

What Determines the Profitability of Commercial Banks?

New Evidence from Switzerland

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This version: January 2009

Abstract

This paper analyzes the profitability of commercial banks in Switzerland over the time period from 1999 to 2006. Our sample includes 1'919 observations from 453 banks. Besides bank-specific characteristics, we include a set of macroeconomic and industry-specific variables into our regression analyses. Our results show that there exist significant differences in profitability between commercial banks in Switzerland and that these differences can to a large extent be explained by the factors included in our analysis. Also, our model specification, which includes several variables that have not been considered before, generates new insights for a better understanding of banking performance.

Key Words: Banking Profitability; Macroeconomic Impact on Banking Profitability; Financial Structure, Ownership

EFM Classification: 510; 180; 150; 560

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We would like to thank the Lucerne University of Applied Sciences and Arts for their financial support.

1. Introduction

It is a widely held view that despite recent trends of financial disintermediation and growth in market-based finance, the role of banks is essential to the performance and operation of modern economies. The literature on the bank-lending channel has pointed out for long that a great deal of economic activity would be seriously hampered if the most prominent agents in the credit markets, the commercial banks, did not execute their function properly. A sound and profitable banking sector is better able to resist negative shocks and contributes to the stability of the financial system.

During the last two decades, the banking sector all around the world has experienced major transformations in its environment, resulting in significant impacts on its performance. Thereby, both external and internal factors have been affecting the profitability of banks over time. Identifying the key success factors of commercial banks allows to formulate policies for improving the profitability of the banking industry. Therefore, the determinants of bank profitability has attracted the interest of academic research as well as of bank management, financial markets and bank supervisors. Finally, the study of bank performance becomes even more important also in view of the ongoing financial and economic crises, which will have a fundamental impact on the banking industry in many countries around the globe.

The present paper follows in the footsteps of Molyneux and Thornton (1992), Demirguc-Kunt and Huizinga (1999), and Micco et al. (2007). Following these studies and in accordance with the majority of other research analyzing the determinants of bank profitability, our paper uses a linear model to estimate the impact of various bank- and market-specific factors on the profitability of commercial banks. However, our study differs from the above papers in several important aspects and adds several key aspects to the existing literature on banking performance. First, there is to our best knowledge no econometric study that has examined the important issue of the determinants of the banking profitability for the Swiss banking market. Data from Switzerland offers a particularly advantageous environment to analyze these issues as Switzerland has a banking-oriented financial system. Also, the Swiss banking industry does not only play a significant role for the Swiss economy, but Switzerland is one of the most important banking centers in the world. In addition, we also consider region-specific factors which heavily differ between the Swiss cantons. Therefore, the present study fills an important gap in the

existing literature and improves the understanding of bank profitability in Switzerland. Second, we provide recent evidence by analyzing the years from 1999 to 2006. Given the changes that occurred in the banking sector over the last ten years, an updated consideration of these issues is necessary and may provide additional insights. Third, we extend earlier work by adding new bank- as well as market-specific determinants of bank profitability, such as, e.g., the growth of a bank's loans relative to the growth rate of the market, the share of interest income relative to total income, bank age, bank ownership, regional population growth and the effective tax rate. The inclusion of these additional determinants improve our understanding of bank performance in significant ways.

In our study, we measure bank profitability by the return on average assets and the return on average equity. As to the explanatory variables, we divide them into three different categories, namely bank-specific characteristics, industry-specific factors and macroeconomic determinants of commercial bank profitability. The most interesting results for our main profitability measure return on average assets are as follows. Better capitalized bank seem to be more profitable. In addition, an above-average loan volume growth affects bank profitability positively. The share of interest income at total income also has a significant impact on profitability. Banks that are heavily dependent on interest income are less profitable than banks whose income is more diversified. As to the geographic distribution, banks in the Lake Geneva region, which is the second most important banking area in Switzerland, are slightly more profitable than banks in the Zurich region. Looking at the ownership variables, foreign banks are clearly less profitable than Swiss owned banks, and privately owned institutions are slightly more profitable than state-owned banks. Finally, the market-specific characteristics included in our analyses also explain differences in banking profitability. The most important factors are the GDP growth rate, which has a positive impact on bank profitability, and the effective tax rate and the bank concentration rate, which both negatively influence bank profitability. Overall, our results provide interesting new insights for a better understanding of the mechanisms that determine the profitability of commercial banks in Switzerland.

The paper is organized as follows: In Section 2, we survey the relevant literature on banking profitability and provide an overview of the Swiss banking market. Section 3 describes our model and the dependent and independent variables. In Section 4, we specify and describe the

sample and methodology used. In Section 5, we present the results from our empirical analysis. Section 6 concludes.

2. Theoretical Background

2.1. Literature on determinants of bank profitability

Following early work by Short (1979) and Bourke (1989), a number of more recent studies have attempted to identify some of the major determinants of bank profitability. The respective empirical studies have focused their analyses either on cross-country evidence or on the banking system of individual countries. The studies of Molyneux and Thornton (1992), Demircuc-Kunt and Huizinga (1999), Abreu and Mendes (2002), Staikouras and Wood (2004), Goddard et al. (2004), Athanasoglou et al. (2006), Micco et al. (2007) and Pasiouras and Kosmidou (2007) investigate a panel data set. Studies of Berger et al. (1987), Berger (1995), Neely and Wheelock (1997), Naceur (2003), Mamatzakis and Remoundos (2003), Naceur and Goaeid (2001, 2005), Aburime (2008) and Athanasoglou et al. (2008) focus their analyses on single countries. The empirical results of these above-mentioned studies vary, as datasets, time periods and the investigated environment and countries differ. However, there exist some mutual elements that allow to further categorize the determinants of banking profitability.

Bank profitability is usually measured by the return on average assets and is expressed as a function of internal and external determinants. The internal determinants include bank-specific variables. The external variables reflect environmental variables that are expected to affect the profitability of financial institutions.

In most studies, variables such as bank size, risk and overhead costs are used as internal determinants of banking profitability. Pasiouras and Kosmidou (2007) find a positive and significant relationship between the size and the profitability of a bank. Other authors, such as Berger et al. (1987), provide evidence that costs can be reduced only slightly by increasing the size of a bank and that very large banks are often even facing scale inefficiencies. Micco et al. (2007) find no correlation between the relative bank size and the ROAA for banks, i.e., the coefficient is always positive but never statistically significant. Another determinant of bank profitability is the risk a bank is facing. Abreu and Mendes (2002), who examined banks in Portugal, Spain, France and Germany, find that the loans-to-assets ratio, as a proxy for risk, has a

positive impact on the profitability of banks. Bourke (1989) and Molyneux and Thornton (1992), among others, find a negative and significant relationship between the level of risk and profitability. This result might be explained by taking into account that financial institutions that are exposed to high-risk loans also have a higher accumulation of unpaid loans. These loan losses lower the returns of the affected banks.

Empirical evidence from Bourke (1989), Demirguc-Kunt and Huizinga (1999), Abreu and Mendes (2002), Goddard et al. (2004), Naceur and Goaid (2001, 2005), and Pasiouras and Kosmidou (2007) indicate that the best performing banks are those who maintain a high level of equity relative to their assets. The authors explain this relation with the observation that banks with higher capital ratios tend to face lower costs of funding due to lower prospective bankruptcy costs. Furthermore, also overhead costs are an important determinant of profitability: the higher the overhead costs in relation to the assets, the lower the profitability of a bank (e.g., Athanasoglou et al., 2008). A further bank-specific variable is the ownership of a bank. Micco et al. (2007) found that bank ownership is influencing the performance of a bank. According to these results, state-owned banks operating in developing countries tend to have a lower profitability, lower margins and higher overhead costs than comparable privately owned banks. When focusing on industrial countries, this relationship has been found to be much weaker. Iannotta, Nocera and Sironi (2007) point out that government-owned banks exhibit a lower profitability than privately owned banks. Demirguc-Kunt and Huizinga (2000) suggest that the international ownership of banks has a significant impact on bank profitability. Foreign banks are shown to be less profitable in developed countries. In contrast, Bourke (1989) as well as Molyneux and Thornton (1992) report that the ownership status is irrelevant for explaining bank profitability. They find little evidence to support the theory that privately-owned banks are more profitable than state-owned banks. Furthermore, Beck et al. (2005) controlled for the age of the bank since longer established banks might enjoy performance advantages over relative newcomers. Their results for the Nigerian market indicate that older banks perform worse as new entrants into the market were better able to pursue new profit opportunities.

External determinants of bank profitability used in literature are factors such as central bank interest rate, inflation, the GDP development, taxation, or variables representing market characteristics (e.g. market concentration). Most studies have thereby shown a positive relationship between inflation, central bank interest rates, GDP growth and bank profitability

(e.g., Bourke, 1989; Molyneux and Thornton, 1992; Demirguc-Kunt and Huizinga, 1999; Athanasoglou et al., 2008). Furthermore, there is some evidence that legal and institutional characteristics of a country matter. The study of Demirguc-Kunt and Huizinga (1999) reports that taxation negatively affects bank profitability. Another study by Albertazzi and Gambacorta (2006) concludes that the impact of taxation on the banking profitability is small as banks can shift a large fraction of their tax burden towards depositors, borrowers or purchasers of fee-generating services. Overall, although fiscal issues are likely to exert a significant influence on banks' behavior, the taxation of the financial sector has received little attention. To measure the effects of market structure on bank profitability, the structure-conduct-performance (market-power) hypothesis states that increased market power yields monopoly profits. According to the results of Bourke (1989) and Molyneux and Thornton (1992), the bank concentration ratio shows a positive, statistically significant relationship with the profitability of a bank and is, therefore, consistent with the traditional structure-conduct-performance paradigm. In contrast, the results of Demirguc-Kunt and Huizinga (1999) and Staikouras and Wood (2004) indicate a negative but statistically insignificant relationship between bank concentration and bank profits. The estimations by Berger (1995) and Mamatzakis and Remoundos (2003) do not support the structure-conduct performance hypothesis neither.

In sum, the existing literature provides a comprehensive explanation of the effects of bank-specific, industry-specific and macroeconomic determinants on bank profitability. Since the datasets and the investigated environments and markets differ significantly across the various studies, it is not surprising that the empirical results vary as well.

2.2. Earlier studies on Swiss Banking

As to our best knowledge, there are no similar investigations on banking profitability for Switzerland, and our study fills, therefore, an important gap in the literature. Many of the Swiss banking studies have instead focused on the relationship between the size of a bank and its efficiency. An early work by Hermann and Maurer (1991) empirically investigates economies of scope and scale using a translog cost function for the single year of 1989. The estimations indicate that there are economies of scale both in classic banking and in investment banking, except for the largest banks. In contrast, only larger banks can enjoy the benefits stemming from economies of scope. Sheldon and Haegler (1993) and Sheldon (1994) examine scale economies,

scope economies and cost efficiency for a panel of Swiss banks over the period from 1987 to 1990 by using both parametric and non-parametric methods. They find no strong evidence for substantial economies of scale and scope. However, inefficient banks in their sample tend to be small. Bikker (1999) examines the cost efficiency of the banking systems in nine European countries using the stochastic frontier approach and an alternative method based on country-specific dummies. This study indicates that Swiss banks rank among the best in terms of cost efficiency. However, this study does neither examine scale and scope economies, nor does it report correlates between efficiency and size.

Rime and Stiroh (2003) analyze the performance of Swiss banks from 1996 to 1999. They find evidence of economies of scale for small and mid-sized banks, but little evidence that significant scale economies exist for the very largest banks. Furthermore, evidence on scope economies is weak for the largest banks. A more recent study by Freuler (2005) examines scale economies and cost efficiency for a panel of 1737 commercial and savings banks in Switzerland, Norway and the European Union over the period from 1983 to 1997. The author does not find empirical evidence for economies of scale, and mergers and an increasing bank size do not lead to more efficient banks.

Further investigations of the Swiss banking markets more focus on the banking relationships (e.g., Neuberger and Schacht, 2005; Neuberger, et al., 2008) or on the relationship between changes in risk and changes in leverage (Bichsel and Blum, 2002). A study by Egli and Rime (1999) analyzes the impact of the UBS-SBC merger on the concentration in the Swiss retail banking market and the expected consequences for the consumers. As a result, they find no significant relationship between the market concentration and interest rates for mortgages.

To conclude, there are a number of papers dealing with the Swiss banking market, but so far, no study has analyzed the profitability determinants of Swiss banks within the framework used in our paper.

2.3. Understanding the Swiss banking market

The Swiss banking system is based on the concept of universal banking, where all banks can offer all banking services. Nevertheless, many different specialized bank groups have developed. As of 2006, there are 331 authorized banks and securities dealers in Switzerland, ranging from the "two big banks" down to small banks serving the needs of a single community or a few

special clients. Swiss banks vary in their use of the option to engage in all financial activities. On the one side, there exist truly universal banks. On the other hand, there are institutions specializing either in traditional banking or in asset management. In the official statistics maintained by the Swiss National Bank, Swiss banks are classified into seven major groups: The (two) big banks, the cantonal banks, regional and savings banks, Raiffeisen banks, foreign owned banks, private bankers and other banks. In order to better understand our sample and subsequent empirical work, it is useful to provide a brief description of each type.

The two "big" banks - UBS AG and the Credit Suisse Group are the largest and second largest Swiss banks and account together for over 50% of the balance sheet total of all banks in Switzerland. Both banks have extensive branch networks throughout the country and most international centers. UBS is the world's leader in wealth management and Switzerland's leading bank for individual and corporate clients. It is also an important global player in investment banking and the securities business. Credit Suisse is a global acting bank headquartered in Zurich and also an important player in the Swiss market for individual and corporate clients. We include both big banks in our sample as they pursue all lines of financial activities and as they are the key actors in most segments of the domestic commercial banking activities.

Cantonal banks are either 100 percent or partially state-owned banks. The majority of their capital is always owned by the cantons, which also guarantee their liabilities. Formerly one to two per canton, there are today 24 Cantonal banks (in Switzerland's 26 cantons and half-cantons). Cantonal banks vary both in size and in their business activities. They are engaged in all banking businesses with an emphasis on lending/deposit business and operate primarily in the market of their home canton. Their objective, according to cantonal law, is to promote the canton's economy. However, Cantonal banks must comply with commercial principles in their business activities. All the Cantonal banks together account for around 30 percent of banking business in Switzerland and have a combined balance sheet total of more than 300 billion Swiss francs. As these banks are mainly active in the traditional commercial banking business, we include all 24 cantonal banks in our sample.

Regional and savings banks are mainly small banks focusing on traditional banking and limited to often very small geographical areas. They are almost all included in our sample.

As a group of banks with the largest branch network in Switzerland, 390 Raiffeisen banks with totally 1154 branches together form Raiffeisen Switzerland. Raiffeisen Switzerland coordinates the group's activities, creates the conditions for the business activities of the local Raiffeisen banks and advises and supports them in many issues. The bank group is organized as a cooperative and has positioned and established itself as the third largest bank group in Switzerland. As one of Switzerland's leading retail banks, Raiffeisen is mainly focusing on mortgage lending. Raiffeisen meanwhile counts 1.4 million Swiss citizens as members of the cooperative and hence co-owners of their Raiffeisen bank. However, the Raiffeisen banks are still legally independent small banks located and active mainly in rural areas. Due to their legally independent status, we include the various Raiffeisen banks individually in our sample.

Foreign banks are institutions operating under Swiss banking law, but whose capital is primarily foreign controlled. Foreign-control means that foreigners with qualified interests hold over half of the company's votes. The origin of these foreign owned banks is predominantly Europe (over 50%) and Japan (around 20%). They differ widely in their size and activities. Some qualify as universal banks, while others focus on asset management. We only include foreign owned banks in our sample that are (also) active in the traditional banking activities. We exclude foreign owned banks that are only active in the asset management for private clients.

Private bankers are among the oldest banks in Switzerland. They are unincorporated firms, active primarily in the field of asset management for private clients. Private bankers are subject to unlimited subsidiary liability with their personal assets. As these banks are not active in the traditional banking field, - private banks do not publicly offer to accept savings deposits - and as they do not have to publish data, they are not included in our analysis.

The group "other banks" includes banks with various business objectives, such as institutes specializing in the stock exchange, securities and asset management businesses. For our sample, only banks active in the traditional lending business (mainly group 5.11 – commercial banks, according to the official statistics maintained by the Swiss National Bank) are considered for the analyses.

3. Determinants of bank profitability and variable selection

3.1. Dependent variables

We use the return on average assets (*ROAA*) as our main measure to evaluate bank profitability. The *ROAA* is defined as net profits of average total assets and is expressed in percent. As an alternative profitability measure, we use the return on average equity (*ROAE*), i.e., the net profits over average equity, expressed in percent.

The *ROAA* reflects the ability of a bank's management to generate profits from the bank's assets. It shows the profits earned per USD of assets and indicates how effectively the bank's assets are managed to generate revenues, although it might be biased due to off-balance-sheet activities. Average assets are being used in order to capture changes in assets during the fiscal year. As Golin (2001) points out, the *ROAA* has emerged as key ratio for the evaluation of bank profitability and has become the most common measure of bank profitability in the literature.

Our second profitability measure is the return on average equity *ROAE*, which is the return to shareholders on their equity. Banks with a lower leverage ratio (higher equity) usually report a higher *ROAA*, but a lower *ROAE*. However, note that the *ROAE* disregards the higher risk that is associated with a high leverage; at the same time, financial leverage is affected by regulation. Even though the *ROAE* is also commonly used in the literature, it is not the best profitability indicator. In what follows, we consider the *ROAA* as our more significant and better profitability measure and main dependent variable. However, we also report the results for the *ROAE*.

3.2. Independent variables: Determinants of bank profitability

3.2.1. Bank-specific determinants

We use the following twelve bank-specific characteristics as internal determinants of bank profitability:

Equity over total assets: As a proxy for the bank capital, we use the ratio of equity to assets. Banks with higher capital to asset ratios are considered relatively safer compared to institutions with lower ratios. Given that banks with low capital ratios are also riskier in comparison with better capitalized financial institutions, we expect them to have higher returns. In line with the conventional risk-return hypothesis, we expect a negative impact of the capital ratio on bank

profitability. On the other hand, highly capitalized banks are safer and remain profitable even during economically difficult times. Furthermore, a lower risk increases a bank's creditworthiness and reduces its funding cost. In addition, banks with higher equity to assets ratios will normally have a lower need of external funding, which has again a positive effect on their profitability. From this point of view, a higher capital ratio should have a positive effect on profitability. Given that we have effects pointing out in opposite directions, the theoretical expectation of how a bank's capitalization affects its profitability is indeterminate and remains to be answered by an empirical investigation.

Cost-income ratio: The cost-to-income ratio is defined as the operating costs (such as the administrative costs, staff salaries and property costs, excluding losses due to bad and non-performing loans) over total generated revenues. It is used to measure the impact of efficiency on bank profitability. We therefore expect higher cost-income ratios to have a negative effect on bank profitability.

Loan loss provisions over total loans: The ratio of loan loss provisions over total loans is a measure of a bank's credit quality. The loan loss provisions are reported on a bank's income statement. A higher ratio goes together with a lower credit quality and, therefore, a lower profitability. We thus expect a negative effect of the loan loss provisions relative to total loans on bank profitability.

Yearly growth of deposits: We measure a bank's growth by the annual growth of its deposits. A faster growing bank might be able to expand its business and to generate more profits. However, the contribution of an increasing amount of deposits to the profit depends upon a number of factors. First, it depends on the bank's ability to convert deposit liabilities into income earning assets. Growth is often achieved by lowering the credit quality, which then has a negative effect on bank profitability. In addition, high growth rates might also attract additional competitors. This again reduces the profits for all market participants. Therefore, the sign of this variable is either positive or negative.

Difference between bank and market growth of total loans: Furthermore, we include a variable measuring the growth of a bank's loan volume relative to the average market growth rate of the loans. On one hand, a bank with a higher growth rate of its loan volume (relative to the market's growth rates) might be more profitable due to the additional business generated. On the other

hand, it is also possible that a bank with above-average growth rates has a lower profitability as this growth might be a consequence of lower margins. Furthermore, a high growth of the loan volume might also lead to a decrease in credit quality and thus to a lower profitability. Given that we have effects pointing out in opposite directions, the overall effect on bank profitability is indeterminate and has to be answered empirically.

Bank size: We measure bank size by total assets. In order to identify potential size effects, we build dummy variables for small, medium and large banks. One of the most important questions in the literature is if there exists an optimal bank size in order to maximize bank profitability. It has been argued that a growing bank size is positively related to bank profitability (e.g., Smirlock, 1985; Pasiouras and Kosmidou, 2007). Larger banks are likely to have a higher degree of product and loan diversification than smaller banks. In addition to the higher diversification potential, economies of scale can also arise from a larger size. As diversification reduces risks and economies of scale lead to increased operational efficiency, we expect a positive effect of size on bank profitability. However, it is well known that banks that have become extremely large exhibit a negative relationship between size and profitability due to agency costs, bureaucratic processes and other reasons related to a large firm size. Accordingly, the overall effect is indeterminate from a theoretical point of view. As a robustness test, we use total assets as an alternative size variable in our analyses.

Interest income share: Swiss commercial banks are usually active in both traditional banking (interest operations) and, to a lesser extent, in asset management. As margins in asset management are usually higher than margins in interest operations, we expect banks with a higher share of interest income relative to their total income to be less profitable.

Bank age: We classify bank age into three different groups. The first group consists of banks founded after 1990. The second group contains banks founded between 1950 and 1990. The third group is composed of banks that were established before 1950. We expect older banks to be more profitable due to their longer tradition and the fact that they could build up a good reputation.

Bank ownership: As pointed out above, there exists strong empirical evidence that ownership affects bank profitability. At the same time, some studies find no significant relationship between the ownership status and the performance of a bank (e.g., Bourke, 1989 and Molyneux and

Thornton, 1992). In our model, we investigate whether the profitability of banks is affected by the type of owner, namely whether the bank is a private company or whether the state owns the bank partly or completely. We classify those banks as public in which public sector ownership is more than 50%. Furthermore, we investigate the effect of being listed at a stock exchange on bank profitability. On the one hand, listed banks face more pressure from their shareholders, the analysts and the financial markets overall, and this might have a positive impact on bank profitability. On the other hand, unlisted banks face fewer requirements with respect to the publication of information as well as to other aspects, which also cause significant costs. Therefore, the overall effect is indeterminate and remains to be answered empirically.

Nationality: In addition, we consider the nationality of the bank owner, i.e. whether the bank is a domestic or a foreign bank. An institution is defined as a foreign bank if at least 50 percent of the bank's stocks are in foreign hands. We expect foreign banks to be less familiar with the Swiss environment and, therefore, being less profitable compared to a Swiss owned bank.

Region: As the business of most of the commercial banks in Switzerland is limited to a geographically narrow area, which differs from each other in several important aspects, we control for the seven major regions in Switzerland as defined by the Swiss Federal Statistical Office (FSO). These seven regions are the Lake Geneva region, the Central Plain, Northwest Switzerland, Zurich, Eastern Switzerland, Central Switzerland and Southern Switzerland with its Italian-speaking canton of Ticino. We expect the profitability of a bank to be higher in regions where there is also a higher per capita income.

Bank category: Furthermore, we test whether there are differences in profitability between the banking categories as defined by the Swiss National Bank (SNB). As pointed out above, the banking groups in our sample are the big banks, the cantonal banks, regional and savings banks, Raiffeisen banks and other banks. The relationship between the bank category and the profitability is indeterminate and remains to be answered by our empirical investigation.

3.2.2. Macroeconomic and industry-specific characteristics (external factors)

Furthermore, we include a set of six macroeconomic and industry-specific characteristics, which are expected to have an impact on bank profitability as well.

Effective tax rate: The effective tax rate, defined as taxes paid divided by before-tax profits, reflects the explicit taxes paid by the banks (mostly corporate income taxes). Taxes have a direct

impact on a bank's profitability: The higher the tax rate levied, the lower the post-tax profit. This variable is important for the Swiss market as tax rates vary widely across the Swiss cantons. In Switzerland, every canton has its own tax regime. In line with the results of Demirguc-Kunt and Huizinga (1999), we expect a higher effective tax rate to have a negative impact on bank profitability.

Yearly change of regional population: An increase in the size of the market potentially increases a bank's business opportunities. If banks are able to expand their business by generating higher margins than the existing opportunities offer, profitability will be affected positively. However, increasing business opportunities do not necessarily always go together with a higher profitability, given that profit margins of additional business activities do not always increase, and even the opposite might sometimes be true. Furthermore, an increasing market potential also attracts additional competitors, which also reduces the profit opportunities for all market participants. Therefore, the effect of this variable on bank profitability is either positive or negative.

Real GDP growth: GDP growth is expected to have a positive impact on bank profitability according to the literature on the association between economic growth and financial sector profitability (e.g., Demirguc-Kunt and Huizinga, 1999; Bikker and Hu, 2002; Athanasoglou et al., 2008). Accordingly, we expect a positive relationship between bank profitability and GDP development as the demand for lending is increasing (decreasing) in cyclical upswings (downswings).

6 month Libor: We use the 6 month Libor in Swiss francs, as published by the Swiss National Bank (SNB), as a proxy for the monetary policy. The Libor is often used as a reference rate, e.g., for mortgage agreements, and is used by the central bank to steer the money supply. Including the Libor in our analyses allows us to see whether the monetary policy affects bank profitability. We use the Libor instead of the inflation rate as the latter is considered as a more endogenous factor. In line with the results of Short (1979) and Bourke (1992), we expect the central bank interest rate variable to affect banking profitability positively.

Stock market capitalization: Stock market capitalization refers to the value of listed shares relative to the GDP. On the one side, an increasing stock market capitalization can be interpreted as an indicator for financial disintermediation and growth in market-based finance. The threat of

substitution of bank finance by market-based finance might lead to lower interest rate margins and thus to less profitable bank. On the other side, it is also possible, that there is a positive relationship between this variable and the profitability of a bank as many Swiss banks are offering trading activities as additional service to their customers. In addition, the banks benefit from relatively high deposit fees for managing the portfolios of their customers with stock holdings. In sum, this relation is indeterminate and remains to be answered by our empirical investigation.

Bank concentration: We measure the market structure in the banking industry by means of the bank concentration variable. The bank concentration variable is defined as the ratio of the three largest banks' assets to the total assets of the entire banking sector. According to the structure-conduct-performance hypothesis, banks in highly concentrated markets earn monopoly rents, as they tend to collude (e.g. Gilbert, 1984). As collusion may result in higher rates being charged on loans and lower interest rates being paid on deposits, we expect that a higher bank concentration has a positive impact on profitability. On the other hand, a higher bank concentration might be the result of a tougher competition in the banking industry, which would suggest a negative relationship between performance and market concentration (Boone and Weigand, 2000). As a result, the overall effect of market concentration on banking performance is again indeterminate.

A summary of the definitions of our dependent and explanatory variables can be found in Table 1.

Table 1: Definition of variables

Variables	Description	
Dependent variables: Bank profitability		
<i>ROAA</i>	Net profits over average total assets (in %).	
<i>ROAE</i>	Net profits over average total equity (in %).	
Independent variables		Expected Effect
Bank-specific characteristics (internal factors)		
<i>equity over total assets</i>	Equity over total assets (in %).	+/-
<i>cost-income ratio</i>	Total expenses over total generated revenues as a measure of efficiency (in %).	-
<i>loan loss provisions over total loans</i>	Loan loss provisions over total loans (in %). This is a measure of credit quality.	-
<i>yearly growth of deposits</i>	Annual growth of deposits (in %).	+/-
<i>difference between bank and market growth of total loans</i>	Difference between the annual growth of a bank's lending volume relative to the average growth rate of the market lending volume (in %).	+
<i>bank size</i>	Dummy variables for different bank size categories. Bank size is measured by the accounting value of the bank's total assets.	+/-
<i>interest income share</i>	Total interest income over total income (in %).	-
<i>bank age</i>	Dummy variable for different bank age groups.	+
<i>bank ownership</i>	Dummy variable: Public bank if public sector owns more than 50% of the shares.	+/-
<i>nationality</i>	Dummy variable: Listed bank if institution is listed at the stock exchange.	+/-
<i>region</i>	Dummy variable: Foreign bank if at least 50 percent of the bank's stocks are in foreign hands.	-
<i>bank category</i>	Dummy variables for the seven major regions in Switzerland, as defined by the Swiss Federal Statistical Office (FSO).	+/-
<i>bank category</i>	Dummy variables for the bank categories according to the definition of the Swiss National Bank (SNB).	+/-
Macroeconomic and industry-specific characteristics (external factors)		
<i>effective tax rate</i>	Total taxes over pretax profit (in %).	-
<i>yearly change of regional population</i>	The yearly growth rate of the population for the seven major regions in Switzerland (in %).	+/-

<i>real GDP growth</i>	The yearly real gross domestic product (GDP) growth (in %).	+
<i>6 month Libor</i>	The 6 month Libor rate in Swiss Francs, as published by the Swiss National Bank (in %).	+/-
<i>stock market capitalization</i>	The value of listed shares relative to the GDP (in %).	+
<i>bank concentration ratio</i>	The sum of the three largest banks' total assets relative to the sum of total assets of the entire banking sector (in %).	+/-

4. Data and methodology

4.1. Data

Our main data source for the bank-specific characteristics is the Fitch-IBCA Bankscope (BSC) database, which provides annual financial information for banks in 179 countries around the world. Coverage by the Bankscope database is very comprehensive, with the banks included accounting roughly for 90 percent of the assets of all banks. Information about bank age, bank ownership, the geographic market regions in Switzerland, the nationality and the bank category were taken from the Swiss National Bank and the web pages of the respective institutions. Besides the bank-specific data, we use a set of macroeconomic and industry-specific variables to explain bank profitability. The information about the yearly population growth by region is provided by the Swiss Federal Statistical Office (FSO). The real GDP growth and the 6 month Libor rate were taken from the Swiss National Bank. The stock market capitalization ratio stems from the Financial Structure Dataset of Beck, Demirgüç-Kunt and Levine, and the market concentration rate was computed using data from the Swiss National Bank and the respective company reports.

In order to use the data of the Bankscope database (BSC) for our statistical analysis, we had to edit the data carefully in the following ways: Given that our focus lies on commercial banks in Switzerland, we start by excluding the Swiss National Bank, investment banks, securities houses and non-banking credit institutions. In a further step, we eliminate duplicate information. If BSC reports both unconsolidated and consolidated statements, we dropped the unconsolidated statement. Another related issue refers to the banks with balance sheet data reported at the aggregated level. BSC builds aggregated statements by combining the statements of banks that have merged or are about to merge. Aggregated statements may then report the data of groups of

affiliated banks that neither have financial links nor form a legal entity. As a result, a given bank might be reported several times in database, namely as an independent unit by its consolidated as well as by its unconsolidated statements. As Micco et al. (2007) outline, there are basically two ways to deal with banks that have aggregated statements. The first is to always work with the aggregated statement and drop the observations for the individual banks. The second is to drop the aggregated statement and work with the individual banks up to the time of the merger and then, starting from the year of the merger, with the new bank. We use the first strategy and work with the aggregated statements.

Our sample is an unbalanced panel dataset of 453 commercial banks in Switzerland, consisting of 1'919 observations over the years from 1999 to 2006. Details related to the number of banks and observations by bank category are given in Table 2. Note that our sample includes all banks in the category *Big banks*, which consists of UBS AG and Credit Suisse AG, and the category *Cantonal Banks*. As to the other categories, the institutions in our sample represent most of the banks and their assets.

Table 2: Number of banks and observations by bank category

	Big banks	Cantonal banks	Regional and savings banks	Raiffeisen banks	Other banks	All
No. of banks	2	24	95	209	123	453
No. of observations	13	156	487	716	547	1919

This table reports the number of banks as well as observations by bank category, as defined by the Swiss National Bank (SNB).

Table 3 reports the descriptive statistics of the variables used in our analyses. For each variable, we report the mean, the median and the standard deviation. On average, banks in our sample have a return on average assets *ROAA* of 0.71% over the entire time period from 1999 to 2006. The median value amounts to 0.36% and is, therefore, significantly lower than the mean. This difference as well as other statistics point out to the fact that there exist large profitability differences between the banks in our sample. The same holds true for our second profitability measure, the return on average equity. The *ROAE* amounts to 7.74% on average, while we observe again a large heterogeneity between the banks in Switzerland.

The capitalization of banks, as defined by the value of equity over total assets, also varies considerably between the banks in our sample. On average, the capital ratio is 9.10%. The best capitalized bank in our sample has a capital ratio of 82%, whereas for the least capitalized institutions total equity only covers 0.5% of total assets. The cost-to-income ratio is on average 64.87%. Again, we observe quite a large heterogeneity between the banks acting in the Swiss commercial banking business. The loan loss provision relative to total loans, which is an indicator for the quality of the credit portfolio, amounts to 0.44% on average, which seems quite low, but there exist large differences between the banks in our sample also with respect to this variable. The yearly growth rate of deposits amounts to 8.53% on average. The median value of 4.47%, however, reveals that total deposits of certain institutions grew at a significantly lower rate, on average. Total assets, which approximates bank size, are 8.65 billion USD on average, and the median value amounts to 355.3 Mio USD. The large difference between these two values can be explained by presence of the two big banks UBS and Credit Suisse, which have a large impact on the average. As to the dummy variable, which serve as our main size variables in our analyses, we see that 61% of all observations fall in the smallest category with total assets of less than 500 Mio USD, about 30% belong to the middle size category with total assets between 10 Bio and 500 Mio USD, and the remaining bank observations belong to the largest category with total assets over 10 billion USD. We use the medium-sized banks as our reference category. Not surprisingly, a substantial part of the total income of the commercial banks in our sample stems from interest operations. This interest income share amounts to 69.76% on average, while the median value is even higher (83.33%).

Looking at the dummy variables referring to bank age, we observe that two thirds of all banks in Switzerland were founded before 1950. About one third of the banks were established between

1950 and 1999, and only one percent of the financial institutions are 6 years old or younger. These observations also reflect the well-known fact that Switzerland has a long-standing banking tradition. In our regression analyses, we use the oldest bank group as our reference category.

As an additional set of independent variables, the ownership type of the bank is taken into account. 90% of the banks in our sample are private companies. In the remaining 10% of the financial institutions of our sample, the state, usually the canton and in some few cases a city, is involved, either with full or partial ownership. We use the private companies as our reference category. Furthermore, we consider whether the bank is listed at a stock exchange. In fact, only 7% of the examined banks are listed at a stock exchange. Therefore, we use the unlisted banks as reference category. As a final ownership variable, we consider the nationality of the bank. From all the banks in our sample, 20% are foreign owned. Accordingly, we use the category Swiss owned as reference category in our regression analyses.

Looking at the geographic distributions of banks in Switzerland, we see that 17% of the banks are in the region of Zurich, which is also our reference category. Note that the Central Plain region, which is the region with most inhabitants, accommodates 23% of the banking institutions in our sample. As to the bank categories, the Raiffeisen bank are the most numerous in our sample, i.e., 37% of all banks belong to this category. Every fourth bank in our sample is a Regional- or Savings bank. This group is thus used as our reference category.

Finally, let us consider the macroeconomic and industry-specific factors included as explanatory variables into our performance analysis. The effective tax rate, computed as total taxes over pretax profit, amounts to 28.71% on average. This variable reflects the tax burden across the different Swiss cantons, which all have their own tax regime. We observe the lowest marginal tax rate in the canton of Nidwalden, and the highest one in the canton of Appenzell-Ausserrhoden over the time period considered. On average, the population by region grew by less than 1% per year. The highest growth rate of 1.6% was reported in the region of Zurich for the year 2006. Real GDP growth amounted to almost 2% on average, which is quite significant for a highly developed economy. This also reflects the fact that the time period considered covers some economically prosperous years. The average 6-month Libor has been rather low in Switzerland over the considered period and amounts to 1.39% on average. The stock market capitalization ratio, measuring the value of listed shares relative GDP is about 240% on average. In the international

context, this figure is quite high. Finally, the average bank concentration ratio amounts to 65.46%. Accordingly, total assets of the three largest banks account for about two thirds of the total assets of all banks in our sample. This value seems quite high compared to bank concentration ratios in other countries (see, e.g., Beck, Demirguc-Kunt and Levine, 2006).

Table 3: Descriptive statistics

Dependent variables: Bank profitability	Mean	Median	Std. dev.
<i>ROAA</i>	0.71	0.36	1.28
<i>ROAE</i>	7.74	6.78	6.77
Independent variables	Mean	Median	Std. dev.
Bank-specific characteristics (internal factors)			
<i>equity over total assets</i>	9.10	6.69	9.90
<i>cost-income ratio</i>	64.87	62.07	16.16
<i>loan loss provisions over total loans</i>	0.44	0.09	2.93
<i>yearly growth of deposits</i>	8.53	4.47	25.16
<i>difference between bank and market growth of total loans</i>	4.32	-1.22	60.55
<i>dummy: large bank: total assets > 10 billion USD</i>	0.07	0	-
<i>dummy: medium bank: total asset btw 10 bio and 500 mio USD</i> (reference category)	0.32	0	-
<i>dummy: small bank: total asset < 500 mio USD</i>	0.61	1	-
<i>interest income share</i>	69.76	83.33	28.79
Bank age			
<i>dummy: bank was founded before 1950</i> (reference category)	0.68	1	-
<i>dummy: bank was founded btw 1950 & 1989</i>	0.22	0	-
<i>dummy: bank was founded after 1990</i>	0.10	0	-
Bank ownership			
<i>Dummy: bank is privately owned</i> (reference category)	0.90	1	-
<i>dummy: bank is (co-)owned by a state or city</i>	0.10	0	-
<i>dummy: bank is not listed at a stock exchange</i> (reference category)	0.93	1	-
<i>dummy: bank is listed at a stock exchange</i>	0.07	0	-
Nationality			
<i>dummy: bank is a Swiss bank</i> (reference category)	0.80	1	-
<i>dummy: bank is a foreign bank</i>	0.20	0	-
Region			
<i>dummy: bank is in region Lake Geneva</i>	0.13	0	-
<i>dummy: bank is in region Central Plain</i>	0.23	0	-
<i>dummy: bank is in region Northwest Switzerland</i>	0.12	0	-
<i>dummy: bank is in region Eastern Switzerland</i>	0.20	0	-
<i>dummy: bank is in region Southern Switzerland</i>	0.05	0	-
<i>dummy: bank is in region Central Switzerland</i>	0.09	0	-
<i>dummy: bank is in region Zurich</i> (reference category)	0.17	0	-
Bank category			
<i>dummy: bank is a Big bank</i>	0.01	0	-
<i>dummy: bank is a Cantonal bank</i> (reference category)	0.08	0	-
<i>dummy: bank is a Raiffeisenbank</i>	0.37	0	-

<i>dummy: bank is a Regional- or Savingsbank</i>	0.25	0	-
<i>dummy: bank is an Other bank</i>	0.29	0	-
Macroeconomic and industry-specific factors			
(external factors)			
<i>effective tax rate</i>	28.76	25	19.67
<i>yearly change of regional population</i>	0.71	0.65	0.35
<i>real GDP growth</i>	1.92	2.50	1.32
<i>6 month Libor</i>	1.39	1.20	0.94
<i>stock market capitalization</i>	239.74	241.65	31.95
<i>bank concentration ratio</i>	65.46	65.98	4.40

The table reports the descriptive statistics of the variables used in the regression analyses. The variables are defined as follows: *ROAA* is the return on average assets; *ROAE* is the return of average equity; *equity over total assets* is the capital ratio and is defined as equity over total assets; the *cost-income ratio* is defined as total expenses over total generated revenues; *loan loss provisions over total loans* is defined as loan loss provisions over total loans; *yearly growth of deposits* is defined as the yearly growth rate of deposits; *difference between bank and market growth of total loans* is defined as the difference between the growth rate of loans between the bank and the market; the dummy variables referring to bank size take the value of one if the bank's total assets fit in the respective size category, and zero else; *interest income share* is the share of interest income over total income. The dummy variables referring to bank age take the value of one if the bank was founded in the respective time period, and zero else. The dummy variable *bank is not listed at stock exchange* takes the value of one if the bank is not listed at a stock exchange, and zero else. The dummy variable *bank is listed at stock exchange* takes the value of one if the bank is a public company, and zero else. The dummy variable *bank is a Swiss bank* is equal to one if the bank is owned by Swiss citizens by at least 50%, and zero else. The dummy variable *bank is a foreign bank* is equal to one if the bank is owned by foreigners by at least 50%, and zero else. The dummy variables referring to the *region* take the value of one if the bank's headquarter is located in the respective region, and zero else. The dummy variables *bank category* refer to the official classification of banks by the Swiss National Bank (SNB). The dummy variables take the value of one if the bank belongs to the respective category, and zero else; *effective tax rate* is defined as total taxes over pre-tax profit; *yearly change of regional population* is the yearly growth rate of the population of a region; *real GDP growth* refers to the annual real GDP growth; *6 month Libor* is 6 month Libor rate in Swiss Francs, as published by the Swiss National Bank; *stock market capitalization* is the value of listed shares to GDP; *bank concentration ratio* is the sum of the three largest banks' total assets relative to the sum of total assets of the entire banking sector. The full sample includes a total of 1919 observations from 453 banks. The time period covers the years 1999 to 2006. The datasources for the bank-specific information are Bankscope and the Swiss National Bank (SNB). The macroeconomic and industry-specific information were provided by the Swiss Federal Statistical Office (FSO), the Swiss National Bank (SNB) and the financial structure dataset of Beck, Demirgüç-Kunt and Levine.

4.2. Methodology

In order to empirically investigate the effects of internal and external factors on bank profitability, we use a linear regression model given by (1) and which is widely used in the literature (e.g., Bourke, 1989; Demirguc-Kunt and Huizinga, 1999; Athanasoglou et al., 2005; Molyneux and Thornton, 1992).

$$PERF_{i,t} = X_{i,t}\gamma' + \varepsilon_{i,t} \quad (1)$$

$PERF_{i,t}$ is a measure of bank profitability for bank i at time t . $X_{i,t}$ is a matrix of bank-specific as well as macroeconomic and industry-specific characteristics as outlined above. $\varepsilon_{i,t}$ is the error term with usual properties. We use OLS regressions with robust standard errors to estimate the coefficients in our model. We also control for serial correlation within firms by clustering on the bank level.

5. Empirical results

Table 4 reports the regression results for our main profitability measure ROAA. The first column presents the results when only bank-specific variables without the dummies on bank age, ownership status and region are considered. Column two shows the estimated results when all bank-specific variables are analyzed. Column three lists the findings for all of our variables, including market structure and macroeconomic factors. Overall, we can see that there are no significant differences between the three estimation results with respect to significance as well as size of the coefficients, with the dummy variables about bank size as sole exception.

Furthermore, the explanatory power of the model slightly increases with the inclusion of additional factors, of which some are statistically relevant. The overall adjusted R² of the full model with all our explanatory variables amounts to 53%.

The capital ratio, which is defined as equity over total assets, has a positive and significant effect on bank profitability in Switzerland as measured by the return on average assets *ROAA*. As outlined earlier, the capital ratio is a measure of bank risk and has, a priori, an ambiguous effect on bank profitability, given that there are opposite effects at work. In our particular case, the negative risk effect seems to be overcompensated by the positive safety aspect, i.e., better capitalized banks are safer compared to those with lower capital ratios. Even though the latter institutions bear more risk and are expected to generate a higher return, the safer banks seem to be more profitable. This result stands in line with the empirical evidence of Bourke (1989), Demirguc-Kunt and Huizinga (1999), Goddard et al. (2004), and Pasiouras and Kosmidou (2007).

The coefficient of the cost-to-income ratio, our efficiency measure, is statistically highly significant and negative in all specifications, which meets our expectation. The more efficient a bank, the higher is its profitability. This result, which stands in line with the results of Athanasoglou et al. (2008), clearly shows that efficient cost management is a prerequisite for improved profitability of Swiss banks.

The loan loss provisions relative to total loans is as a measure of credit quality. As we can see from the estimation results, this variable does not have a statistically significant effect on bank profitability.

The yearly growth of deposits does not affect bank profitability significantly. There is no empirical evidence that banks in Switzerland are able to convert an increasing amount of deposit

liabilities into significantly higher income earning assets. However and most interestingly, banks with relatively higher lending growth rates (in comparison to the market) are more profitable. The effect of a faster growing loan volume seems to overcompensate the risk that growth in loans may also lead to a decrease in credit quality.

As to bank size, which we measure by the dummy variables, we find some empirical evidence that larger banks are slightly less profitable than medium sized banks (reference category), with the coefficients being significant at the 10% level. This gives some indication that larger banks cannot benefit from higher product and loan diversification possibilities and even face scale inefficiencies (see Berger et al., 1987, Micco et al., 2007).³

Swiss commercial banks are usually active in both traditional banking and (usually to a lesser extent) asset management. Our findings show that banks with a higher share of interest income related to the total income are less profitable. This effect on profitability is significant at the 1% level. The reason for this coherence is that margins, and therefore profitability, in asset management and private banking services are usually higher than profit margins in interest operations. For that reason, many Swiss commercial banks strategically force their asset management and private banking activities.

Bank age does not have a significant impact on banking profitability. In contrast to our hypothesis as formulated above, older banks are not more profitable than banks founded in more recent years. This means that new entrants into the market are able to successfully pursue new profit opportunities and a longer tradition and, in this context, a higher reputation does not have a positive influence the bank profitability.

The results regarding ownership structures are as follows: On the one side, we find empirical evidence to support the theory that privately-owned banks are more profitable than state-owned banks in Switzerland. This result is in line with the findings of Micco et al. (2007) and Iannotta et al. (2007), who also point out that government-owned banks exhibit a lower profitability than privately owned bank. Furthermore, we find that the international ownership of a bank has a significant impact on bank profitability. In fact, foreign-owned banks in Switzerland seem to be

³ As a robustness test, we alternatively measure bank size by total assets instead of the dummy variables for the different size categories. The effect of total assets on the ROAA is negative and statistically significant at the 10% level, which confirms our results from the dummy approach. Note that the advantage of including the size dummies is that we have obtain more information about the impact of different bank size categories on the return on bank profitability.

less profitable than their Swiss competitors. This result confirms the findings of Demirguc-Kunt and Huizinga (2000), who find evidence that foreign-owned banks are less profitable in developed countries than domestic banks. On the other side, there is no empirical evidence that banks listed at the stock exchange are more or less profitable than banks that are not public.

The coefficients of the region-specific dummy variables show that bank profitability varies at least slightly by regions. Compared to our reference category “banks in region Zurich”, financial institutions in the Lake Geneva region are more profitable, with the coefficients being significant at the 10% level.

Looking at the bank categories, we find no empirical evidence for differences in profitability between the seven bank groups, after having controlled for the various profitability variables.

Considering the external factors related to the macroeconomic environment and the financial structure in Switzerland, our study provides the following results: Taxation negatively affects bank profitability in Switzerland, with the coefficients being significant at the 1% level. Our results confirm the findings of Demirguc-Kunt and Huizinga (1999) that the post-tax profit is lower, the higher the tax rate levied. This result is of specific importance in Switzerland as tax rates vary widely across the Swiss cantons, which all have their own tax regime. However, the impact of taxation on banking profitability is small, as banks seem to be able to shift a large fraction of their tax burden towards depositors, borrowers or purchasers of fee-generating services.

The yearly change of the regional population does not significantly influence the profitability of a bank. This means that, even though the market potential is increasing, banks cannot transform this higher market potential into a higher profitability.

The GDP growth rate affects bank profitability in Switzerland positively, with the coefficients being significant at the 5% level. This result stands in line with the findings of Bourke (1989), Molyneux and Thornton (1992) and Athanasoglou et al. (2008). Obviously, there is a positive effect of more business opportunities induced by economic growth on banking profitability.

In contrast, the 6-month Libor has no statistically significant impact on bank profitability. Furthermore, there is no significant impact of a higher stock market capitalization on bank profitability. It seems that banks cannot benefit from a larger number of listed companies and an

increased value of listed shares (in relation to GDP) even though many Swiss banks also offer trading activities as additional service to their customers.

The impact of the market structure, approximated by the concentration ratio, on bank performance is another interesting issue. The structure-conduct-performance (market-power) hypothesis states that increased market power and a higher market concentration yields monopoly profits and hence increases profitability. However, our findings outline that there exists a statistically significant *negative* relation between the market concentration and the bank profitability in Switzerland. Note that a higher market concentration can also be the result of tougher competition, which goes together with lower profitability. Therefore, our empirical findings, which are in line with findings of Berger (1995), Mamatzakis and Remoundos (2003) and Dietrich (2008), do not support the structure-conduct performance hypothesis.

Table 4: Regression results for returns on average assets (ROAA) as dependent variable

Dependent variable: ROAA	(1)	(2)	(3)
<i>equity over total assets</i>	0.032*** (0.009)	0.034*** (0.009)	0.036*** (0.010)
<i>cost-income ratio</i>	-0.032*** (0.004)	-0.033*** (0.004)	-0.034*** (0.004)
<i>loan loss provisions over total loans</i>	-0.014 (0.034)	-0.011 (0.035)	-0.013 (0.036)
<i>yearly growth of deposits</i>	0.002 (0.001)	0.002 (0.001)	0.002 (0.001)
<i>diff. btw bank and market growth of total loans</i>	0.003** (0.001)	0.003** (0.001)	0.003** (0.001)
<i>large bank: total assets > 10 bio. USD</i>	-0.105 (0.068)	-0.136 (0.086)	-0.159* (0.096)
<i>small bank: total assets < 500 mio. USD</i>	0.173** (0.070)	0.098 (0.075)	0.088 (0.088)
<i>interest income share</i>	-0.022*** (0.003)	-0.023*** (0.003)	-0.022*** (0.004)
<i>dummy: bank was founded btw 1950 and 1989</i>	-	0.010 (0.090)	-0.039 (0.093)
<i>dummy: bank was founded after 1989</i>	-	0.168 (0.140)	0.121 (0.137)
<i>dummy: bank is (co-)owned by state or city</i>	-	-0.010 (0.065)	-0.182* (0.111)
<i>dummy: bank is listed at stock exchange</i>	-	-0.141 (0.098)	-0.116 (0.099)
<i>dummy: bank is a foreign bank</i>	-	-0.450*** (0.152)	-0.471*** (0.175)
<i>dummy: region Lake Geneva</i>	-	0.250 (0.158)	0.286* (0.157)
<i>dummy: region Central Plain</i>	-	-0.003 (0.096)	0.276 (0.171)
<i>dummy: region Northwest Switzerland</i>	-	-0.027 (0.108)	0.154 (0.151)
<i>dummy: region Eastern Switzerland</i>	-	-0.073 (0.096)	0.175 (0.184)
<i>dummy: region Southern Switzerland</i>	-	0.045 (0.209)	0.075 (0.214)
<i>dummy: region Central Switzerland</i>	-	-0.037 (0.119)	0.079 (0.133)
<i>dummy: bank is a big bank</i>	-	-	0.095 (0.196)
<i>dummy: bank is a Raiffeisenbank</i>	-	-	0.203 (0.170)
<i>dummy: bank is a regional- or savingsbank</i>	-	-	-0.144 (0.121)
<i>dummy: bank is an other bank</i>	-	-	0.060 (0.213)
<i>effective tax rate</i>	-	-	-0.008***

<i>yearly change of regional population</i>	-	-	(0.002) 0.337
<i>real GDP growth</i>	-	-	(0.224) 0.087**
<i>6 month Libor</i>	-	-	(0.041) -0.036
<i>stock market capitalization</i>	-	-	(0.048) 0.003
<i>bank concentration ratio</i>	-	-	(0.002) -0.034***
<i>constant</i>	3.937*** (0.417)	4.189*** (0.447)	5.411*** (0.818)
Number of observations	1919		
Number of banks	453		
Adjusted R-squared	0.50	0.51	0.53

The table reports results from OLS estimations of the effects of bank- and market-specific characteristics on bank profitability. The dependent variable is the return on average assets *ROAA*. The explanatory variables are defined as follows: *equity over total assets* is the capital ratio and is defined as equity over total assets; the *cost-income ratio* is defined as total expenses over total generated revenues; *loan loss provisions over total loans* is defined as loan loss provisions over total loans; *yearly growth of deposits* is defined as the yearly growth rate of deposits; *difference between bank and market growth of total loans* is defined as the difference between the growth rate of loans between the bank and the market; the dummy variables referring to bank size take the value of one if the bank's total assets fit in the respective size category, and zero else; *interest income share* is the share of interest income over total income. The dummy variables referring to bank age take the value of one if the bank was founded in the respective time period, and zero else. The dummy variable *bank is listed at stock exchange* takes the value of one if the bank is listed at a stock exchange, and zero else. The dummy variable *bank is a foreign bank* is equal to one if the bank is owned by foreigners by at least 50%, and zero else. The dummy variables referring to the *region* take the value of one if the bank's headquarter is located in the respective region, and zero else. The dummy variables *bank category* refer to the official classification of banks by the Swiss National Bank (SNB) and take the value of one if the bank belongs to the respective category, and zero else; *effective tax rate* is defined as total taxes over pre-tax profit; *yearly change of regional population* is the yearly growth rate of the population of a region; *real GDP growth* refers to the annual real GDP growth; *6 month Libor* is the 6-month Libor rate in Swiss Francs, as published by the Swiss National Bank; *stock market capitalization* is the value of listed shares to GDP; *bank concentration ratio* is the sum of the three largest banks' total assets relative to the sum of total assets of the entire banking sector. The full sample includes a total of 1919 observations from 453 banks. The time period covers the years 1999 to 2006. The datasources for the bank-specific information are Bankscope and the Swiss National Bank (SNB). The macroeconomic and industry-specific information were provided by the Swiss Federal Statistical Office (FSO), the Swiss National Bank (SNB) and the financial structure dataset of Beck, Demirgüç-Kunt and Levine. Robust standard errors accounting for serial correlation within firms in brackets. Coefficients that are significantly different from zero at the 1%, 5%, and 10% level are marked with ***, **, and * respectively.

Table 5 reports the regression results for our second profitability measure *ROAE*. Again, the first column presents the results when only bank-specific variables without the dummy variables are considered. Column two shows the estimated results when all bank-specific variables are analyzed. Column three lists the findings for all of our variables, including market structure and macroeconomic factors.

Overall, the main results of these regressions mainly confirm the above-discussed key results. The coefficients of the cost-to-income ratio are significantly negative in all specifications. An above-average loan volume growth affects banking profitability positively. Furthermore, the share of the interest income at total income variable and the effective tax rate also exert a

negative influence on the ROAE variable while the GDP growth rate affects the ROAE variable positively. Finally, our empirical findings confirm that there exists a statistically significant negative relation between the market concentration rate and the ROAE variable in Switzerland.

In contrast to the results for our main profitability measure ROAA, the negative coefficient of the capital ratio points out that bearing more capital has a negative impact on the ROAE. This observation reflects the fact that banks with relatively more equity have automatically also a lower ROAE. As a further difference to our results for the ROAA variable, larger banks are not less profitable when considering the return on equity. This result might be driven by the fact that some of the large banks in Switzerland – with the goal of shareholder maximization – effectively lowered their equity capital in order to increase the ROAE.⁴ In contrast to the results for the ROAA as presented above, where banks in the Lake Geneva region are more profitable than banks acting in the Region of Zurich at the 10% level, region dummy variables do not significantly influence bank profitability when the ROAE is our dependent variable. Furthermore, the yearly change of population affects the return on average equity variable positively. This means that banks can transform an increasing market potential into a higher profitability, when measured by the ROAE. However, the coefficients are only significant at the 10% level. Furthermore, the stock market capitalization affects banks profitability positively at a 5% level.

Overall, the explanatory power of the model does again not vary significantly across the three estimations even though some of the additional factors are statistically and economically relevant. However, with an adjusted R^2 of 35% overall, the explanatory power of the model to explain the return on average equity ratio is lower compared to the 53% for the return on average assets ratio.

⁴ When looking at our alternative size variable, which is total assets, we find a positive and highly significant impact of total assets on the return on average equity. This result might be further evidence for the shareholder maximization strategy of large banks.

Table 5: Regression results for returns on average equity (ROAE) as dependent variable

Dependent variable: ROAE	(1)	(2)	(3)
<i>equity over total assets</i>	-0.200*** (0.044)	-0.205*** (0.043)	-0.174*** (0.045)
<i>cost-income ratio</i>	-0.181*** (0.019)	-0.189*** (0.019)	-0.193*** (0.019)
<i>loan loss provisions over total loans</i>	-0.057 (0.155)	-0.043 (0.162)	-0.061 (0.166)
<i>yearly growth of deposits</i>	0.002 (0.008)	0.000 (0.007)	0.000 (0.007)
<i>diff. btw bank and market growth of total loans</i>	0.016*** (0.006)	0.016*** (0.005)	0.016*** (0.006)
<i>large bank: total assets > 10 bio. USD</i>	0.810 (1.641)	1.729 (1.572)	1.462 (1.781)
<i>small bank: total assets < 500 mio. USD</i>	0.206 (0.402)	-0.058 (0.471)	-0.440 (0.498)
<i>interest income share</i>	-0.133*** (0.018)	-0.136*** (0.022)	-0.121*** (0.020)
<i>dummy: bank was founded btw 1950 and 1989</i>	-	0.425 (0.768)	-0.109 (0.834)
<i>dummy: bank was founded after 1989</i>	-	2.281** (0.944)	1.716* (0.894)
<i>dummy: bank is (co-)owned by state or city</i>	-	-0.518 (0.679)	-0.423 (0.685)
<i>dummy: bank is listed at stock exchange</i>	-	-2.330** (1.108)	-2.140** (0.968)
<i>dummy: bank is a foreign bank</i>	-	-1.673 (1.092)	-2.092 (1.357)
<i>dummy: region Lake Geneva</i>	-	-1.204 (0.983)	-0.750 (0.944)
<i>dummy: region Central Plain</i>	-	-1.385* (0.808)	0.538 (1.100)
<i>dummy: region Northwest Switzerland</i>	-	-0.635 (1.034)	0.581 (1.192)
<i>dummy: region Eastern Switzerland</i>	-	-1.676* (0.863)	0.051 (1.183)
<i>dummy: region Southern Switzerland</i>	-	-2.118 (1.572)	-1.798 (1.595)
<i>dummy: region Central Switzerland</i>	-	-1.038 (0.923)	-0.146 (0.925)
<i>dummy: bank is a big bank</i>	-	-	5.522 (4.376)
<i>dummy: bank is a Raiffeisenbank</i>	-	-	3.137*** (1.086)
<i>dummy: bank is a regional- or savingsbank</i>	-	-	0.215 (0.965)
<i>dummy: bank is an other bank</i>	-	-	2.634 (1.746)
<i>effective tax rate</i>	-	-	-0.051***

<i>yearly change of regional population</i>	-	-	(0.011) 2.035*
<i>real GDP growth</i>	-	-	(1.215) 0.472*
<i>6 month Libor</i>	-	-	(0.265) -0.654
<i>stock market capitalization</i>	-	-	(0.441) 0.029***
<i>bank concentration ratio</i>	-	-	(0.010) -0.161***
<i>constant</i>	30.328*** (2.395)	32.539*** (3.215)	32.447*** (3.978)
Number of observations	1919		
Number of banks	453		
Adjusted R-squared	0.29	0.31	0.35

The table reports results from OLS estimations of the effects of bank- and market-specific characteristics on bank profitability. The dependent variable is the return on average equity *ROAE*. The explanatory variables are defined as follows: *equity over total assets* is the capital ratio and is defined as equity over total assets; the *cost-income ratio* is defined as total expenses over total generated revenues; *loan loss provisions over total loans* is defined as loan loss provisions over total loans; *yearly growth of deposits* is defined as the yearly growth rate of deposits; *difference between bank and market growth of total loans* is defined as the difference between the growth rate of loans between the bank and the market; the dummy variables referring to bank size take the value of one if the bank's total assets fit in the respective size category, and zero else; *interest income share* is the share of interest income over total income. The dummy variables referring to bank age take the value of one if the bank was founded in the respective time period, and zero else. The dummy variable *bank is listed at stock exchange* takes the value of one if the bank is listed at a stock exchange, and zero else. The dummy variable *bank is a foreign bank* is equal to one if the bank is owned by foreigners by at least 50%, and zero else. The dummy variables referring to the *region* take the value of one if the bank's headquarter is located in the respective region, and zero else. The dummy variables *bank category* refer to the official classification of banks by the Swiss National Bank (SNB) and take the value of one if the bank belongs to the respective category, and zero else; *effective tax rate* is defined as total taxes over pre-tax profit; *yearly change of regional population* is the yearly growth rate of the population of a region; *real GDP growth* refers to the annual real GDP growth; *6 month Libor* is the 6-month Libor rate in Swiss Francs, as published by the Swiss National Bank; *stock market capitalization* is the value of listed shares to GDP; *bank concentration ratio* is the sum of the three largest banks' total assets relative to the sum of total assets of the entire banking sector. The full sample includes a total of 1919 observations from 453 banks. The time period covers the years 1999 to 2006. The datasources for the bank-specific information are Bankscope and the Swiss National Bank (SNB). The macroeconomic and industry-specific information were provided by the Swiss Federal Statistical Office (FSO), the Swiss National Bank (SNB) and the financial structure dataset of Beck, Demirgüç-Kunt and Levine. Robust standard errors accounting for serial correlation within firms in brackets. Coefficients that are significantly different from zero at the 1%, 5%, and 10% level are marked with ***, **, and * respectively.

6. Conclusions

This paper has examined how bank-specific characteristics, macroeconomic variables and industry-specific factors affect the profitability of 453 commercial banks in Switzerland over the time period from 1999 to 2006. So far, there is no econometric study that has examined the important issue of the determinants of the banking profitability for the Swiss banking market, even though Switzerland is one of the most important banking centers in the world. Besides the common bank-specific factors, our regression model incorporates the influence of previously ignored factors such as, e.g., the growth of a bank's loans relative to the growth rate of the market, the share of interest income relative to total income, the effective tax rate, bank age or

the yearly change of regional population. These factors together with other included characteristics about the macroeconomic development as well as the industry environment contribute to a better understanding of banking performance in general and for the Swiss banking market in particular.

Our results clearly show that there exist large differences in profitability between the banks in our sample and that a significant amount of this variation can be explained by the factors included in our analyses. The most interesting results for our main profitability measure return on average assets are as follows: Better capitalized bank seem to be more profitable. Also, in case that a bank's loan volume is growing faster than the market, the impact on bank profitability is positive. Looking at the effect of the share of interest income at total income, which is a variable that has not been considered before, we find that banks with a higher interest income share are less profitable. Bank age does not have an impact on bank profitability. As to the geographic distribution, banks in the Lake Geneva region, which is the second most important banking area in Switzerland, are slightly more profitable than banks in the Zurich region. Looking at the ownership variables, foreign banks are clearly less profitable than Swiss owned banks. Similarly, privately owned institutions have a slightly higher profitability compared to state-owned banks. Finally, also market-specific and macroeconomic characteristics included in our analyses have a significant effect on our dependent variables. The most important factors are the GDP growth variable, which affects the bank profitability positively, and the effective tax rate and the market concentration rate, which both have a significantly negative impact on bank profitability.

Overall, our results provide some interesting new insights for a better understanding of the mechanisms that determine the profitability of commercial banks in Switzerland. Our findings are relevant for several reasons. First, our estimation results confirm findings from former studies on bank profitability. Second, we consider a larger set of bank- and market-specific determinants of bank profitability, which extend the knowledge about bank profitability with respect to several important dimensions. These extensions allowed us to generate some new and interesting findings. Third, we consider the years from 1999 to 2006. Not only do we provide evidence for a recent time period, but these years were also characterized by some important changes in the banking industry. Finally, considering the particular case of Switzerland generates additional findings in terms of relevant regional-specific profitability determinants.

Even though our sample includes almost all commercial banks active in Switzerland and also considers the main bank profitability determinants as well as factors related to the institutional and macroeconomic environment, it has certain limitations. Including additional aspects in our analyses, such as the impact of mergers, would help to even better understand the determinants of bank profitability. Also, it could be fruitful to integrate specific characteristics about the management and board members, e.g., education, skill level, experience, independence, all of which are increasingly important factors to understand bank profitability. Finally, bank profits show a tendency to persist over time and tend to be serially correlated, reflecting impediments to market competition, informational opacity and sensitivity to regional and/or macroeconomic shocks. From this point of view, a dynamic model specification is expected to provide additional insights. Some of these issues will be addressed in future work.

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