank efficiency. Other European studies make use of even more aggregated figures. For example, Casu and Girardone (2006) use total costs as the only input variable in their DEA model. The impact of purchasing market power distorting input variables for efficiency calculation seems less relevant for personnel costs given industry-wide collective labor agreements, yet could be more significant for other operating

[7] Other operating costs comprise fees and commission paid, administration expenses and other operating expenses.

[8] Cost of equity capital is calculated by multiplying equity book value with the rate of costs of equity from the CAPM model of bank i in period t and is used for calculating EFF_1.

[9] This position consists mainly of corporate bonds and equity held by the bank as well as assets held for trading purposes.

[10] Both investments in virtually risk-free public bonds as well as loans and deposits on the interbank market were disregarded in calculating efficiency to ensure a higher homogeneity of the aggregate figures among the banks in the data set as those commercial operations render only little added value per nominal volume.

[11] Furthermore, banks launch marketing campaigns and qualify and allocate staff in order to increase and maintain customer deposits. For most cooperative and savings banks their customers' deposits represent the very core of their current business model. Additionally, one can check the impact on efficiency measures of a bank's strategic decision to substitute interest expenses by personnel expenses through refunding via customer deposits. Defining deposits as an input according to the intermediation approach, this strategic decision would decrease the DEA efficiency measure whereby showing the disadvantages of the intermediation approach.

costs which include e.g. charges for the use of external data processing capacities. Particularly the input figure of personnel costs might however be distorted when comparing banks from different countries because differences in wage levels between the respective countries are incorporated in the calculated efficiency measures (Burger and Moormann 2008). Especially Spanish banks in the panel could turn up to be more efficient because due to lower labor cost per hour in comparison to countries like Germany a higher usage of the input factor labor could lead to equal or lower total personnel costs.

Costs of equity capital are defined as another input. On the one hand they serve as an estimator of the efficient use of proprietary capital which is an important resource from both an economic view and a perspective of bank supervision. On the other hand they imply a bank's beta as an indicator for its total risk level related to its outputs. In doing so costs of equity capital is a better correction factor for operative risks taken by a bank than the commonly used indicators only concerning the quality of its loan portfolio because all risks perceived by the capital market are included in their calculation. In contrast to Clark (1996) cost of equity capital were computed using equity according to accounting standards and long-term averages of capital market rate of return. One reason was to avoid negative capital costs in the years 2000-2002. Furthermore, it seems more convincing to use a measure for costs of equity capital which decision makers are actually able to control.

For calculation of DEA efficiency values using data for all banks operating in the respective country (EFF2) or all banks operating in Euro5 (EFF3) only personnel costs and other operating costs could be included as inputs.[12]

3.4 Other Variables

3.4.1 Company specific variables

The existing literature continues to measure a bank's size and market share by the insufficient indicator of total assets. But this approach ignores all off-balance sheet business, the type of on-balance sheet positions and the creation of value related to them. Therefore, in this investigation a bank's absolute size is measured by its capacity to create value for its clients. This is estimated by the sum of personnel costs and costs of equity representing the basic production factors labour and capital. Added value itself is not used to estimate size as it is by definition (personnel costs + operating profit) automatically correlated with a bank's financial performance.

The size of a bank might have a positive effect on the net return on equity because of economies of scale, economies of scope, or too-big-to-fail guarantees. Furthermore, size could facilitate risk diversification within the bank or enable large investments in information technology.

[12] For these calculations the efficient production frontier is defined by all banks – not only those listed on the stock exchange - within the categories commercial bank, savings bank, cooperative bank or bank holding of the Bankscope database which contains all required variables in the respective period.

A bank's market share is calculated as the weighted average of its market share[13] in the product segments of deposits, loans, other interest-bearing assets, and off-balance-sheet business. These segments are also the four defined outputs in efficiency measurement –,taking into account that banks usually have different stakes in different market segments. Off- vs. on-balance-sheet business is weighted by gross income, whereas for on-balance-sheet business volume is used for weighting. A high positive impact of the market share variable would make it desirable for bank managers to actively consolidate national banking markets in order to use market power in pricing and economies of density (Hensel 2006). The latter refers to the opportunity to improve branch network utilization through higher market share. Furthermore, this would support the imperative to create national champions.

The banks in the dataset are typically operating in various business areas, nevertheless some players concentrate on specific products or clients. A bank's degree of specialization was roughly approximated by the standard deviation of the share of the four product segments of its entire value creation. Unfortunately, specialization in local markets or specific products could not be reproduced by the given data. Horizontal focus on a specific market segment for financial services corresponds to Porter's generic strategy of specialization. The phenomenon of outsourcing which equates to a vertical specialization within the value chain has been neglected by researchers so far in this kind of analyses. To control for outsourcing the real net output ratio is used. It is calculated on the basis of value creating capacities (personnel and equity costs divided by total operating costs including equity costs) in order to avoid distortions due to capacity utilization. Provided that the investigated banks are relatively homogeneous in their business model, this variable shows whether the advantages of outsourcing like higher flexibility, concentration on core competences outbalance its disadvantages like higher dependency on suppliers or higher costs of coordination. Conclusions on single bank processes such as transaction settlement and clearing cannot be drawn. Another constraint is that differences in the real net output ratio could not only be due to outsourcing decisions but also be caused by differences in a bank's general business model (e.g., wholesale vs. retail banking).

Another relevant decision for banks is how aggressively they should expand into commission-based OBS business, which in the context of disintermediation becomes more and more important. As variable to control for OBS business commission-based income divided by total income was chosen. The use of assets as divisor like in other studies (DeYoung and Rice 2004a) does not seem to be appropriate because commission-based income from e.g. sales of insurance products or funds can be generated independently from on-balance-sheet business.

Finally, the affiliation of the banks in the dataset to categories such as cooperative banks, savings banks, privately owned commercial banks et cetera is represented by a dummy variable. A significant negative coefficient would indicate systematically lower rates of return of savings and cooperative banks because of their potentially higher orientation on general wel-

[13] Due to the use of consolidated data to avoid double-counting, each national market is defined as the sum of all banks based in the respective country including its national and international subsidiaries. This is not exactly identical to geographical borders and unfortunately does not take account of non-bank competitors either.

fare.[14]

3.4.2 Industry variables

The sector specific variables display the impact of the market conditions on a bank's profitability. To obtain an indicator for the respective industry structure in which an individual bank operates the Herfindahl-Hirschman index (HHI)[15] was computed for the corresponding national market in the four output categories (deposits, loans, other interest-bearing assets, and off-balance-sheet business). Then a weighted average HHI for each bank was constructed analogous to the market share variable described above. The HHI as an index of market concentration might show the opportunity to earn excess rates of return via collusion. Other parameters used to describe the competitive environment of a bank's domestic market are the net interest margin to show the conditions of interest-based business and the yearly rate of return of the national stock exchange index to capture the environment for commission-based income. The first variable represents the dependency of bank performance on the competitive fierceness of the respective domestic loan and deposit market. The latter tracks the development of the national stock exchange and thus the commonly related opportunities for commission-based business in brokerage, investment banking, and sales of funds. Theoretically, a high impact of the market parameters on financial performance would fit into Porter's framework and the attention it pays to industry analysis. It would therefore support the market-based view against the resource-based approach. On the other hand these variables show whether claims of banking associations for higher market consolidation are meaningful from a business point of view. The HHI could further be interpreted according to the classic Structure Conduct Performance paradigm.

3.4.3 Dynamic Variables

In the dynamic regression using panel data also dynamic variables can be included. A high persistence of the net return on equity of the previous year could be interpreted as a sign of high entry barriers into national banking markets, whereas the influence of growth on risk-adjusted return could support or refute a potential trade-off between profitability and growth.

4. Methodology and Data

4.1 Data Envelopment Analysis

Modern efficiency measurement methods avoid the problem to define optimal weights implied by traditional efficiency measurement in order to aggregate partial productivity measures. They allow the construction of a production function based on empirically observable

[14] As this dummy variable does not change in time, the influence of a bank's ownership type was not part of the panel analysis.

[15] HHI is calculated as the sum of the squared market participations of all players in the market: $HHI = \sum MS^2$.

input-output combinations of individual Decision Making Units (DMUs). Then, the distance of inefficient units to the optimal border of the production function in a multi-dimensional space can be measured. Two types of efficiency measurement currently used by researchers can be distinguished: the parametric and the non-parametric approach. Parametric efficiency measurement rests upon estimating the production function by stochastic regression analyses while non-parametric measurement is based on mathematical optimization techniques (see Berger and Humphrey (1997) for a detailed review of the various techniques). Within non-parametric methods the Data Envelopment Analysis (DEA), first used by Rhodes (1978), is dominating (Berger and Humphrey 1997).

The choice of the method of efficiency measurement may have a significant impact on the calculated efficiencies. Various investigations, e.g. Eisenbeis, Ferrier, and Kwan (1999) or Cummins and Zi (1997), have shown serious differences between measurement methods especially when ranking DMUs according to their resulting efficiency. Both parametric and non-parametric methods have their downsides: Non-parametric measurement has the advantage not to impose a virtual production function on the data, but does not allow for neither hazard nor measurement errors defining any deviation from the production frontier as inefficiency (Porembski 2003). Thus, there is no "best" efficiency measurement method, a fact that has to be considered when using or interpreting efficiency values (Berger and Humphrey 1997).

This investigation uses DEA to compute efficiency because it is more flexible, needs less assumptions and – in contrast to parametric approaches – delivers reliable results also with comparatively small datasets. To keep the specification of the efficiency measures as close as possible to management practice the applied DEA model implies variable economies of scale (Banker, Charnes, and Cooper 1984) and input-orientation. The supposition of variable economies of scale assumes that not all banks operate at optimal scale (Casu and Molyneux 2003) as e.g. bank managers might adjust their bank's scale only with limited speed to the optimum due to restricted funding opportunities. This assumption seems realistic and is common practice in bank research (Casu and Girardone 2006). Thus, pure technical efficiency measures are calculated as both economies of scale and inefficiencies in input and output prices are not considered. The approach of input-orientation assumes that bank executives have more opportunities to optimize production inputs and concentrate more on cost management, which seems to be realistic. This approach is used by most researchers. A change to output-orientation would, in addition, cause no change in the identification of efficient banks (Coelli et al. 2005).

DEA measures were calculated using the DEA super-efficiency variant.[16] This method developed by Andersen and Petersen (1993) is equal to standard DEA with the exception that for the calculation of the efficient production frontier for each DMU the DMU itself is disregarded. This does not change the measures of inefficient units, but efficient ones can achieve efficiency values above 100%. Thus, measurement errors can be identified. Moreover, it is possible to differentiate among efficient DMUs by means of the competitive edge against

[16] For the calculation itself the program "ems 1.3" by Holger Scheel, Operations Research, University of Dortmund, was used.

their relevant benchmarking partners. In some cases though, the exclusion of the DMU might render the linear system of equations insolvable (Lovell and Rouse 2003). This applies to those banks in the sample which are the largest regarding at least one output category (deposits, loans, other interest-bearing assets, and off-balance-sheet business).

Other critical issues in computing DEA efficiency values are the size of the dataset and the identification of outliers. DEA values have a systemic error upwards in estimating efficiency as long as the sample data does not comprise the entire population. The reason for this is that each efficient bank additionally included into the dataset possibly deteriorates the values of previously inefficient banks. Yet this error is difficult to correct and therefore neglected in the further analysis. As DEA figures react very sensitive on outliers, the decision from which super-efficiency value upwards measurement error is assumed is also important. Given the comparatively small dataset super-efficiencies of up to 250% were allowed in our analysis. But a reduction of the maximum level allowed to 200% did not change the results substantially either.

4.2 Regression Analysis

The cross-sectional model (A) and the dynamic model (B) introduced in section 3 were applied on the data with means of different types of regression techniques in order to calculate the coefficients.[17]

In a first step, the cross-sectional regression was performed, calculating different coefficients for each year. To avoid systematic errors due to the issue of selection the Heckman two-step procedure (Heckman 1976) was used in different versions: (a) in combination with white standard errors (robust standard errors), (b) with the Feasible Generalized Least Squares method (FGLS), and (c) with the maximum-likelihood variant of the Heckman procedure. Additional exogenous variables to explain selection (i.e., the probability to be listed on the stock exchange and therefore to appear in the panel) were the quality of the credit portfolio measured as the percentage of non-performing loans and the share of loan loss provision as part of the credit portfolio as well as the percentage of trading as part of non-interest based income. These variables represent credit risk and market risk as major reasons for bank crises.[18]

The second part of the analysis is the dynamic panel data regression. As the thesis of unbiasedness of the random effects method had to be rejected using the Hausman test as well as to facilitate the inclusion of lagged profitability the panel regression analysis was executed by means of the first differences method. For this method the variables had to be transformed

[17] Regression analysis was performed using the program Stata/SE 8.0.

[18] Some of the explanatory variables (EFF1, SIZE, RNOR) had to be excluded in the first step of the Heckman procedure as they include equity costs and therefore they are affected by the same selection problem as NRoE. As large companies are more likely to be listed, personnel costs were included in the first step as size indicator. Thus, all banks without listing (N=3481) could be used for this part of the procedure, too.

into their annual deltas.[19] Therefore, also the interpretation has to alter, e.g. a bank's logarithmic size becomes its percental growth rate. To avoid systematic errors due to the issue of selection the Heckman two-step procedure was used also for the dynamic regression. As common standard error techniques do not deliver valid standard errors to calculate confidence intervals, the whole dynamic regression procedure was bootstrapped to obtain correct standard errors.

4.3 Data

The dataset comprises data of 103 banks based in the Euro5 which were listed on stock exchanges at least one year during the observation period of 1998-2005. Thus, the dataset constitutes an unbalanced panel taking account of mergers, acquisitions, and initial public offerings. The principal regression model including capital costs (EFF1) comprises on average 61 banks per year starting with 48 banks in 1998 and closing with 66 in 2005 (Tab. Blank 3). Only for 21 banks all required data existed for the entire observation period. Reasons for the staggering data are bankruptcies, IPOs, mergers or temporarily low trading volumes which did not allow for reliable betas.

Table 3: Sample Size

Sample Size N							thereof
	DE	ES	FR	UK	IT	Euro5	savings/cooperative banks
1998	2	10	7	7	22	48	7
1999	2	9	14	7	26	58	15
2000	4	9	14	7	27	61	12
2001	4	8	15	8	27	62	17
2002	3	9	18	7	26	63	17
2003	6	9	18	8	25	66	19
2004	7	9	18	7	23	64	20
2005	10	9	12	8	27	66	18

* The increase in the number of German banks is principally due to IPOs of various small banks.

Financial reporting data were drawn from the Bankscope database (Bureau van Dijk) which already harmonizes and standardizes the data. In order to make accounting data matchable to the corresponding stock price information, avoid double count or division of single economic units consolidated financial reporting data were employed. This inherently does not define the banking market of country X by its geographical borders but as the sum of all banks with headquarters in X including their national and international subsidiaries. However, as large pan-European mergers did not occur until recently, the differences should not be substantial (Bikker and Haaf 2000).

Furthermore, the dataset for both calculating efficiency measures and regression analysis was restricted to the Bankscope categories "commercial banks", "bank holding & holding socie-

[19] As instrument for the change in NRoE in t-1 the NRoE of t-2 was used. This approach sacrifices two years of data but renders unbiased estimates.

ties", "savings banks" and "cooperative banks". This was meant to guarantee a certain level of homogeneity in regard to the business models and process structures of the investigated banks. National banking markets for calculation of market participation were defined as all business units in the mentioned categories in the respective country and year. This leads to an unbalanced panel of 3,481 banks. Due to foreign activities these banks account for higher credit and deposit volumes to non-banks than the aggregated sector balances of the respective national central banks. Stock price, stock index, and interest rate data were gathered from Datastream.

5. Results and Discussion

5.1 Descriptive Statistics

During the observed period national banking markets especially in France and Spain have been consolidated in an environment of volatile stock markets and narrowing interest margins (Table 4). While Germany and Italy still featured a comparatively low concentration in 2005, the UK and France had arrived at a degree of concentration which was at the limit of competition regulation requirements (Table 5).[20]

The statistical characteristics of the variables used for the years 1998-2005 are shown in the appendix (Tables 4 to 8).

For the analysis of the further variables it is important to consider that the mean values shown in Tables 6, 7, and 8 represent the „typical" bank listed at the stock exchange of each respective country in the corresponding year. This mean is therefore neither a size-weighted average of the sample nor representative for each national financial sector.[21] Nevertheless, some trends can be observed. The share of off-balance-sheet business has grown throughout Europe since 1998. In 2005 more than half of total gross income resulted from OBS activities. Thus, the classic intermediation approach seems obsolete, though the high percentage of OBS business could be partially explained by historically low interest margins. The net real output ratio showed a general level of about 60% with decreasing tendency in all countries of the Euro5 except for Spain (Table 6). This confutes popular theories of ratios above 80% in banking (Burchard 1997) and might reflect a heightened eagerness towards outsourcing in European banking or an enforced focus on standardized services.

To compare computed x-efficiencies with other investigations the median of the entire sample should be chosen because "normal" DEA restricts efficiency to a maximum of 100%. As expected the values of EFF1 (Figure 1) are rather high because of the small sample size of 61 banks on average. But the use of the super-efficiency method still guarantees sufficient variance in efficiency values. The results of EFF2 (Figure 2) are also relatively high whereas the

[20] In the USA mergers which result in a HHI > 0,18 violate competition regulation principles (Cetorelli 1999).

[21] Especially the small sample of German banks is affected by special effects. Various IPOs of small banks influenced the values during the Internet bubble and in 2001/2002 large German banks suffered from exceptional write-offs which affect their NRoE.

median of EFF3 (Figure 3) showing values between 0.49 and 0.74 is strictly in line with previous research predicting a median of about 0.65 (Casu and Girardone 2004; Casu and Molyneux 2003). The average efficiency remains remarkably stable during the observed period. Only the values of EFF3 which do not include costs of capital show increased technical inefficiencies for listed banks during the years of bear market, which could be the result of increased restructuring efforts during those years. The statistical characteristics of EFF1, EFF2, and EFF3 for the years 1998-2005 are delivered in Table 8 (appendix).

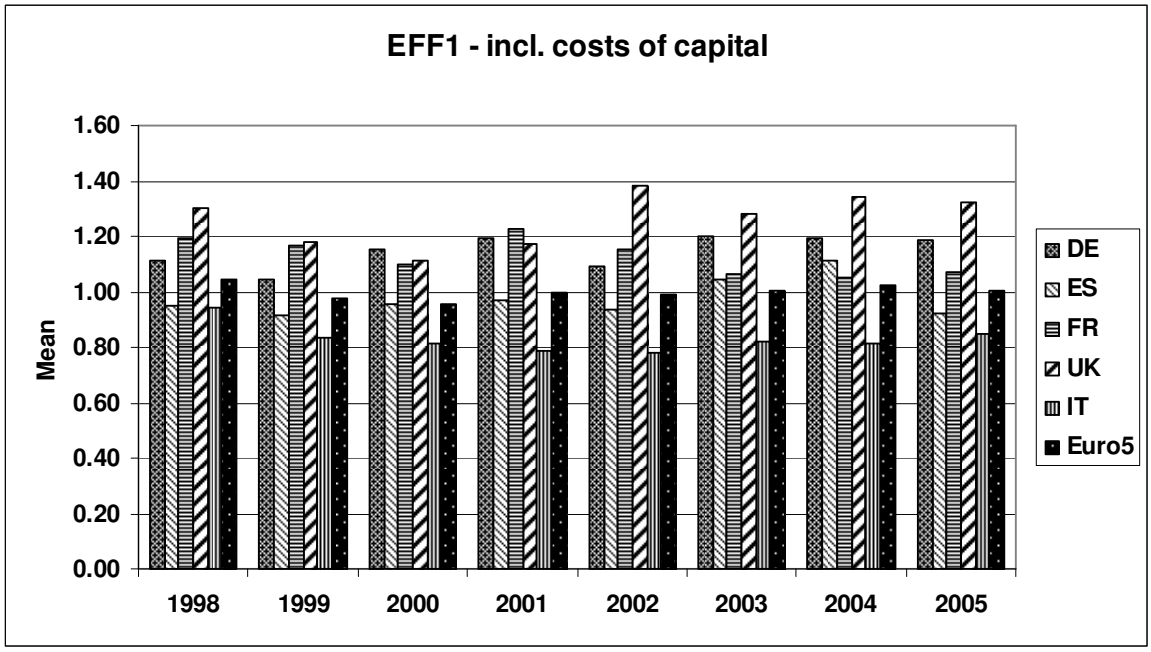

Figure 1: Efficiency index including costs of capital (EFF1)

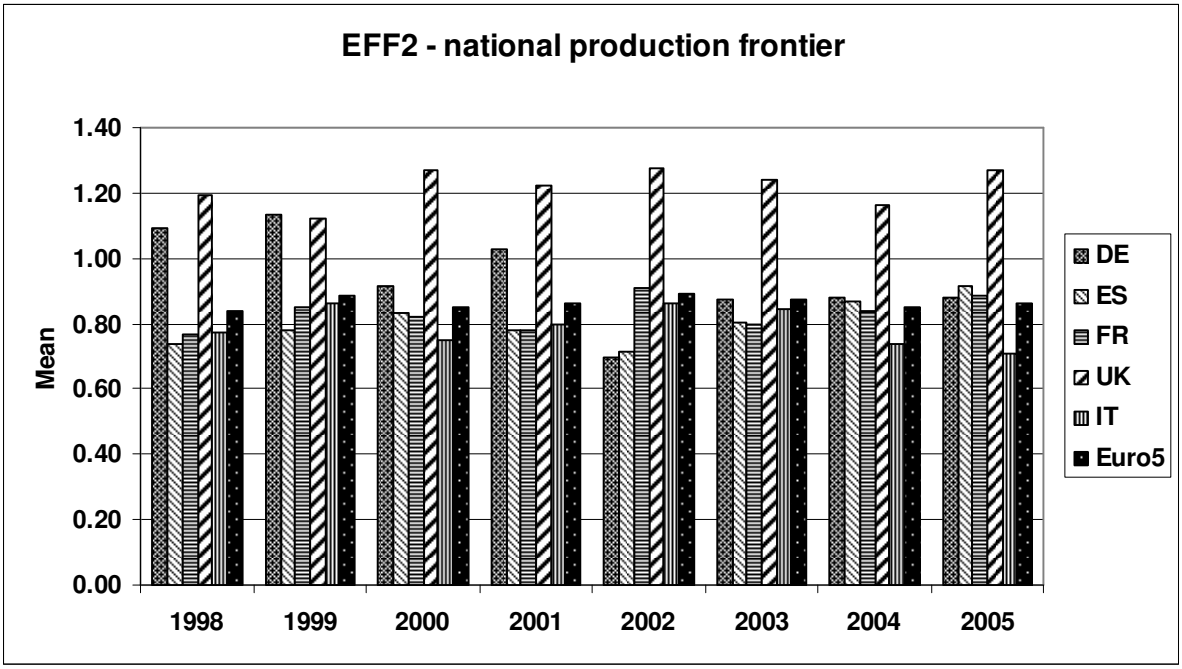

Figure 2: Efficiency index including costs of capital (EFF2)

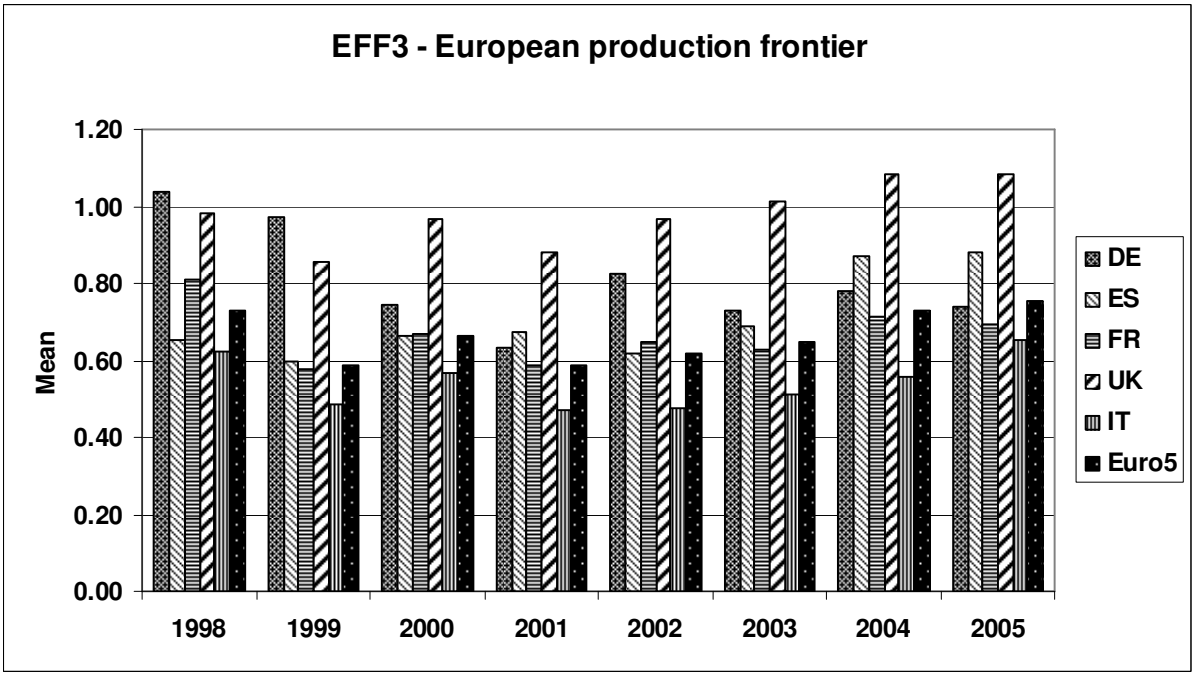

Figure 3: Efficiency index including costs of capital (EFF3)

Regarding earning power European banking proved to be highly profitable between 1998 and 2005 (Table 6). Except for Germany the typical listed European bank achieved profits above capital costs in all years observed.

5.2 Regression results

The results of cross-sectional analysis for each year are shown in the appendix (Tables 9 to 15).

Concerning the regression results for efficiency there exist striking differences between the different calculated efficiency measures. Though x-efficiency nearly always shows a positive impact on net return on equity independent of its definition, the statistical significance of the definitions´ impact differs considerably between EFF1 and EFF3 on the one hand and EFF2 on the other hand. The coefficient of EFF1, which includes costs of capital, shows in half of the regressions a positive algebraic sign with a level of significance of at least 10%. The same happened to EFF3, based on the European production function, in even 11 of 16 regressions. EFF2, i.e. efficiency measurement based on the national production frontier, seems to possess less power of explanation. This could be technically explained by the highly diverging number of banks per country forming the national production frontier. At the same time the higher power of explanation of "European" efficiency values could also be interpreted as an increasing harmonization of the European banking market.

The cross-sectional results comparing banks against each other imply a relatively strong support of the thesis: $H_0 : \beta_1 > 0$. Thus, a positive correlation between efficiency and a bank's financial performance in the observed period can be assumed. The positive correlation might be interpreted in two directions. Assumed that efficiency has to be correlated logically with profitability one could see the positive correlation as a proof of quality of DEA efficiency measurement. Or under the condition that DEA provides good efficiency measures and assuming a corresponding causality the results might confirm the positive effect of x-efficiency on profitability. Interpreting the result the latter way it should be kept in mind that features of differentiation like quality or brand name could not be taken into account because these data are not available. Provided that these features are correlated with both variables of the specified model like x-efficiency and profitability, the omitted variable bias might distort the estimated coefficients. According to Porter's assumption that cost leadership and differentiation are mutually exclusive (Porter 1980), which is debatable (Ghemawat 2001), $\beta_1 > 0$ would correspond to the statement that the strategy of cost leadership was superior to differentiation in banking.[22]

From all other bank specific variables only specialization suggests a clear tendency of correlation. Yet surprisingly the sign of the coefficient is in 17 out of 56 regressions significantly negative (Tables 9 to 15). A higher focus as was therefore rather related to competitive disadvantages and lower returns.

The coefficients of bank size and market share are nearly always insignificant and furthermore change their sign. The relative market power hypothesis and thus the positive impact of

[22] Omitted variable bias: $E(\beta_1\text{^}) = \beta_1 + \beta_2 (\sigma_{12}/ \sigma_1)$, β_2 = not observed coefficient
This equation would reduce to $E(\beta_1\text{^}) = \beta_1 - \beta_2$ under the following conditions: Perfect negative correlation between differentiation and x-efficiency, equal variances and – ceteris paribus – positive effect of both strategies on NRoE. In this case H_0 would imply a comparison of strength between both factors.

high market share on financial performance could not be confirmed for European banking. The results also offer little support for a positive correlation between NRoE and the OBS share of total income. RNOR was statistically significant in many cases but altered its sign according to regression technique and observation period. Here the supposed linear relationship might not reproduce business reality adequately, besides the RNOR variable reflects deliberate outsourcing as well as the differences in the general business model (retail vs. wholesale). As the dummy variable which controlled for cooperative and savings banks was statistically irrelevant, these banks appear to have no systemic profit disadvantage against their competitors.

Regarding market variables, capital market return (EXRET) and net interest margin (NIM) display in general the expected sign, but they are seldom statistically significant (EXRET: 15/56 and NIM: 12/56). A clear positive correlation exists between NRoE and industry concentration in the respective submarkets measured as HHI – this could be expected based on the descriptive statistics. The Herfindahl-Hirschman index exhibits no negative sign regardless of the observation period and is in 24 out of 56 cases significantly positively correlated with profitability (Tables 9 to 15). The hypothesis of a positive influence of the structure of the respective national banking industry on the success of a European bank cannot be disproved.

Those variables presenting a comparatively clear correlation, i.e. x-efficiency and HHI, also show stable relationships to risk-adjusted return without definite variances in time. The other variables do not exhibit an explicit pattern in time, neither in terms of relevance, strength nor the sign of the correlation (Tables 9 to 15).

As the panel regression explains the variance in time for each bank, the results can vary from the comparison between different banks. The results of the panel regression show a highly significant coefficient for all three types of efficiency (Table 16). Both EFF1 and EFF3 are significant at the 99% confidence level, EFF2 at the 95% level, indicating that improvements in efficiency lead to higher NRoE for the same bank. In all three regressions specialization presents highly significant coefficients. This means that changes towards more specialization inside the same bank were rewarded with higher returns although the existing degree of specialization was negatively correlated to NRoE in cross-sectional analysis. On the other hand an increased focus on OBS business was negatively correlated to net return, showing significant negative coefficients thrice.

Regarding banking market variables the results of the panel analysis also differ strongly from the cross-sectional data. Changes in the concentration of the respective banking sector measured by the HHI are surprisingly negatively correlated with bank performance, twice at the 99% level and once at the 95% level (Table 16). But a favourable market environment in form of the average net interest margin exerts an important influence on the variation of individual banks' return showing a large, positive correlation at the 99% or 95% confidence level (Table 16). This contrasts again with the static regression where the NIM had little impact. In contrast, the yearly return of the respective national index seems to have no impact on banks' performance.

Both panel specific variables, i.e. growth and lagged profitability, show no or little correlation to current profitability. Only in the regression using EFF3 lagged profitability is positively correlated to NRoE at the 95% confidence level (Table 16).

In respect to the explained variance and significance of the variables the specified models range within the results of previous research on this issue. These are for example Berger (1995) and Goddard, Molyneux, and Wilson (2004b) who also show an averaged R^2 of about 10% and similar size and direction of key coefficients. The thesis of correct specification according to the Ramsey specification test had to be rejected though, using a level of significance of 5%. Attempts to cure the misspecification by inclusion of squared or logarithmic variable terms failed.

5.3 Discussion

The regression results deliver important insight for the development of sustainable and appropriate strategies in European banking.

Successful banks feature particularly two characteristics: Firstly, they operate with higher technical efficiency than their competitors and are able to transfer the hereby obtained cost advantages into higher margins and finally excess returns compared to their peers. Secondly, the strategic environment and in this regard the structure and concentration of the national banking sector have a considerable impact on a bank's financial performance.[23] Apart from being statistically significant these two factors are also economically significant: Using median coefficients from all cross-sectional regressions and median values from the banks used in the regression, a 10% increase in both HHI and EFF1 would increase NRoE by 19.5% or 1.51 percentage points. Using the coefficients of the EFF1 panel regression and median values a 10% increase in efficiency, specialization and NIM would raise NRoE by 5.59 percentage points whereas the similar increase of HHI and OBS values would reduce NRoE by 4.14 percentage points. These results show the economic significance of efficiency and market structure on a bank's success, especially as they concern percentage points of net return on equity.

The results support the appropriateness of the generic strategy of cost leadership for the European banking market. Banks following this strategy were able to achieve higher excess returns during the analyzed period and efforts to improve efficiency in the same bank were rewarded by higher profitability. If, following Porter, a negative correlation between differentiation and cost leadership is assumed (although quality and customer satisfaction might be quite positively related with x-efficiency) the latter would have shown as the dominant strategy for European banks. Additionally, the results would support Gardener's, Molyneux' and Moore's theses of a growing importance of efficiency and cost control for the performance of European banks. The scenario that financial services will be sold as basic goods primarily through

[23] The results base on the constraint that regression analysis can only rate correlations as statistically significant or insignificant. Direction of causality or positive evidence is per definition not feasible and mere interpretation.

lower price in the future thus making the most efficient institutes the most successful appears to be realistic in the context of further deregulation measures by the European Union (EU-Commission 2005).

For specialization, the third generic strategy in Porter's framework, the static model could not detect significant advantages in NRoE.[24] In fact, the thesis that universal banks might be more competitive due to synergies between different business units received some support. At the same time the panel results show that banks moving towards higher horizontal specialization were rewarded with significantly higher net returns. Well diversified universal banks should therefore look at specialization efforts with caution. With regard to vertical specialization no clear trend was detected. The development of the entire industry towards a higher focus on single parts of the values chain does not explain differences in net return between banks or between different years of the same bank. This might originate from the fact that the optimal RNOR might vary between the different and rather heterogeneous services offered by banks. Therefore, the optimal RNOR could change pursuant to the strategic position of a bank. Global conclusions which see outsourcing at the core solution to problems of profitability were nevertheless confuted.

Regarding the issue of pushing OBS business no clear statement can be made based on the results. OBS business plays an important role in banking due to the trend towards disintermediation. But a particular focus on that type of business is not coercively the basis for sustainable competitive advantages or disadvantages. In contrast, the panel results show a significant negative impact of heightened focus on OBS business.

Highly interesting is the observation that cooperative or savings banks do not systematically generate lower rates of return because of their specific legal status and history. Insofar, these types of banks can represent quite attractive investment targets for investors and are therefore in principle suitable for stock listing.

The thesis that mere size might be a desirable target on the way to profitability could not be confirmed. Also small financial service providers have apparently enough strategic options to position themselves successfully and thus to obtain a competitive advantage. Maybe the alleged advantages of size like economies of scale or opportunities of diversification are not available or usable in economic reality. Size per se should be a target of the past – the results of the investigation do not indicate an evident rationale in favour of the creation of bigger companies through mergers and acquisitions which is in line with existing research (Berger and Humphrey 1994).

Besides the relative-market-power hypothesis and the related imperative to create national champions could not be confirmed from a business point of view. This shows again that comparatively small market players have chances to perform well and that there is no general necessity towards largeness.

[24] This could be partially related to the comparatively brute calculation method.

Logically associated to the market power of individual players is nevertheless the national industry structure. A high HHI though can result from some very large market participants or many medium to large players (Bikker 2004). According to the results of the static regression banks in highly concentrated markets[25] like Spain or UK appear to be capable to achieve sustainable excess returns independent of their x-efficiency, size or market share. This is a strong indication of collusion in terms of the Structure Conduct Performance paradigm. This result contrasts previous investigations on the less consolidated US market for which the individual market share was detected to be more relevant than concentration (Berger 1995) but corresponds to the results of Goddard, Molyneux, and Wilson.

The results of the dynamic regression show that increases in market concentration in recent years have resulted in lower excess returns. This relation could be caused by an unobserved variable: market transparency. In markets where the Internet and/or legal reforms heighten transparency for consumers and thus increase competitive pressure, excess returns are likely to fade and market participants often react through mergers.

The results highlight the importance of Porter's market and industry analysis: International or European banks should scrutinize the competitive fierceness of the target market before realizing expansion plans. But also incumbent players in less consolidated markets like Germany can use the positive impact of the current market structure through intelligent selection and focus on market segments which are more concentrated and therefore less competitive. On the other hand further market consolidation should not be expected to automatically create higher profits in the industry. Concurrently the high positive correlation between national market concentration and profit is an explicit hint that further initiatives have to be undertaken on the way to a true single European financial sector. The observed excess return due to collusion is therefore on the other hand menaced by the increasing intensification of competition through the creation of a single European banking market.

Despite the existing significance of the strategic approach pursuant to Porter the relevance of the resource-based view has to be returned to mind at this point. The applied analytical model could per se only look at generic strategies. The very high percentage of unexplained variance (more than 85% in the panel and between 32% and 80% in the cross-sectional analysis) is certainly not only due to measurement error, but also to the impossibility to represent the diversity of individual strategic options and competitive advantages.

Furthermore the obtained empirical results have to be interpreted with caution due to several underlying assumptions. E.g., the interpretation of the correlation between DEA values and NRoE is based on the assumption that DEA actually measures x-efficiency in an unbiased manner. This seems to be debatable in the light of the variance in the results of DEA, SFA, and other measurement methods. Yet the main weakness is the availability of data because even the most advanced mathematical methods can not compensate the deficit of financial accounting data concerning topics like efficiency, market share and specialization. The rela-

[25] As the concentration variable was defined for each bank as the average (weighted by income/volume) of national deposits, loans, other interest-bearing assets, and OBS market even banks operating in national markets with low overall concentration could face a high HHI in their specific focus segment (e.g., OBS business).

tively small number of included European banks was an additional problem for this investigation which reduced the precision of the regression techniques.

6. Conclusion

A positive relation between risk-adjusted profitability and the success factors x-efficiency and national market environment (concentration, net interest margin) was found in European banking. These two factors proved to be statistically and economically significant in both cross-sectional and panel regressions.

Market concentration (measured in HHI) had a significant positive effect on net return on equity in cross-sectional comparison between different banks. Yet analyzing changes in the environment of the same bank (panel analysis) market concentration turned out to be insignificant whereas the national net interest margin turned out to be highly significant.

Technical efficiency proved to be a significant factor for banks' financial performance both in cross-sectional and panel regressions. Apparently banks operating with higher technical efficiency are more profitable than their peers. Furthermore, improvements in x-efficiency in the same bank (panel analysis) were also rewarded with higher net return on equity. Therefore, the initial question, whether efficiency is important for success in banking, has to be approved.

Having shown the importance of x-efficiency for banks and bank managers, there remain lots of questions for further research: How can decision makers take concrete actions to improve x-efficiency? How can the rather abstract construct of x-efficiency measured by accounting data be transferred into operative actions? The explanation of x-efficiency and measures to improve it provide a field for future investigations. Also, the more in-depth analysis of the banks´ value chains and the integration into the presented model can provide results which appear to be relevant to academics and practitioners as well.

Especially as efficiency is likely to become an even more decisive competitive feature than today this topic will gain further interest. The expected slow but steady harmonization of the European banking market and the associated reinforcement of competition for more informed clients will foster the activities to measure, analyze, improve, and control efficiency in banks.

References

Adenso-Díaz, B. and F. Gascón (1997): Linking and Weighting Efficiency Estimates with Stock Performance in Banking Firms. Working Paper 97-21, Wharton Financial Institutions Center, University of Pennsylvania

Andersen, P. and N.C. Petersen (1993): A Procedure for Ranking Efficient Units in Data Envelopment Analysis. In: Management Science, Vol. 39, pp. 1261-1264.

Banker, R.D., A. Charnes, and W.W. Cooper (1984): Some Models for Estimating Technical and Scale Inefficiency in Data Envelopment Analysis. In: Management Science, Vol. 30, pp. 1078-1092

Beccalli, E., B. Casu, and C. Girardone (2006): Efficiency and Stock Performance in European Banking. In: Journal of Business Finance & Accounting, Vol. 33, 2006, Issue 1/2, pp. 245-262

Berger, A.N. (1995): The Profit-Structure Relationship in Banking. Tests of Market-Power and Efficient-Structure Hypotheses. In: Journal of Money, Credit and Banking. Vol. 27, No. 2, pp. 404-431

Berger, A.N. and D.B. Humphrey (1992): Measurement and Efficiency Issues in Commercial Banking. In: Griliches, Z. (Ed.): Output Measurement in the Service Sectors. Chicago: University of Chicago Press, pp. 245-276

Berger, A.N. and D. B. Humphrey (1994): Bank Scale Economies, Mergers and Efficiency. The U.S. Experience. Working Paper 94-25, Wharton Financial Institutions Center, University of Pennsylvania

Berger, A.N. and D.B. Humphrey (1997): Efficiency of Financial Institutions: International Survey and Directions for Future Research. Working Paper 97-05, Wharton Financial Institutions Center, University of Pennsylvania, pp. 4-8

Berger, A.N. and L.J. Mester (1997): Inside the Black Box: What Explains Differences in the Efficiencies of Financial Institutions. Working Paper 97-04, Wharton Financial Institutions Center, University of Pennsylvania

Bikker, J.A. (2004): Competition and Efficiency in a Unified European Banking Market. Cheltenham, UK and Northampton, USA: Edward Elgar

Bikker, J.A. and J. Bos (2004): Trends in Competition and Profitability in the Banking Industry. A Basic Framework. DNB Working Paper No. 18

Bikker, J.A. and K. Haaf (2000): Competition, Concentration and their Relationship: An Empirical Analysis of the Banking Industry. DNB Research Series Supervision No. 30

Brealey, R.A. and Stewart C. Myers (2003): Principles of Corporate Finance. 7. ed. New York: McGraw-Hill/Irwin

Burchard, U. (1997): Kompetenz-Netzwerk versus Universalbank. In: Die Bank, No. 1, pp. 4-7

Burger, A. and J. Moormann (2008): Productivity in banks: myths & truths of the cost income ratio. In: Banks and Bank Systems Vol. 3, No. 4, pp. 92-101

Canals, J. (1993): Competitive Strategies in European Banking. Oxford: Clarendon Press

Casu, B. and C. Girardone (2004): Large Banks' Efficiency in the Single European Market. In: The Services Industries Journal, Vol. 24, No. 6, pp. 129-142

Casu, B. and C. Girardone (2006): Bank Competition, Concentration and Efficiency in the Single European Market. In: The Manchester School, Vol. 74, No. 4, Special Issue, pp. 441-468

Casu, B. and P. Molyneux (2003): A comparative study of efficiency in European banking. In: Applied Economics, Vol. 35, pp. 1865-1876

Cetorelli, N. (1999): Competitive Analysis in Banking: Appraisal of the Methodologies. In: Economic Perspectives, Federal Reserve Bank of Chicago, pp. 2-15

Clark, J.A. (1996): Economic Cost, Scale Efficiency, and Competitive Viability in Banking. In: Journal of Money, Credit and Banking, Vol. 28, No. 3, Part 1, pp. 345-348.

Clark, J.A. and T.F. Siems (2002): X-efficiency in Banking. Looking beyond the Balance Sheet. In: Journal of Money, Credit and Banking, Vol. 34, No. 4, pp. 987-1013

Coelli, T.J., D.S.P. Rao, C.J. O'Donnell, and G.E. Battese (2005): An Introduction to Efficiency and Productivity Analysis. 2. ed., New York, NY: Springer

Cummins, J.D. and H. Zi (1997): Measuring Cost Efficiency in the U.S. Life Insurance Industry: Econometric and Mathematical Programming Approaches. Working Paper 97-03, Wharton Financial Institutions Center, University of Pennsylvania

Deutsche Bank Research (2004): Bank performance in Europe: Great progress through consolidation – except in Germany. EU Monitor, Financial Market Special, No. 13

DeYoung, R. and T. Rice (2004a): Noninterest Income and Financial Performance at U.S. Commercial Banks. In: The Financial Review, Vol. 39, pp. 101-127

DeYoung, R. and T. Rice (2004b): How do banks make money? The fallacies of fee income. In: Economic Perspectives, Federal Reserve Bank of Chicago, No. 4, pp. 34-51

DeYoung, R. and T. Rice (2004c): How do banks make money?. A variety of business strategies. In: Economic Perspectives, Federal Reserve Bank of Chicago, No. 4, pp. 52-67

Dixon, R. (1993): Banking in Europe. The Single Market. Revised Edition. London und New York: Routledge

Eisenbeis, R.A., G.D. Ferrier, and S.H. Kwan (1999): The Informativeness of Stochastic Frontier and Programming Frontier Efficiency Scores: Cost Efficiency and Other Measures of Bank Holding Company Performance. Working Paper 99-23, Federal Reserve Bank of Atlanta

European Commission (2005): White Paper: Financial Services Policy 2005-2010. Brussels

Farrell, M.J. (1957): The Measurement of Productive Efficiency. In: Journal of the Royal Statistical Society, Vol. 120, No. 3, pp. 253-281

Gahan, A.M. and M.E. Porter (1997): How Much Does Industry Matter, Really? In: Strategic Management Journal. Vol. 18, Special Issue: Organizational and Competitive Interactions, pp. 15-30.

Gardener, E.P.M., P. Molyneux and B. Moore (1998): The Strategic Implications of EMU for European Banking. In: The Service Industries Journal. Vol. 18, No. 4, pp. 87-108

Ghemawat, P. (2001): Strategy and the Business Landscape: Core Concepts. Upper Saddle River, NJ: Prentice Hall

Goddard, J., P. Molyneux, and J.O. Wilson (2004a): The Profitability of European Banks. A Cross-Sectional and Dynamic Panel Analysis. The Manchester School, Vol. 72, No. 3, pp. 363-381

Goddard, J., P. Molyneux, and J.O. Wilson (2004b): Dynamics of Growth and Profitability in Banking. In: Journal of Money, Credit and Banking. Vol. 36, No. 6, pp. 1069-1090

Grant, R.M. (1991): The Resource-Based Theory of Competitive Advantage. Implications or Strategy Formulation. In: CMR, Vol. 33, Spring, pp. 114-135

Haberer, J.-Y. (1991): The Banks' Strategies in the Perspective of the Single Financial Market in Europe. In: Ulrich Ramm (Ed.): Challenges of Global Finance. Mainz: v. Hase & Koehler, pp. 173-187

Heckman, J.J. (1976): The Common Structure of Statistical Models of Truncation, Sample Selection, and Limited Dependent Variables and a Simple Estimator for Such Models. In: Annals of Economic and Social Measurement, Vol. 5, pp. 475-492

Heffernan, S. (1996): Modern Banking in Theory and Practice. Chichester: John Wiley

Hempel, G.H. and D.G. Simonson (1999): Bank Management. Text and Cases. 5. ed. Chichester: John Wiley

Hensel, N.D. (2006): Cost-efficiencies, Profitability, and Strategic Behavior. Evidence from Japanese Commercial Banks. In: International Journal of Managerial Finance, Vol. 2, No. 1, pp. 49-76

Hess, K. and G. Francis (2004): Cost income ratio benchmarking in banking. A case study. In: Benchmarking: An International Journal, Vol. 11, No. 3, pp. 303-319

Kirkwood, J. and D. Nahm (2006): Australian Banking Efficiency and its Relation to Stock Returns. Economic Record, Vol. 82, pp. 253-267

Lovell, C.A.K. and A.P.B. Rouse (2003): Equivalent Standard DEA Models to provide Super-Efficiency Scores. Journal of the Operational Research Society, Vol. 54, pp. 101-108

Maudos, J. (1998): Market structure and performance in Spanish banking using a direct measure of efficiency. In: Applied Financial Economics. Vol. 8, pp. 191-200

Molyneux, P. and W. Forbes (1995): Market structure and performance in European banking. In: Applied Economics, Vol. 27, pp. 155-159

Papadopoulos, S. (2004): Market Structure, Performance and Efficiency in European Banking. In: IJCM, Vol. 14, No. 1, pp. 79-97

Paul, S., A. Horsch, and S. Stein (2005): Wertorientierte Banksteuerung I, Renditemanagement. Bankakademie e.V. (Ed.). Frankfurt am Main: Bankakademie Publishers

Porter, M.E. (1980): Competitive Strategy: Techniques for Analyzing Industries and Competitors. New York: Free Press

Porembski, M. (2000): Produktivität der Banken. Untersuchungen mit der Data Envelopment Analysis. Wiesbaden: Deutscher Universitäts-Verlag

Prahalad, C.K. and G. Hamel (1990): The Core Competence of the Corporation. In: Harvard Business Review, Vol. 68, No. 3, pp. 79-91

Rhodes, E. (1978): Data Envelopment Analysis and Related Approaches for Measuring Efficiency of Decision-Making Units with an Application to Program Follow Through in U.S. Education. Dissertation. School of Urban and Public Affairs, Carnegie-Mellon University

Sealey, C.W. Jr. and J.T. Lindley (1977): Inputs, Outputs and a Theory of Production and Cost at Depository Financial Institutions. In: The Journal of Finance, Vol. 32, No. 4, pp. 1251-1266

Vennet, R.V. (2002): Cost and Profit Efficiency of Financial Conglomerates and Universal Banks in Europe. In: Journal of Money, Credit and Banking. Vol. 34, No. 1, pp. 254-282

Walter, I. (2002): Strategies in Financial Services, the Shareholders and the System. Is Bigger and Broader Better? Entwurf zur Brookings Institution Conference, Washington
Weisser, N. (2004): Leistungstiefe Deutscher Banken. Das Phänomen der falschen Zahlen. In: Die Bank, No. 12, pp. 48-51
Wooldridge, J.M. (2006): Introductory Econometrics. A Modern Approach. 3. ed., Mason, Ohio: Thomson

Appendix

Table 4: Net Interest Margins and Stock Exchange Returns

Net Interest Margin						
	DE	**UK**	**IT**	**ES**	**FR**	**Euro5**
1998	1,32%	2,09%	2,10%	2,31%	1,04%	1,60%
1999	1,22%	1,95%	2,08%	2,12%	0,83%	1,45%
2000	1,08%	1,75%	2,16%	1,98%	0,80%	1,38%
2001	1,18%	1,75%	2,21%	2,25%	0,72%	1,43%
2002	1,21%	1,64%	2,20%	2,22%	0,79%	1,43%
2003	1,18%	1,70%	2,09%	1,95%	0,83%	1,39%
2004	1,13%	1,55%	1,98%	1,63%	0,75%	1,28%
2005*	1,05%	1,40%	1,71%	1,58%	0,86%	1,24%

Stock Exchange Return						
	DE	**UK**	**IT**	**ES**	**FR**	**Euro5**
1998	16,99%	16,16%	34,63%	29,34%	30,10%	25,44%
1999	32,92%	18,72%	20,13%	16,85%	43,27%	26,38%
2000	-7,84%	-8,59%	1,68%	-24,52%	0,95%	-7,66%
2001	-21,09%	-15,20%	-31,71%	-7,76%	-22,63%	-19,68%
2002	-57,88%	-25,55%	-30,06%	-33,01%	-38,45%	-36,99%
2003	31,54%	17,47%	11,19%	24,81%	19,40%	20,88%
2004	7,08%	10,81%	15,58%	16,01%	11,60%	12,22%
2005	23,96%	18,76%	12,48%	16,72%	23,41%	19,07%

Table 5: HHI-Balance-Related Business and HHI-OBS Business

HHI-Balance-Related-Business						
	DE	**UK**	**IT**	**ES**	**FR**	**Euro5**
1998	0,05	0,16	0,06	0,09	0,12	0,09
1999	0,06	0,16	0,06	0,10	0,15	0,10
2000	0,06	0,15	0,06	0,13	0,15	0,10
2001	0,07	0,17	0,06	0,12	0,15	0,11
2002	0,06	0,16	0,07	0,10	0,15	0,11
2003	0,06	0,17	0,07	0,10	0,16	0,11
2004	0,06	0,17	0,07	0,13	0,14	0,12
2005*	0,09	0,17	0,15	0,13	0,16	0,14

HHI-OBS-Business						
	DE	**UK**	**IT**	**ES**	**FR**	**Euro5**
1998	0,09	0,18	0,05	0,12	0,10	0,11
1999	0,12	0,18	0,07	0,16	0,10	0,12
2000	0,13	0,15	0,07	0,20	0,13	0,13
2001	0,13	0,17	0,08	0,20	0,13	0,14
2002	0,11	0,17	0,09	0,19	0,12	0,13
2003	0,12	0,17	0,10	0,17	0,12	0,14
2004	0,11	0,18	0,09	0,16	0,15	0,14
2005	0,13	0,20	0,10	0,18	0,20	0,17

Tabelle 6: Net Return, Share OBS business, Real Net Output Ratio

Net Return on Equity

	DE		ES		FR		UK		IT		Euro5			
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Min	Max
1998	2.9%	0.2%	10.0%	4.5%	1.4%	6.2%	21.0%	9.1%	8.4%	8.1%	9.3%	9.0%	-12.1%	35.7%
1999	4.6%	1.4%	12.3%	4.2%	9.3%	3.9%	19.9%	10.3%	10.1%	9.2%	11.2%	8.2%	-5.1%	38.6%
2000	-0.1%	9.2%	11.1%	6.2%	10.2%	7.8%	16.4%	7.9%	9.5%	11.8%	10.1%	10.1%	-18.5%	33.3%
2001	-32.8%	32.2%	11.7%	5.2%	10.1%	5.3%	4.8%	15.1%	4.8%	16.2%	4.5%	17.4%	-70.9%	24.6%
2002	-14.1%	2.8%	10.0%	5.6%	5.5%	6.3%	7.2%	12.0%	3.7%	10.5%	4.6%	9.8%	-24.2%	25.5%
2003	-7.4%	17.2%	10.7%	4.2%	8.7%	6.3%	11.1%	15.3%	2.7%	12.8%	5.5%	12.2%	-46.5%	38.1%
2004	-6.9%	10.1%	8.9%	4.7%	8.7%	4.2%	13.5%	8.3%	7.1%	9.0%	7.0%	8.9%	-21.8%	36.6%
2005	1.9%	9.8%	10.2%	4.9%	8.8%	5.7%	14.0%	6.7%	6.2%	18.4%	7.5%	13.2%	-70.7%	28.5%

Share of off-balance-sheet business

	DE		ES		FR		UK		IT		Euro5			
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Min	Max
1998	58.9%	6.4%	45.6%	8.4%	54.9%	9.8%	48.8%	18.8%	47.7%	12.4%	48.9%	12.4%	15.1%	87.8%
1999	64.5%	5.0%	47.0%	8.4%	55.1%	12.3%	50.7%	19.4%	49.6%	12.7%	51.1%	13.0%	13.6%	91.1%
2000	75.6%	10.1%	47.2%	8.7%	56.1%	14.5%	55.8%	15.6%	50.3%	14.1%	53.5%	14.7%	21.2%	90.1%
2001	73.9%	8.1%	43.1%	7.6%	54.1%	15.6%	54.4%	17.2%	45.3%	9.8%	50.2%	14.2%	21.8%	94.3%
2002	60.4%	3.2%	40.7%	6.5%	58.0%	18.7%	55.3%	18.5%	45.1%	13.9%	50.0%	16.2%	20.2%	95.3%
2003	62.6%	12.4%	44.1%	8.6%	54.3%	15.2%	58.1%	15.7%	48.7%	14.1%	52.0%	14.5%	20.9%	97.4%
2004	69.2%	12.6%	46.0%	7.6%	55.2%	14.7%	60.8%	16.5%	50.7%	13.0%	54.4%	14.5%	32.1%	97.1%
2005	59.7%	14.4%	46.6%	9.0%	56.7%	19.0%	54.4%	20.9%	51.7%	13.7%	53.5%	15.4%	18.2%	94.5%

RNOR - Real Net Output Ratio

	DE		ES		FR		UK		IT		Euro5			
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Min	Max
1998	60.4%	0.8%	62.9%	4.9%	57.6%	9.1%	56.7%	4.8%	62.2%	7.6%	60.8%	7.0%	40.3%	74.2%
1999	59.0%	5.9%	61.6%	4.1%	56.3%	9.7%	56.4%	5.4%	60.5%	7.6%	59.1%	7.6%	28.7%	73.1%
2000	45.7%	15.0%	60.0%	4.1%	58.4%	4.8%	56.0%	7.3%	58.3%	8.2%	57.5%	8.0%	30.3%	70.5%
2001	46.5%	13.6%	60.5%	4.3%	57.9%	3.5%	53.9%	6.9%	59.0%	7.8%	57.5%	7.6%	31.4%	70.8%
2002	52.3%	4.5%	59.4%	4.2%	56.0%	10.4%	52.4%	7.4%	57.2%	8.9%	56.4%	8.6%	19.8%	70.1%
2003	49.0%	11.5%	61.5%	4.4%	56.2%	9.1%	53.3%	8.9%	56.0%	11.6%	55.8%	10.1%	19.2%	66.5%
2004	50.4%	8.4%	63.5%	4.5%	56.5%	9.3%	53.7%	10.8%	57.6%	9.7%	56.9%	9.4%	21.9%	70.5%
2005	50.6%	16.5%	65.1%	3.2%	55.9%	12.7%	53.0%	7.3%	59.7%	6.9%	57.6%	10.6%	19.0%	80.7%

Table 7: Market Share, Specialization, Size

Average market share of indiv. bank

	DE		ES		FR		UK		IT		Euro5			
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Min	Max
1998	9.7%	2.8%	4.7%	7.5%	6.0%	7.8%	8.8%	6.1%	2.7%	3.6%	4.8%	5.9%	0.1%	19.9%
1999	9.7%	2.8%	6.5%	9.9%	2.5%	5.1%	8.6%	6.0%	2.7%	3.9%	4.2%	6.0%	0.1%	24.2%
2000	4.7%	5.5%	7.3%	11.6%	4.1%	7.5%	9.6%	6.1%	2.8%	3.9%	4.7%	6.9%	0.0%	29.2%
2001	5.2%	6.2%	8.1%	11.8%	3.9%	7.4%	8.5%	7.7%	2.9%	4.2%	4.7%	7.1%	0.1%	27.9%
2002	5.3%	4.8%	6.7%	10.6%	4.4%	7.1%	6.9%	7.0%	3.1%	4.5%	4.5%	6.6%	0.0%	25.8%
2003	2.5%	3.1%	6.9%	9.9%	2.9%	5.7%	8.7%	8.4%	3.4%	4.7%	4.3%	6.4%	0.0%	26.1%
2004	2.4%	3.7%	7.0%	10.6%	3.0%	6.3%	6.6%	6.9%	3.8%	4.8%	4.2%	6.5%	0.0%	30.5%
2005	2.2%	3.6%	7.1%	11.1%	2.2%	4.7%	6.3%	7.9%	3.4%	5.3%	3.8%	6.5%	0.1%	32.6%

Level of specialization (std. dev. of business segments)

	DE		ES		FR		UK		IT		Euro5			
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Min	Max
1998	0.24	0.04	0.19	0.03	0.24	0.03	0.20	0.10	0.17	0.06	0.19	0.06	0.09	0.42
1999	0.27	0.03	0.18	0.03	0.24	0.05	0.21	0.11	0.19	0.06	0.20	0.07	0.10	0.44
2000	0.34	0.07	0.18	0.03	0.26	0.06	0.22	0.09	0.19	0.07	0.22	0.08	0.09	0.43
2001	0.33	0.05	0.16	0.02	0.25	0.06	0.21	0.11	0.17	0.05	0.20	0.08	0.10	0.46
2002	0.25	0.01	0.16	0.02	0.27	0.08	0.22	0.11	0.17	0.07	0.21	0.09	0.11	0.47
2003	0.26	0.08	0.18	0.02	0.25	0.06	0.23	0.10	0.19	0.08	0.22	0.08	0.11	0.48
2004	0.30	0.08	0.18	0.02	0.24	0.08	0.25	0.10	0.20	0.07	0.23	0.08	0.13	0.48
2005	0.26	0.07	0.19	0.02	0.25	0.10	0.23	0.10	0.21	0.08	0.22	0.08	0.08	0.46

Size (sum of personnnel and capital costs)

	DE		ES		FR		UK		IT		Euro5			
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Min	Max
1998	4,309,793	1,239,703	1,409,538	2,355,560	2,070,384	2,800,871	2,323,180	1,990,074	940,282	1,196,227	1,544,919	1,968,067	45,334	6,612,464
1999	4,873,386	1,539,578	1,537,918	2,460,695	871,891	1,927,084	2,783,600	2,357,748	975,303	1,394,888	1,390,303	1,997,252	24,653	7,473,838
2000	2,771,246	3,224,721	1,772,801	2,969,438	1,678,669	3,073,566	4,397,065	3,136,459	1,000,844	1,400,971	1,776,128	2,591,681	3,224	9,021,445
2001	2,844,030	3,282,559	2,345,338	3,769,994	1,709,818	3,307,406	4,337,854	4,157,422	1,093,955	1,556,748	1,935,898	2,974,374	35,174	10,736,966
2002	3,074,207	2,691,490	1,879,524	3,199,386	1,840,027	3,381,541	3,166,181	3,311,566	1,069,366	1,544,520	1,733,739	2,687,578	6,516	11,298,574
2003	1,600,953	2,250,530	1,852,203	2,923,690	1,148,216	2,556,111	3,923,852	3,850,792	1,148,849	1,584,324	1,622,053	2,545,972	6,174	9,494,830
2004	1,286,230	2,055,591	2,041,601	3,258,789	1,263,853	2,823,125	3,299,892	3,685,455	1,257,862	1,554,666	1,596,210	2,544,422	19,604	10,076,149
2005	1,069,580	1,823,316	2,361,044	3,894,436	1,283,279	3,086,583	3,464,113	4,389,767	1,183,496	1,662,322	1,621,391	2,785,870	28,208	12,655,214

Table 8: Efficiency

EFF1 - incl. costs of capital

	DE		ES		FR		UK		IT		Euro5				
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Median	Std. dev.	Min	Max
1998	1.11	0.13	0.95	0.21	1.19	0.22	1.30	0.40	0.95	0.23	1.04	0.96	0.28	0.57	1.90
1999	1.04	0.16	0.91	0.23	1.17	0.38	1.18	0.34	0.84	0.24	0.98	0.90	0.32	0.57	1.94
2000	1.15	0.18	0.96	0.23	1.10	0.39	1.11	0.18	0.81	0.36	0.96	0.86	0.35	0.28	2.13
2001	1.20	0.45	0.97	0.33	1.23	0.51	1.17	0.24	0.79	0.18	0.99	0.89	0.38	0.52	2.34
2002	1.09	0.39	0.93	0.30	1.15	0.40	1.38	0.44	0.78	0.18	0.99	0.86	0.37	0.57	2.05
2003	1.20	0.13	1.04	0.28	1.06	0.41	1.28	0.33	0.82	0.32	1.01	0.90	0.36	0.51	2.26
2004	1.20	0.35	1.11	0.33	1.05	0.46	1.34	0.26	0.81	0.27	1.02	0.88	0.38	0.56	2.29
2005	1.19	0.27	0.92	0.10	1.07	0.55	1.32	0.43	0.84	0.35	1.01	0.86	0.40	0.45	2.18

EFF2 - National production frontier, excl. costs of capital

	DE		ES		FR		UK		IT		Euro5				
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Median	Std. dev.	Min	Max
1998	1.09	0.08	0.74	0.48	0.77	0.60	1.19	0.31	0.77	0.31	0.84	0.79	0.42	0.00	1.66
1999	1.13	0.14	0.78	0.52	0.85	0.42	1.12	0.30	0.86	0.41	0.89	0.85	0.42	0.00	2.18
2000	0.92	0.14	0.83	0.59	0.82	0.33	1.27	0.40	0.75	0.38	0.85	0.84	0.42	0.00	1.82
2001	1.03	0.26	0.78	0.58	0.78	0.30	1.22	0.38	0.80	0.38	0.86	0.83	0.40	0.00	2.08
2002	0.70	0.68	0.71	0.48	0.91	0.51	1.27	0.41	0.86	0.45	0.89	0.85	0.49	0.00	2.40
2003	0.88	0.44	0.81	0.52	0.79	0.30	1.24	0.39	0.84	0.45	0.88	0.87	0.43	0.00	1.97
2004	0.88	0.76	0.87	0.40	0.84	0.31	1.17	0.39	0.74	0.37	0.85	0.87	0.42	0.00	2.34
2005	0.88	0.47	0.92	0.38	0.89	0.32	1.27	0.54	0.71	0.26	0.86	0.85	0.39	0.00	2.15

EFF3 - European production frontier (3,481 banks) excl. costs of capital

	DE		ES		FR		UK		IT		Euro5				
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Median	Std. dev.	Min	Max
1998	1.04	0.03	0.66	0.20	0.81	0.22	0.98	0.18	0.62	0.23	0.73	0.74	0.25	0.22	1.33
1999	0.97	0.11	0.60	0.16	0.58	0.22	0.86	0.17	0.49	0.16	0.59	0.55	0.22	0.21	1.10
2000	0.75	0.13	0.66	0.17	0.67	0.30	0.97	0.20	0.57	0.21	0.66	0.62	0.25	0.00	1.55
2001	0.63	0.33	0.67	0.21	0.59	0.34	0.88	0.35	0.47	0.17	0.59	0.51	0.29	0.00	1.75
2002	0.82	0.36	0.62	0.17	0.65	0.31	0.97	0.53	0.47	0.12	0.62	0.50	0.30	0.26	2.05
2003	0.73	0.16	0.69	0.17	0.63	0.30	1.01	0.48	0.51	0.17	0.65	0.56	0.30	0.31	1.97
2004	0.78	0.29	0.87	0.22	0.72	0.26	1.08	0.41	0.56	0.17	0.73	0.67	0.30	0.00	1.82
2005	0.74	0.23	0.88	0.10	0.69	0.20	1.08	0.47	0.65	0.24	0.76	0.70	0.29	0.38	1.74

Table 9: Static Regression with EFF1, ML Method

Static Regression with EFF1 (incl. capital costs): Yearly results

	1998		1999		2000		2001	
	Coefficient	**Std. dev.**	**Coefficient**	**Std. dev.**	**Coefficient**	**Std. dev.**	**Coefficient**	**Std. dev.**
EFF1	0,06	0,038	0,02	0,029	0.118**	0,050	0,013	0,021
SIZE	0,02	0,018	0.065***	0,017	0,013	0,014	-0.078*	0,041
MS	-0.678*	0,363	-0,184	0,246	-0,103	0,180	0,185	0,338
SPEZ	-1.223***	0,373	-0,094	0,355	-0.981**	0,432	-1.52***	0,117
RNOR	-0.399*	0,208	0,002	0,108	-0,036	0,162	0.806***	0,214
OBS	0.486***	0,171	-0,026	0,108	0.413*	0,217	0,227	0,205
PUB	0,015	0,026	0,006	0,024	-0,039	0,048	-0.039***	0,011
HHI	0.871***	0,305	0.874**	0,442	1.384*	0,723	-0,98	2,875
EXRET	-0,138	0,222	0,763	0,998	0.573**	0,281	0,273	1,024
NIM	9.117***	2,028	16,471	19,442	5,108	3,760	-10.977***	2,899
Constant	-0,198	0,294	-1.422**	0,687	-0,38	0,271	1.344*	0,754
rho	0,034		0,967		0,098		-1,000	
Wald: rho=0	0,900		0,000		0,712		0,000	
censored N	2544		2532		2401		2280	
uncens. N	48		58		61		62	
Prob > chi2	0,000		0,000		0,000		nicht konkav	

Estimation using maximum-likelihood variant of Heckman Procedure, EFF1= Efficiency, Size= Size, MS= Market share, SPEZ= Specialization, RNOR= Real Net Output Ratio,OBS= Share of OBS, PUB= Savings/cooperative bank, HHI= Hirschmann-Herfindahl-Index, EXRET= Stock exchange return, NIM= Net Interest Margin, rho= Selection

Continued

	2002		2003		2004		2005	
	Coefficient	**Std. dev.**	**Coefficient**	**Std. dev.**	**Coefficient**	**Std. dev.**	**Coefficient**	**Std. dev.**
EFF1	0.1***	0,032	0,095	0,060	0.021***	0,004	0.111***	0,038
SIZE	-0,009	0,009	-0.109**	0,047	0.064***	0,007	0,012	0,051
MS	-0,118	0,223	1,044	0,663	-0.389***	0,019	-0,17	0,364
SPEZ	-0.528*	0,308	-0.943**	0,415	0.441***	0,076	-0.985*	0,507
RNOR	0.376***	0,124	0,006	0,046	-0.366***	0,005	0.354**	0,162
OBS	0	0,136	0.132*	0,076	-0.25***	0,018	0,286	0,259
PUB	0,016	0,025	-0.104***	0,007	0.079***	0,001	-0,087	0,059
HHI	0,558	0,425	0,003	0,815	1.091***	0,054	0.998**	0,494
EXRET	0.46**	0,183	-0.499**	0,227	1.65***	0,023	-1,832	1,152
NIM	-1,346	2,428	-10.275**	4,110	-0,584	0,406	-25,505	18,002
Constant	0,291	0,262	1.952***	0,650	-1.027***	0,079	0,204	0,496
rho	-0,846		-1,000		1,000		0,178	
Wald: rho=0	0,012		0,000		0,014		0,819	
censored N	2149		1965		1880		1062	
uncens. N	63		66		64		66	
Prob > chi2	0,000		nicht konkav		nicht konkav		0,014	

Estimation using maximum-likelihood variant of Heckman Procedure, EFF1= Efficiency, Size= Size, MS= Market share, SPEZ= Specialization, RNOR= Real Net Output Ratio,OBS= Share of OBS, PUB= Savings/cooperative bank, HHI= Hirschmann-Herfindahl-Index, EXRET= Stock exchange return, NIM= Net Interest Margin, rho= Selection

Table 10: Static Regression with EFF1, Standard Heckman

Static Regression with EFF1 (incl. capital costs): Yearly results

	1998		1999		2000		2001	
	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.
EFF1	0,065	0,045	0,056	0,045	0.118**	0,053	0.084*	0,047
SIZE	0,029	0,034	0,006	0,031	0,018	0,013	-0,013	0,024
MS	-0,817	0,583	-0,059	0,534	-0,169	0,216	0,195	0,415
SPEZ	-1.258***	0,424	-0,441	0,549	-1.012**	0,473	-0.727**	0,339
RNOR	-0,388	0,231	-0,114	0,232	-0,023	0,178	1.467***	0,308
OBS	0.5**	0,195	0,131	0,199	0.434*	0,239	-0,099	0,149
PUB	0,007	0,039	0,01	0,036	-0,055	0,048	0,06	0,047
HHI	1.01**	0,426	1,176	0,829	1.909**	0,878	1,277	2,110
EXRET	-0,036	0,367	1,288	2,552	0.818**	0,375	-0,296	0,872
NIM	9.749***	2,903	28,731	48,829	7,249	4,927	-1,931	3,596
IMR	-0,014	0,027	0,005	0,033	-0,018	0,015	0,015	0,023
Constant	-0,352	0,503	-0,89	1,931	-0,491	0,299	-0,76	0,622
N	48		58		61		62	
R^2	0,574		0,205		0,344		0,6804	

Estimation using Heckman Procedure and robust standard errors, EFF1= Efficiency, MS= Market share, SPEZ= Specialization, RNOR= Real Net Output Ratio,OBS= Share of OBS, PUB= Savings/cooperative bank, HHI= Hirschmann-Herfindahl-Index, EXRET= Stock exchange return, NIM= Net Interest Margin, IMR= Inverse Mills Ratios

Continued

	2002		2003		2004		2005	
	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.
EFF1	0.087**	0,034	0.06*	0,035	0,01	0,047	0.105**	0,042
SIZE	-0,009	0,014	-0.042*	0,023	0,009	0,015	0,012	0,019
MS	-0,086	0,328	0,794	0,478	-0,313	0,346	-0,279	0,328
SPEZ	-0,407	0,331	0,047	0,536	0,318	0,680	-1.04*	0,564
RNOR	0.393***	0,139	0,103	0,152	-0.28*	0,161	0.35*	0,176
OBS	-0,032	0,149	-0,207	0,265	-0,086	0,331	0,294	0,275
PUB	0,014	0,039	0,068	0,057	-0,003	0,036	-0,115	0,084
HHI	0,496	0,460	1.762**	0,843	1.206*	0,614	0.968*	0,556
EXRET	0.456*	0,268	-0,042	0,410	2.124***	0,760	-2,568	1,546
NIM	-2,352	3,344	3,162	3,903	-1,383	5,155	-35,662	23,644
IMR	0	0,012	0,008	0,012	-0,009	0,011	-0,005	0,004
Constant	0,088	0,241	0,26	0,213	-0.299**	0,140	0,545	0,464
N	63		66		64		66	
R^2	0,462		0,291		0,439		0,282	

Estimation using Heckman Procedure and robust standard errors, EFF1= Efficiency, MS= Market share, SPEZ= Specialization, RNOR= Real Net Output Ratio,OBS= Share of OBS, PUB= Savings/cooperative bank, HHI= Hirschmann-Herfindahl-Index, EXRET= Stock exchange return, NIM= Net Interest Margin, IMR= Inverse Mills Ratios

Table 11: Static Regression with EFF1, 2-Step FGLS

Static Regression with EFF1 (incl. capital costs): Yearly results

	1998		1999		2000		2001	
	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.
EFF1	0.086*	0,050	0,054	0,048	0,081	0,049	0.095**	0,040
SIZE	0,029	0,031	-0,012	0,027	0.027**	0,012	-0,02	0,024
MS	-0.952*	0,504	0,123	0,466	-0,285	0,242	0,18	0,422
SPEZ	-1.363***	0,440	-0,43	0,526	-0,575	0,578	-0,687	0,465
RNOR	-0.443**	0,197	-0,23	0,198	0,199	0,160	1.384***	0,272
OBS	0.552***	0,189	0,085	0,255	0,28	0,279	-0,008	0,246
PUB	-0,009	0,038	0,012	0,041	-0,038	0,040	0,063	0,040
HHI	1.205*	0,624	2.407**	1,117	2.407**	1,002	0,379	1,824
EXRET	0,093	0,417	0,324	3,174	1.003**	0,392	-0,031	0,738
NIM	9.128***	3,173	8,517	61,156	10.292*	5,158	-2,386	3,620
IMR	-0,016	0,034	0,029	0,032	-0.025*	0,013	0,028	0,019
Constant	-0,377	0,516	0,008	2,213	-0.802***	0,235	-0,529	0,518
N	46		51		58		54	
Adj. R^2	0,603		0,235		0,541		0,6003	

Estimation using Heckman Procedure and 2-Step-GLS (efficient weights), EFF1= Efficiency, MS= Market share, SPEZ= Specialization, RNOR= Real Net Output Ratio,OBS= Share of OBS, PUB= Savings/cooperative bank, HHI= Hirschmann-Herfindahl-Index, EXRET= Stock exchange return, NIM= Net Interest Margin, IMR= Inverse Mills Ratios

Continued

	2002		2003		2004		2005	
	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.
EFF1	0.071*	0,037	0,074	0,066	0,02	0,044	0,088	0,064
SIZE	-0,003	0,015	-0.049**	0,020	0,01	0,020	0,035	0,022
MS	-0,092	0,299	1.419**	0,673	-0,296	0,396	-0,584	0,470
SPEZ	-0,4	0,473	0,305	0,595	0,121	0,907	-1.939*	0,987
RNOR	0.406**	0,154	0,145	0,172	-0.29*	0,170	0.39*	0,197
OBS	-0,018	0,253	-0,327	0,307	0,006	0,497	0,714	0,459
PUB	0,003	0,039	0.1*	0,055	0,003	0,041	-0.168***	0,057
HHI	0,679	0,540	0,68	0,585	1.093*	0,594	-0,488	0,909
EXRET	0.645**	0,308	0,289	0,393	2.02**	0,912	-1,425	1,576
NIM	-3,085	3,774	4,834	4,907	-1,875	6,189	-31,317	22,408
IMR	-0,006	0,012	0,012	0,012	-0,01	0,015	-0.01**	0,004
Constant	0,082	0,238	0,309	0,192	-0,297	0,256	0,223	0,650
N	58		56		54		48	
Adj. R^2	0,510		0,245		0,390		0,374	

Estimation using Heckman Procedure and 2-Step-GLS (efficient weights), EFF1= Efficiency, MS= Market share, SPEZ= Specialization, RNOR= Real Net Output Ratio,OBS= Share of OBS, PUB= Savings/cooperative bank, HHI= Hirschmann-Herfindahl-Index, EXRET= Stock exchange return, NIM= Net Interest Margin, IMR= Inverse Mills Ratios

Table 12: Static Regression with EFF2, Standard Heckman

Static Regression with EFF2 (national production frontier): Yearly results

	1998		1999		2000		2001	
	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.
EFF2	-0,003	0,060	0.093*	0,052	0,034	0,066	0,001	0,082
SIZE	0,031	0,032	-0,009	0,024	0,01	0,020	-0,016	0,029
MS	-0,831	0,873	0,395	0,798	-0,126	0,457	0,59	0,813
SPEZ	-1.174*	0,595	-0.853**	0,397	-1.07*	0,567	-0,489	0,410
RNOR	-0,314	0,240	0,108	0,168	0,141	0,212	1.414***	0,347
OBS	0.507*	0,263	0,191	0,158	0.531*	0,280	-0,261	0,202
PUB	-0,013	0,041	0,023	0,034	-0,08	0,057	0,04	0,047
HHI	1.399**	0,626	1.375*	0,794	2.308*	1,278	1,737	2,137
EXRET	0,029	0,399	1,09	2,337	0,86	0,542	-0,375	0,845
NIM	9.379**	3,869	21,839	44,649	4,52	6,124	-2,588	3,453
IMR	-0,039	0,035	0,008	0,025	-0,014	0,024	0,007	0,018
Constant	-0,38	0,445	-0,688	1,623	-0,441	0,403	-0,623	0,627
N	42		53		54		56	
R^2	0,523		0,385		0,269		0,6748	

Estimation using Heckman Procedure and robust standard errors, EFF2= Efficiency, MS= Market share, SPEZ= Specialization, RNOR= Real Net Output Ratio,OBS= Share of OBS, PUB= Savings/cooperative bank, HHI= Hirschmann-Herfindahl-Index, EXRET= Stock exchange return, NIM= Net Interest Margin, IMR= Inverse Mills Ratios

Continued

	2002		2003		2004		2005	
	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.
EFF2	0	0,037	-0,061	0,067	-0,009	0,035	0,04	0,048
SIZE	-0,01	0,021	-0,047	0,030	0,001	0,014	0,006	0,023
MS	0,123	0,751	1,506	0,897	0,288	0,292	0,317	0,529
SPEZ	-0,359	0,381	0,483	0,584	0,141	0,619	-0,277	0,627
RNOR	0.327*	0,176	0,012	0,172	-0,134	0,116	0.324*	0,167
OBS	-0,063	0,164	-0,298	0,246	-0,024	0,331	0,006	0,300
PUB	-0,02	0,050	0,077	0,073	-0,002	0,036	-0,134	0,085
HHI	0,64	0,540	1,522	0,928	1.219**	0,525	0,66	0,631
EXRET	0,476	0,368	0,3	0,522	1.65**	0,778	-2,814	1,724
NIM	-4,432	4,757	6,223	5,831	-2,277	4,918	-41,112	26,021
IMR	-0,004	0,016	0,009	0,015	-0,012	0,011	-0,003	0,002
Constant	0,271	0,273	0,343	0,242	-0,198	0,166	0.842*	0,489
N	55		58		57		62	
R^2	0,385		0,245		0,431		0,259	

Estimation using Heckman Procedure and robust standard errors, EFF2= Efficiency, MS= Market share, SPEZ= Specialization, RNOR= Real Net Output Ratio,OBS= Share of OBS, PUB= Savings/cooperative bank, HHI= Hirschmann-Herfindahl-Index, EXRET= Stock exchange return, NIM= Net Interest Margin, IMR= Inverse Mills Ratios

Table 13: Static Regression with EFF2, 2-Step FGLS

Static Regression with EFF2 (national production frontier): Yearly results

	1998		1999		2000		2001	
	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.
EFF2	0,017	0,065	0.115**	0,047	0,062	0,066	0,094	0,079
SIZE	0,029	0,034	0,006	0,025	0,005	0,017	-0,039	0,031
MS	-0,734	0,871	0,06	0,643	-0,174	0,435	1,119	0,896
SPEZ	-1.223**	0,585	-0.784*	0,447	-0,868	0,535	-0,703	0,510
RNOR	-0,324	0,221	-0,141	0,185	-0,1	0,236	1.438***	0,321
OBS	0.483*	0,250	0,158	0,210	0.481*	0,266	-0,088	0,259
PUB	-0,012	0,043	-0,02	0,041	-0.098**	0,047	0,065	0,042
HHI	1,425	0,856	1.837*	0,975	1,749	1,274	1,185	2,411
EXRET	0,125	0,526	3,079	2,911	0,607	0,506	-0,177	0,948
NIM	5,976	3,679	57,614	55,958	2,057	5,713	-4,068	4,395
IMR	-0,043	0,043	-0,008	0,025	-0,018	0,022	0,014	0,017
Constant	-0,303	0,534	-1,867	1,986	-0,167	0,382	-0,353	0,646
N	40		46		50		46	
Adj. R^2	0,485		0,463		0,292		0,6101	

Estimation using Heckman Procedure and 2-Step-GLS (efficient weights), EFF2= Efficiency, MS= Market share, SPEZ= Specialization, RNOR= Real Net Output Ratio,OBS= Share of OBS, PUB= Savings/cooperative bank, HHI= Hirschmann-Herfindahl-Index, EXRET= Stock exchange return, NIM= Net Interest Margin, IMR= Inverse Mills Ratios

Continued

	2002		2003		2004		2005	
	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.
EFF2	0,012	0,045	-0,007	0,047	-0,027	0,051	0,039	0,094
SIZE	-0,013	0,024	-0,036	0,024	0,004	0,017	0,019	0,026
MS	0,294	0,783	0,616	0,966	0,204	0,387	-0,091	0,696
SPEZ	0,03	0,757	0,592	0,658	0,495	0,647	-0,295	1,148
RNOR	0,279	0,183	0,09	0,231	-0,072	0,112	0,351	0,236
OBS	-0,272	0,419	-0,177	0,293	-0,193	0,301	0,023	0,618
PUB	0	0,054	0,075	0,063	0,003	0,037	-0.168**	0,064
HHI	0,832	0,656	2.708***	0,916	1.205**	0,463	-0,189	1,005
EXRET	-0,032	0,607	0,034	0,528	1.279*	0,720	-3.3*	1,828
NIM	-0,141	5,726	8,548	5,160	-0,092	4,692	-55.155*	27,009
IMR	0,001	0,018	0,008	0,019	-0,01	0,012	-0,004	0,002
Constant	0,074	0,371	-0,057	0,329	-0,227	0,225	1,103	0,741
N	48		49		51		43	
Adj. R^2	0,292		0,306		0,395		0,297	

Estimation using Heckman Procedure and 2-Step-GLS (efficient weights), EFF2= Efficiency, MS= Market share, SPEZ= Specialization, RNOR= Real Net Output Ratio,OBS= Share of OBS, PUB= Savings/cooperative bank, HHI= Hirschmann-Herfindahl-Index, EXRET= Stock exchange return, NIM= Net Interest Margin, IMR= Inverse Mills Ratios

Table 14: Static Regression with EFF3, Standard Heckman

Static Regression with EFF3 (European production frontier): Yearly Results

	1998		1999		2000		2001	
	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.
EFF3	0.214**	0,100	0.372***	0,096	0.212**	0,098	0.168**	0,073
SIZE	-0,016	0,028	-0,021	0,019	-0,009	0,010	-0,017	0,015
MS	-0,323	0,407	-0,091	0,249	-0,039	0,219	-0,238	0,360
SPEZ	-1.437***	0,383	-0,323	0,362	-0,736	0,472	-0,511	0,396
RNOR	-0.461*	0,236	0,015	0,203	-0,176	0,227	1.451***	0,294
OBS	0.459***	0,152	0,03	0,123	0,261	0,250	-0,218	0,195
PUB	0,022	0,036	0,015	0,030	-0,05	0,052	0,026	0,038
HHI	0.689*	0,392	1.514**	0,583	1,072	0,946	1,785	1,435
EXRET	-0,112	0,320	3.84*	2,236	0,485	0,379	-0,585	0,578
NIM	9.269***	2,847	79.793*	42,479	3,85	4,553	-2,434	3,275
IMR	-0,005	0,023	-0,002	0,015	0	0,005	0,001	0,002
Constant	0,278	0,361	-2,313	1,482	0,044	0,287	-0.765*	0,386
N	48		58		60		62	
R^2	0,616		0,432		0,299		0,6794	

Estimation using Heckman Procedure and robust standard errors, EFF3= Efficiency, MS= Market share, SPEZ= Specialization, RNOR= Real Net Output Ratio,OBS= Share of OBS, PUB= Savings/cooperative bank, HHI= Hirschmann-Herfindahl-Index, EXRET= Stock exchange return, NIM= Net Interest Margin, IMR= Inverse Mills Ratios

Continued

	2002		2003		2004		2005	
	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.
EFF3	0.069**	0,034	0,022	0,060	-0,024	0,075	0.089*	0,053
SIZE	-0,017	0,012	-0.046**	0,021	-0,001	0,014	0,004	0,018
MS	-0,106	0,251	0.732*	0,427	-0,165	0,340	-0,189	0,260
SPEZ	-0,261	0,293	0,246	0,504	0,487	0,696	-0,644	0,614
RNOR	0.322*	0,160	0,099	0,157	-0.284*	0,162	0.275*	0,162
OBS	-0,094	0,123	-0,256	0,252	-0,165	0,340	0,151	0,320
PUB	0,001	0,034	0,063	0,055	0,017	0,035	-0,12	0,079
HHI	0,629	0,502	1.777**	0,880	1.597**	0,617	0,864	0,571
EXRET	0.471**	0,207	0,059	0,408	1.668**	0,723	-2,421	1,450
NIM	-3,216	3,501	3,602	3,978	1,68	5,387	-35,663	22,285
IMR	0,001	0,003	0,008	0,009	0,001	0,006	-0,001	0,001
Constant	0,279	0,249	0,312	0,215	-0,201	0,148	0,7	0,469
N	63		66		63		66	
R^2	0,424		0,289		0,436		0,239	

Estimation using Heckman Procedure and robust standard errors, EFF3= Efficiency, MS= Market share, SPEZ= Specialization, RNOR= Real Net Output Ratio,OBS= Share of OBS, PUB= Savings/cooperative bank, HHI= Hirschmann-Herfindahl-Index, EXRET= Stock exchange return, NIM= Net Interest Margin, IMR= Inverse Mills Ratios

Table 15: Static Regression with EFF3, 2-Step FGLS

Static Regression with EFF3 (European production frontier): Yearly Results

	1998		1999		2000		2001	
	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.
EFF3	0.198**	0,084	0.37***	0,101	0.156*	0,091	0.28***	0,084
SIZE	0,008	0,027	-0,002	0,019	-0,016	0,014	-0,028	0,022
MS	-0.666*	0,362	-0,126	0,407	0,039	0,293	-0,327	0,403
SPEZ	-1.357***	0,413	-0,186	0,625	-1.123**	0,511	-0,117	0,476
RNOR	-0.635***	0,187	0,197	0,153	-0,182	0,200	1.46***	0,270
OBS	0.388*	0,197	0,168	0,395	0.492*	0,263	-0,33	0,255
PUB	0,001	0,033	-0,001	0,032	-0.09**	0,038	0,009	0,036
HHI	1,002	0,614	-5,604	4,972	1,077	1,096	1,886	1,809
EXRET	0,234	0,391	-13,422	13,063	0,455	0,407	-0,699	0,761
NIM	9.094***	3,037	-266,222	259,566	-0,738	5,144	-1,034	3,796
IMR	-0,02	0,029	-0,022	0,017	0	0,005	0,001	0,002
Constant	0,016	0,405	8,415	8,303	0,229	0,292	-0,746	0,444
N	46		46		59		50	
Adj. R^2	0,626		0,514		0,304		0,6143	

Estimation using Heckman Procedure and 2-Step-GLS (efficient weights), EFF3= Efficiency, MS= Market share, SPEZ= Specialization, RNOR= Real Net Output Ratio,OBS= Share of OBS, PUB= Savings/cooperative bank, HHI= Hirschmann-Herfindahl-Index, EXRET= Stock exchange return, NIM= Net Interest Margin, IMR= Inverse Mills Ratios

Continued

	2002		2003		2004		2005	
	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.	Coefficient	Std. dev.
EFF3	0.112**	0,054	-0,004	0,085	0,028	0,072	0,026	0,103
SIZE	-0,008	0,011	-0,013	0,017	-0,005	0,015	0,01	0,018
MS	-0,451	0,303	0,413	0,435	0,03	0,321	-0,019	0,433
SPEZ	-0,406	0,496	-0,162	0,537	1,07	0,885	0,538	0,959
RNOR	0.348**	0,146	-0,034	0,183	-0.294*	0,166	0,23	0,216
OBS	0,005	0,265	-0,143	0,285	-0,557	0,471	-0,378	0,497
PUB	-0,006	0,031	0,04	0,050	0,024	0,034	-0.115*	0,056
HHI	0,664	0,497	1.976***	0,675	1.297**	0,582	1,243	0,749
EXRET	-0,362	0,494	0	0,367	1.542**	0,763	-3.734**	1,606
NIM	1,229	4,102	3,703	4,664	2,287	5,853	-45.938*	24,687
IMR	0	0,003	-0,002	0,004	0	0,007	-0,001	0,001
Constant	-0,226	0,305	0,031	0,205	-0,057	0,201	1,023	0,686
N	57		57		55		49	
Adj. R^2	0,349		0,294		0,422		0,349	

Estimation using Heckman Procedure and 2-Step-GLS (efficient weights), EFF3= Efficiency, MS= Market share, SPEZ= Specialization, RNOR= Real Net Output Ratio,OBS= Share of OBS, PUB= Savings/cooperative bank, HHI= Hirschmann-Herfindahl-Index, EXRET= Stock exchange return, NIM= Net Interest Margin, IMR= Inverse Mills Ratios

Table 16: Panel Regression, Bootstrapping Method

Panel Regression with EFF1 (incl. capital costs)			
Variable	Coefficient	95% Confidence Interval	
EFF1	0.096***	0.027	0.291
SIZE	-0.087	-0.351	0.087
MS	0.000	-1.420	3.267
SPEZ	1.530***	0.712	7.251
FINOR	-0.012	-0.687	0.433
OBS	-0.702**	-4.794	-0.241
HERF	-0.628**	-2.551	-0.265
EXRET	0.049**	0.009	0.174
NIM	10.860***	5.060	25.077
Growth	0.041	-0.046	0.326
π(t-1)	0.060	-0.213	0.544
Konstante	-0.006	-0.037	0.005
N		3481	
Replications		1000	
R^2		0.136	
Prob > F		0.579	

Panel Regression with EFF2 (national production frontier)			
Variable	Coefficient	95% Confidence Interval	
EFF2	0.064**	0.026	0.177
SIZE	0.02	-0.118	0.259
MS	-0.427	-4.307	1.238
SPEZ	1.118**	0.015	3.060
FINOR	0.078	-0.406	0.474
OBS	-0.454*	-1.591	0.059
HERF	-0.755***	-2.509	-0.399
EXRET	0.031	-0.020	0.116
NIM	20.418***	18.398	30.688
Growth	0.008	-0.054	0.117
π(t-1)	-0.131	-0.380	0.249
Konstante	0.008	-0.006	0.037
N		3481	
Replications		1000	
R^2		0.146	
Prob > chi2		0.650	

Panel Regression with EFF3 (European production frontier)			
Variable	Coefficient	95% Confidence Interval	
EFF3	0.197***	0.169	0.306
SIZE	-0.057	-0.291	0.093
MS	-0.288	-1.742	1.653
SPEZ	1.078*	-0.084	2.483
FINOR	-0.308*	-0.925	-0.121
OBS	-0.516*	-1.621	0.030
HERF	-0.937***	-2.223	-0.728
EXRET	0.024	-0.042	0.083
NIM	10.224**	4.081	26.772
Growth	0.006	-0.080	0.144
π(t-1)	0.168**	0.026	0.537
Konstante	-0.008*	-0.030	0.001
N		3481	
Replications		1000	
R^2		0.145	
Prob > chi2		0.426	

As instrument for the growth in profitability of the previous year, the profitability of period t-2 was taken. Growth = Growth in SIZE, π(t-1) = NRoE previous year

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