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Determinants of bank profitability during the post-crisis period

Levien Driessen

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Supervisor: Dr. M. Visser

Abstract

In this paper we study the determinants of bank profitability in the post-crisis period for banks located in the Euro Area. Current literature has only focused on the pre-crisis and crisis period. Bank profitability is measured by the return on assets (ROA). Our determinants include bank-specific, industry-specific and macroeconomic variables. One of these industry-specific variables is stock-exchange ownership, which has only been included by Dietrich & Wanzenried (2011) so far. In order to investigate and account for the dynamic nature of the determinants we make use of the two step system-GMM estimator developed by Arellano and Bover (1995). Our results show that profits are persistent over time to a moderate extent. These findings indicate no large deviations from a perfect competitive market structure in the Euro Area. A bank's capitalization shows a significant positive relationship with profits, whereas exposure to credit risk seems to have a significant negative effect on profitability. None of our industry-specific and macroeconomic variables showed a significant relationship with profitability. These findings emphasize the importance of internal factors in generating profits.

Keywords: Bank profitability, Financial Crisis, Euro Area, system-GMM estimator, Stock-exchange ownership

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1.0 Introduction

Banks are seen as one of the most innovative and dynamic institutions operating in the financial system. Institutions that have no legitimate place in neoclassical and growth theory, because they are no contributor to economic growth and welfare. (Schmidt et al., 1999) However the central role of banks is not to cause economic growth and welfare, but to facilitate growth opportunities, which remains even nowadays the central role of banks. According to Levine & Zervos (1998) the amount of bank credit strongly affects economic growth indicators. It is therefore of great importance to have a sound understanding of the underlying dynamics working within a bank to ensure a solid and profitable banking system.

Short (1979) was the first to investigate the determinants of bank profitability for international banks. His work was the first to make a distinction between country unique variables and bank unique variables. This distinction has been adapted and extended by later research, and now not only includes bank and country specific variables, but also industry specific variables. (Bourke, 1989; Molyneux & Thornton, 1992; Athanasoglou et al., 2008; Tan & Floros, 2012) Existing literature has found a bank's capital position, concentration, age, size, inflation, cyclical output and labor productivity growth to have a positive relationship with bank profitability, whereas size only seems of significant influence when we look at a national framework instead of an international framework. (Chaudhry et al., 1995) Credit risk exposure, foreign ownership and operating expenses show a negative relationship.

As these determinants have been investigated extensively in the empirical literature and over many time periods, it is shown that none of these variables are static. The significance and impact of the above-mentioned variables does vary in the empirical literature, and therefore these variables should rather be seen as dynamic. Causes of change are the disintermediation of banks and the emergence of non-financial intermediaries. (Athanasoglou et al., 2008) Also, the role of stakeholders, the influence of sustainability, and the way banks operate have changed over the years, which has a large impact on bank's profitability determinants. At last it is not illogical to assume that major events also have an impact on the determinants of bank profitability. Dietrich & Wanzenried (2011) investigated the impact of the global financial crisis on the determinants of bank profitability and found some changes in the importance of variables affecting bank profitability. They found funding costs, which had a significant influence on bank profitability before the crisis, to be of no influence during the crisis. Ownership status on the other hand had no significant influence before the crisis, but showed of significant

importance during the crisis. At last the capitalization of banks becomes of greater importance during financial crises. (Berger & Bouwman, 2013) Thus previous literature has shown the dynamic nature of the determinants.

No research has yet been done on the determinants of bank profitability after the global financial crisis. Due to the dynamic underlyings of the profitability determinants we would contribute to the existing literature by looking into a new time interval. Previous literature mainly addresses the pre-crisis period and to a lesser extent the crisis period. *Therefore, the aim of this paper is to investigate the determinants of bank profitability during the post-crisis period (2013-2017).* Subsidiarily, we want to see if the global financial crisis had lasting effects on the determinants, and it would even be more interesting to see when this would not be the case. Due to data availability we are not able to run a regression on the crisis period, which makes it hard for us to directly compare the differences in determinants between the crisis and post-crisis periods. However, in our discussion section in chapter five we will pay attention to our results in comparison with Dietrich & Wanzenried (2011).

Our paper also contributes to the existing literature by applying a modern econometric model developed by Arellano & Bover (1995), which has only been applied recently in bank profitability literature. Athanasoglou et al. (2008) introduced this method for the first time in bank profitability literature, and were followed by García-Herrero et al. (2009), Dietrich & Wanzenried (2011) and Tan & Floros (2012). Previous literature made use of traditional panel data models, like pooled OLS and fixed effect models. These traditional models lead to biased and inconsistent estimates given the dynamic nature of our variables. (Baltagi, 2001). Therefore we employ a dynamic panel data model, the system Generalized Method of Moments (GMM), in this paper, as developed by Arellano & Bover (1995), which takes into account the dynamic nature of the dependent and independent variables.

After this brief introduction the paper will continue (Chapter 2) with an overview of the existing literature on the determinants of bank profitability. Due to the nature of our research question, the effect of internal and external determinants on bank profitability, it is uncommon to include a chapter with hypothesis. Therefore we will also discuss the expected effects in chapter two and is summed in table one. Next (Chapter 3) the paper will discuss the methodological framework, the source of data and give an overview of the variables we are going to use in this paper. After defining the methodological framework and the variables we provide (Chapter 4) the results of our statistical tests. We will end (Chapter 5) with a brief discussion and conclusion.

2.0 Literature overview

Profitability is an inherent factor to keep a bank solid, because profitability indicates that a bank is performing efficiently. Given the strong relationship between a solid banking system and economic growth, research on the determinants of bank profitability has been conducted extensively. This research contains individual and cross-country analyses, and included internal as well as external factors to the right hand side of the equation. Internal factors are synonymous with bank specific factors, which could only be influenced by management. Later on external factors, like industry specific and macroeconomic variables, were added. External factors lie beyond the scope of management and are determined by market forces and governmental influences. (Short, 1979; Bourke, 1989; Molyneux & Thornton, 1992; Athanasoglou et al., 2008; García-Herrero et al., 2009; Dietrich & Wanzenried, 2011) The empirical findings of previous literature do vary significantly, which indicates that the determinants of bank profitability are susceptible to differences in time periods and environmental differences. Nevertheless some mutual features can be found across these varying results and can be used to extend current knowledge about the determinants.

2.1 Profitability variables

Even though there have been many changes in the list of variables which explain bank profitability, there have been few changes in bank profitability itself. Bank profitability is most commonly measured by taking the return on assets (*ROA*). Other key ratios to measure bank profitability are the return on equity (*ROE*) and net interest margins. According to Golin (2001) return on assets became the key ratio to operationalize bank profitability, and is also most commonly used in empirical literature. Athanasoglou et al. (2008) also point out that Central Banks and supervisory institutions use ROA to measure bank profitability. Net interest margins is only a proper measurement of bank profitability when interest revenues and expenses are closely related to banks' behavior. (García-Herrero et al., 2009) However due to strong interference of the ECB, think of the asset purchase program (APP), this key-ratio seems an inappropriate measurement for Euro Area banks. Methodological reasons lead to ROA as the preferred measurement over ROE, which will be discussed further in chapter three.

Recent literature questions the explanatory power of profitability to indicate a bank's efficiency, which is synonymous with bank performance. (Naceur & Omran, 2011; Padake & Soni, 2015) Therefore we feel that further clarification is needed. Bank profitability is one of the elements

to indicate bank performance. Naceur & Omran (2011) mention cost of intermediation and operational performance as other elements to investigate bank performance, but they are used less frequently. This leads to use of ROA, ROE and NIM (to a lesser extent), in both bank profitability and bank performance literature, in which there is only a subtle difference between them. Bank performance could be seen as a wider understanding of bank efficiency, and can therefore not be used subsidiarily to bank profitability. Padake & Soni (2015) argue that the key-ratios to explain bank profitability are not sufficient to explain efficiency on its own. To clarify the aim of our paper, we try to investigate what determines one of the elements of bank performance, namely a bank's profitability. It lies beyond the scope of this paper to explain the determinants on all the performance variables, as they may differ among them. (Naceur & Omran, 2011)

2.2 Bank specific determinants

The list of bank specific determinants is wide and the empirical results vary across the different literature. Internal factors often used as bank specific variables are size, operational efficiency, credit risk, capitalization, and deposit growth. *Size* is one of the most complex variables on the right hand side of the equation. It can influence ROA in multiple ways, and therefore no mutual consensus exists on the effect found in past research. A larger size is related with more beneficial advantages of economies of scale, but also diseconomies of scale can arise due to a more complex managerial and bureaucratic framework. Early research did not find economies or diseconomies of scale to be of significant influence on bank profitability. This indicates the absence of economies or diseconomies of scale, or a cancellation effect of both economies as diseconomies of scale, which led to no additional cost reductions. This led to the removal of size as an independent variable in studies from the 1990s. (Short, 1979; Benston et al., 1982; Bourke, 1988) Later research found a significant positive relationship between size and profitability and shows that too-big-to-fail considerations are not the only source of scale economies. (Anbar & Alper, 2011; Dietrich & Wanzenried, 2011; Hughes & Mester, 2013) However part of the later research also shows insignificant results or even a negative relationship. (Stiroh & Rumble, 2006; Athanasoglou et al., 2008) An interesting addition pointed out by Athanasoglou et al. (2008) is the argument that size does not have a linear relationship. Bank profitability may benefit from economies of scale to a certain point, but when they become larger than the optimal size they experience diseconomies of scale. This would indicate a non-linear relationship. Due to the recent contradicting literature and the possibility

of size being non-linear we include size in our regression. The results found by recent literature are not unilateral to the extent where we could leave size out of our regression as confidently as the literature in the 1990s did. However we do not expect a significant relationship between size and bank profitability.

Another cost related variable is *Operational Efficiency*. This variable is an indicator for the degree of management efficiency. Previous literature also uses cost efficiency to measure the efficiency of management. The difference between the two measurements lies in the costs they take into account. Operational efficiency only looks at operational costs whereas cost efficiency looks at total costs. However a key element of internal bank-specific variables is the extent of influence management can carry out. It therefore seems inappropriate to look at costs efficiency, because management can only influence operational costs. (Alexiou & Sofoklis, 2009) More efficient management should be able to decrease its operational costs to a larger extent, and thereby increase bank profitability. Empirical evidence on operational efficiency is consistent. Almost all research shows a highly significant negative relationship between operational efficiency and bank profitability. (Athanasoglou et al., 2008; Alexiou & Sofoklis, 2009; Dietrich & Wanzenried, 2011) This verifies the ability of bank management to increase profitability by decreasing its operational costs. We therefore expect a negative relationship between operational efficiency and bank profitability.

The variable *Credit Risk* reflects the inability of the borrower to fulfill its contractual obligations towards the bank. Loan loss provisions are often used as a proxy for credit risk, because this embodies the expectations of a bank on its loans. Forming these expectations is incredibly difficult, because credit risk is dependent on many factors. Salas & Saurina, (2002) mention GDP growth, family indebtedness and concentration ratio as possible factors, which shows the complexity of forming expectations and level of correlation with other variables. When banks expect more loans to turn 'bad' this will result in a higher credit risk, which leads to higher actual losses on loans, and therefore decreases profitability. Even though the ECB offers guidance to non-performing loans, which contain standards for loss reserves, it is the bank's management who determines the future amount of loan loss provisions. Therefore credit risk is rather a bank-specific than an industry-specific variable. However it is not included in most of the early empirical literature. (Short, 1979; Bourke, 1988; Molyneux & Thornton, 1992) Research in the twenty-first century started to use credit risk as an independent variable and found a significant negative relationship between credit risk and bank profitability. (Staikouras & Wood, 2004; Athanasoglou et al., 2008; Alexiou & Sofoklis, 2009; Dietrich & Wanzenried,

2011) This indicates the importance of credit risk on bank profitability and shows the meaning of screening and monitoring policies. Based on former literature we expect a negative relationship between credit risk and bank profitability.

Whereas credit risk reflects the bank's ability to deal with expected losses on bad loans, the variable *Capitalization* measures the ability to absorb unexpected losses. Capitalization displays a bank's own funds and acts as a safety net in times of financial distress. During the financial crisis it became clear how large the impact of unexpected losses, combined with a poor quality of capital, can be for bank profits. According to a study of the Deutsche Bank profits declined to half the boom level, and absolute capital as capital ratios spiked up. The large increase in absolute capital is closely related with the introduction of the Basel III Accord in 2010. Larger amounts of capital decrease the impact of unexpected losses, lowers the need for banks to use additional borrowing, lowers the funding costs, and increases the recourses available for additional lending. (Gul et al., 2011; Tan & Floros, 2012) However even with increased capital requirements a negative relationship between capitalization and bank profitability could exist. Berger (1995a) points out that banks with lower amounts of capital tend to have more risky positions than banks with a higher amount of capital. Because a higher degree of risk taking could result in higher profits a negative relationship could exist.

2.3 Industry specific variables

The Structure-Conduct-Performance paradigm (SCP) is a well-known theory in banking and has been studied by many researchers. The SCP paradigm tries to find a relationship between the market structure of a bank, its conduct, and its profitability. Market structure is often described by *market concentration* and *market share*. Both are assumed to have a positive relationship with the loan rate, i.e. bank profitability. This is often related to as the MP-hypothesis. (Hannan, 1991) Market concentration represents the monopolistic power of banks in the market. Therefore a high concentration enables banks to increase their margins, because they can act in a rather monopolistic or oligopolistic manner than in a competitive way. Regardless of the market form a bank operates in, a higher market share will lead to larger profits. An increased market share means that the bank owns a larger part of the total loans and deposits on the market, which is the main source of a bank's assets. This enables banks to lower their costs as a percentage of total assets. (Buzell & Sultan, 1975; Berger, 1995b)

Empirical evidence is divided about the relationship between market concentration, or market share, and bank profitability. A large share of the empirical literature presents evidence for a

significant and positive relationship between bank concentration and bank profitability. (Bourke, 1988; Evanoff & Fortier, 1988; Molyneux & Thornton, 1992; Dietrich & Wanzenried, 2011; Tan & Floros, 2012) This evidence favors the view that higher levels of concentration lead to monopolistic profits, and explain the large merger waves that took place in the banking sector in the late 90's. (Berger, 1995b; Dermine, 2000) However also insignificant results are found. Smirlock (1985) argues that these insignificant results favor the relative market power-hypothesis (RMP), which states that market concentration is not a result on its own, but is the effect of superior efficiency obtained by firms with a large market share. Athanasoglou et al. (2008) find evidence for this alternative hypothesis. Nevertheless all the research was conducted before or during the financial crisis and may not be relevant anymore. Dietrich & Wanzenried (2011), too, find market concentration to be of great significance for Swiss banks before the financial crisis, but of no significance during the financial crisis. Due to methodological limitations by including both variables we will only proceed with *market concentration* in this paper.

Ownership-status is one of the oldest and most widely studied industry-determinants. One part of the literature looked at the effects of governmental ownership of a bank and its profits. Short (1979), Micco et al. (2007) and Iannotta et al. (2007) all found a negative relationship between governmental ownership of a bank and its profits. However Micco et al. (2007) found no significant negative relationship in industrialized countries. The negative relationship could be explained by arguing that government owned banks have fewer incentives to maximize their profits due to government policy. Dietrich & Wanzenried (2011) found no significant relationship in the pre-crisis period, but found governmental ownership of positive influence during the crisis. Nevertheless due to data limitations, and the combined results of Micco et al. (2007) and Dietrich & Wanzenried (2011), which show no significant results for industrialized countries and non-crisis periods, we do not include this variable into our paper.

Another part of the literature looks at ownership-status by *nationality*. The distinction is made between domestic and internationally owned firms. Foreign owned banks have a positive effect on bank profitability for banks located in developing countries. In industrialized countries foreign ownership seems to have a negative effect on bank profitability, whereby foreign owned banks are less profitable. (Demirgüç-Kunt & Huizinga, 1999) An explanation for the lower profitability in industrialized countries may lie in the home field advantage hypothesis. This hypotheses suggest that foreign banks experience organizational diseconomies, like higher monitoring costs due to the distance. They also encounter other barriers like information

disadvantages, language barriers and cultural barriers. Only a few papers concerning bank profitability take nationality into account. Dietrich & Wanzenried (2011) found a significant negative relationship between foreign ownership and bank profitability over their entire sample period. Berger et al. (2000a) found in a pool of Spain, France, the U.K., Germany and the U.S. that domestic banks during the 1990s were more cost efficient and profit efficient than their foreign counterparts. This confirms the presence of the home field advantage, and therefore we include nationality into our paper. We expect foreign owned banks to have a negative relationship with bank profitability.

At last Dietrich & Wanzenried (2011) include in the difference in *stock exchange ownership*. This difference isn't made by any other paper yet, even though their argumentation is solid. They argue that publicly listed banks face greater pressure from their stakeholders than non-listed companies do. Among the stakeholders are their shareholders, but also credit rating agencies, market analysts and the financial market as a whole. Therefore publicly listed companies have a greater incentive to be profitable. Nevertheless, these banks also face higher reporting and other requirements. These higher standards increase the costs of publicly listed banks, i.e. negatively affecting profits. Therefore the overall effect is undetermined. Dietrich & Wanzenried (2011) find a strong negative relationship, which seems in favor of costs overweighting the larger incentive to be profitable. However the empirical evidence is too scarce to fully support this relationship and makes it worthwhile to include stock exchange ownership as an independent variable.

2.4 Macroeconomic variables

Macroeconomic variables distinguish themselves from bank-specific variables and industry specific variables by having an effect on the whole economy and all its sectors. The most common macroeconomic variables are inflation, output growth and capital scarcity. Revel (1979) studies the influence of *inflation* on the profitability of the banking sector, and argues that the ability to forecast future inflation is all decisive whether the relationship between inflation and bank profitability turns positive or negative. Hence adequately forecasting inflation enables banks to increase their revenues on loans, before funding and operational costs, like employee wages, short term interest rates on deposits and operating expenses, increase. (Alexiou & Sofoklis, 2009) In addition Perry (1992) argues that unanticipated inflation could lead to insufficient loan loss provisions, and decreased profits.

Therefore the predictability of inflation is one of the key elements determining the relationship. According to Athanasoglou et al. (2008) the strength of the predictions depends on the maturity of the economy, which seems to be supported by the empirical literature. Bourke (1989) and Molyneux & Thornton (1992) find a positive relationship between inflation and bank profitability for U.S. banks, Alexiou & Sofoklis (2009) find a positive relationship between Greek inflation and bank profitability, and Jiang et al. (2003) also find a positive relationship for Hong Kong. Contrarily, Demirgüç-Kunt & Huizinga (1999) find a negative relationship between inflation and bank profitability for developing countries. Hence we expect a positive relationship between inflation and bank profitability for European banks.

Inflation is closely related with *cyclical movements*. Business cycles, i.e. GDP growth, are taken into account as a macroeconomic variable in most recent literature. (Athanasoglou et al., 2008; Albertazzi & Gambacorta, 2009; Dietrich & Wanzenried, 2011) Most literature finds business cycles to be of significant influence when output is above its trend value. Below its trend value this variable seems to have an insignificant effect on bank profits. So did Dietrich & Wanzenried (2011) find business cycles to be an important determinant of bank profitability for European banks before the crisis, but during the crisis they find business cycles of no significant influence.

A third macroeconomic variable is *capital scarcity*, and is introduced by Short (1979). Again this variable is closely related with business cycles and inflation. Interest rates rise when the input factors become scarce, which is mostly in upward trends of the business cycle with more economy-wide profits. Therefore capital scarcity is often assumed to have a positive relationship with profitability. Because capital scarcity is not a measurable variable, it should be assessed by other variables. Short (1979) proposes the central banks discount rate and the long-term government bond yield as variables, both are found to have a positive relationship with bank profitability. Bourke (1989) and Molyneux & Thornton (1992) confirm this relationship, but it is not found to be of significant influence in the sample period Dietrich & Wanzenried (2011) study. We prefer long-term government bond yields, because these do not only show the availability of capital, like the central bank discount rate does, but also represent the willingness of markets to provide funds. The financial crisis caused interest rates to spike, and in the post-crisis years we see these interest rates gradually declining. Most of these interest rate movements are caused by the unwillingness of lenders, instead of scarcity due to a demand overflow. Therefore the large fluctuations in interest may shed some light on the influence of capital scarcity on bank profitability, even though our sample only contains 5 years.

3.0 Methodology and variables

3.1 Model and methodology

Short (1979) was the first author who investigated the determinants of bank profitability for international banks. Therefore this paper laid out the empirical framework for academic research that followed. Short (1979) considered many functional forms, but didn't find improved results by choosing another functional form than a linear model. However Bourke (1989) argues that alternative functional forms are qualitatively equivalent to the linear model. Nevertheless the linear model became the leading empirical framework, and is specified as follows:

$$ROA_{it} = \alpha + \sum_{b=1}^b \beta_i X_{it}^b + \sum_{i=1}^i \beta_i X_{it}^i + \sum_{m=1}^m \beta_i X_{it}^m + \varepsilon_{it}$$

Bank profitability is a function of a constant term and the sum of three categories of explanatory variables. The categories exist of bank-specific, industry specific and macroeconomic variables. ε_{it} is the error term and contains an unobserved bank-specific effect and an idiosyncratic error, $\varepsilon_{it} = v_i + u_{it}$. (Athanasoglou et al, 2008) For the linear model to be in line with the Gauss-Markov Theorem we expect our error term to be normally distributed, with $\varepsilon_{it} | X_i \sim N(0, \sigma_\varepsilon^2)$.

This traditional empirical framework changed when Berger et al. (2000b) found that profitability of banks was persistence over time due to market power, informational opacity and sensitivity to local, state, and regional shocks. These findings led to the addition of a dynamic component to the traditional framework, replacing the static nature of the model with a dynamic nature. The dynamic model looks as follows, and is used recently by Athanasoglou et al. (2008), García-Herrero et al. (2009), Naceur & Omran (2011), Dietrich & Wanzenried (2011) and Tan & Floros (2012).

$$ROA_{it} = c + \delta ROA_{it-1} + \sum_{b=1}^b \beta_i X_{it}^b + \sum_{i=1}^i \beta_i X_{it}^i + \sum_{m=1}^m \beta_i X_{it}^m + \varepsilon_{it}$$

The incorporation of lagged values of the dependent variable account for the dynamic nature of the model. Delta (δ) could be seen as the time persistent rate. It lies between zero and one, with a value of zero meaning that past profits do not play a role in future profits. This indicates a

high speed of adjustment and a market structure close to perfectly competitive. A delta of one means a low speed of adjustment and indicates an oligopolistic or monopolistic market structure.

To estimate the model of determinants of bank profitability we make use of longitudinal data, also known as panel data. This data contains repeated observations (time series) for cross sectional units, and therefore the number of observations is calculated by $n * T$. Most commonly this data is estimated by fixed or random effect models. According to Judge et al. (1988) both models result in roughly the same parameters when the number of units is small and the number of time periods is large. However in this paper we use a large number of cross-sectional units, 599, and a small number of time periods, 5. Therefore parameters are expected to differ systematically and hence a Hausman-test will prefer the Fixed-Effect model. (See Staikouras & Wood, 2004; Pasiouras & Kosmidou, 2007; Alper & Anbar, 2011)

However according to Baltagi (2001) incorporating a lagged dependent variable will cause Fixed-Effect parameters to be biased and inconsistent. Athanasoglou et al. (2008) argue that Monte Carlo simulations have shown that this bias decreases with an increasing time period, but for a small number of time periods this bias is significant. Their study on a sample period of 16 years contained an average bias of their parameters of 6% when using Fixed-Effect models. Therefore a dynamic panel regression model, like system GMM, seems more appropriate, and is designed for a small time period and a large sample. Alvarez and Arellano (2003) show that for every $T < n$ the system GMM bias is always smaller than the Fixed-Effect model bias.

Another argument in favor of the system-GMM approach is offered by García-Herrero et al. (2009). They argue that when estimating bank profitability problems of endogeneity can play a role. The results of Athanasoglou et al. (2008) show that the GMM-estimator is best modeled with capital as endogenous and credit risk as predetermined. Capital should be endogenous because it can be argued that banks are more profitable when they have a higher degree of capital to total assets, but it can also be argued that more profitable banks have more capital due to retained profits. García-Herrero et al. (2009) expand the list of endogenous variables with size and operational efficiency. They argue that more profitable banks can increase their size, but larger banks may also be more profitable. The opposite is also possible, that more profitable banks hire more personnel and are therefore less efficient. Hence causality plays a role. The system-GMM approach of Arellano–Bover takes possible endogeneity problems into account,

and is therefore preferred to traditional panel data models. We follow the current literature by modelling capital and size as endogenous. We don't follow Athanasoglou et al. (2008) and García-Herrero et al. (2009) by modelling credit risk as predetermined and operating efficiency as endogenous because their argumentation lacks a convincing reasoning to include them as endogenous or predetermined. García-Herrero et al. (2009) do not explain why more personnel leads to more inefficiency, especially because it is not the number of employees that determines the efficiency, but the productivity of these employees. At last the system-GMM estimator of Arellano-Bover accounts for unobserved heterogeneity across banks, which may be present. In total the use of a system-GMM estimator leads to unbiased and consistent estimates of our parameters.

After running the model we should also incorporate some specification tests discussed by Arellano, & Bond (1991) and Roodman (2006). A Wald-test should indicate if the model fits the panel data. We should also check for over-identifying restrictions by applying a Hansen-test. When applying a robust system-GMM estimator we should run a Hansen-test rather than a Sargan-test for over-identifying restrictions. A robust system-GMM estimator suspects non-sphericity in the error term. (heteroscedastic errors) This makes the Sargan-test inconsistent. (Roodman, 2006) In order for the Hansen-test to be valid we should accept the null-hypothesis which states that the instruments used are valid. Special care should be taken for the 'problem of too many instruments' described by Roodman (2006). When too many instruments are included it "*can overfit endogenous variables and fail to expunge their endogenous components*". (Roodman, 2006; p.47) It may also weaken the Hansen test by resulting in p-values of 1.000, which seems implausible and cause the Hansen-test to be ineffective for detecting over-identification. Roodman (2006) advocates a p-value between 0.100 and 0.250, anything below or above that range are signs of trouble. This questions the application of the GMM-estimator by García-Herrero et al. (2009) and Dietrich & Wanzenried (2011) who both report p-values of 0.995 and 1.000 for the Hansen-test. At last we run an Arellano-Bond test proposed by Arellano, & Bond (1991) for first and second order autocorrelation, which may indicate inconsistent estimators when presence.

3.2 Data

The bank-specific data used in this paper is abstracted from Orbis Bank Focus, which is a database held by Bureau van Dijk (BvD). Orbis Bank Focus is the replacement of BankScope, which was replaced because Fitch, the main data provider for BankScope, terminated its

contract with BvD. BankScope was the main database for most of the previous literature on bank profitability, and contained more information than Orbis Bank Focus. Orbis Bank Focus contains extensive historical annual financial information up to 5 years for over more than 35.000 banks. One third of these banks are active non-U.S. banks and include both listed and unlisted banks. Also industry-specific data about stock exchange ownership and foreign ownership were retrieved from Orbis Bank Focus. Market concentration data and macroeconomic data is retrieved from the website of the European Central Bank and the IMF. Data about inflation rates and GDP growth is retrieved from the World Economic Outlook Database owned by the IMF. Long-term government bond yields and market concentration variables are obtained from the Statistical Data Warehouse owned by the ECB.

In this paper we only take banks located in the Euro Area into account. After excluding subsidiaries to overcome double accounting problems and after deleting missing values, our sample consists of 599 European banks over the period of 2013 until 2017. This results in 2.995 observations, and 2.394 observations after including lagged variables. To account for outliers that cause our sample to be biased, we have Winsorized the data. We did not Winsorized the variable Size and Size², because these values are expressed by taking the natural logarithm, which inherently corrects for outliers.

3.3 Variables

In order to investigate the model we need to operationalize the variables. Therefore this section will describe the way we measure the variables discussed in the second chapter. In total we have thirteen variables. The variables return on assets and return on equity are classified as dependent variables and the others are divided into bank-specific variables, industry-specific variables and macroeconomic variables. Table 1 provides a summary of all the variables used in this paper.

Return on assets (ROA) is defined as the net profit before taxes divided by total assets. It is multiplied by hundred to translate it into percentages. Also ROE is measured in percentages and is net profit before taxes divided by shareholders equity. As said in chapter two there are methodological reasons to use ROA instead of ROE. ROA could be seen as the leveraged form of the ROE, because ROE does only include equity. According to a study of the IMF (2002) leveraged firms often report high ROA values, but low ROE values. Using ROE as a dependent variable disregards the risks associated with high degrees of leverage. Therefore using ROA as a dependent variable is preferred. However Athanasoglou et al. (2008) argue that ROA could

be biased too, because it only reflects the profits divided by the assets of a bank. Before the crisis we saw an up rise in off-balance sheet activities and part of the profits were not made by a bank's assets, but are included in the ROA. This leads to an upward biased ROA. Nevertheless we continue using ROA as our dependent variable, because it is a deeply rooted key ratio, and due to the severe negative impact of off-balance sheet activities on the banking system, it is highly regulated afterwards and we expect the bias to be minimum in our sample period. (Papanikolaou & Wolff, 2015) We use ROE as a robustness check to see if the estimates hold.

After we have defined our dependent variables we can define our independent variables, starting with bank-specific variables. Size is measured as the natural logarithm of total assets, and Size^2 is defined as the natural logarithm of $(\text{total assets})^2$. Operational efficiency is defined as operational expenses divided by total assets. Operational expenses are expenses that incurs by a banks day to day business operations, and form a part of their total expenses. Other expenses, like tax expenses and depreciation form the remaining part of total expenses, but can't be influenced by a bank's management. Credit Risk is defined as the ratio of loan loss provisions divided by the gross amount of loans. Another frequently used term for loan loss provisions is loan loss allowances, and means the same thing. Nevertheless loan loss provisions should not be confounded with loan loss reserves. Loan loss reserves are the accumulated loan loss provisions over the years, and can differ substantially from the yearly loan loss provisions. Capitalization is used as a proxy for the absorption of unexpected losses, and is measured by the equity to assets ratio. The equity primarily includes common and preferred stocks, paid-in capital and retained earnings. (Alexio & Sofoklis, 2009) All of our bank-specific variables are scaled by taking the natural logarithm, or divide a variable by total assets, total sales, or gross loans. This is done to overcome scale effects, which is common practice in academic research.

Our industry-specific variables consist of market concentration, nationality and stock exchange ownership. Market concentration is measured by the Herfindahl-Index and concentration ratios. Concentration ratios are commonly used in early literature (Short, 1979; Bourke, 1989; Molyneux & Thornton, 1992) and are defined by the market share of the largest two/three/five banks divided by total market share. In this paper we use the five-bank concentration ratio, because the ECB only provides concentration ratios about the largest five banks in a country. According to Bikker & Haaf (2002) the Herfindahl-Index has developed itself into the most widely used concentration measure in theoretical literature over the years. Also recent empirical literature has replaced concentration ratios with the Herfindahl-Index. (Athanasoglou et al.,

2008; García-Herrero et al., 2009; Dietrich & Wanzenried, 2011) A reason for the replacement of concentration ratios by the Herfindahl-index could be the fact that the Herfindahl-Index takes into account all banks operating in a market, and does not only look at the largest banks. It is defined as the sum of the squared market shares of all the banks in one country. $HH = \sum_{i=1}^n (\text{market share})_i^2$ Its value can lie between 100 and 10.000, with 100 meaning all banks are of equal size and 10.000 that there is monopoly. Nationality is measured by a dummy variable, which takes the value of one when a bank is owned for 50.01% or more by foreign owners. Also stock exchange ownership is measured by a dummy, which takes the value of one when a bank is listed on a stock exchange.

At last we have our macroeconomic variables, which are all measured at a country level. Inflation is measured by the consumer price index. The consumer price index measures price developments for a package of goods and services, and is mostly calculated by national statistical agencies. Cyclical movements are measured by calculating the growth of the Gross Domestic Product (GDP). Capital Scarcity is defined as long-term the government bond yield, which is the ten year government bond yield.

Table 1, summary of the definition of variables

Variable	Measurement Discription	Notation	Expected effect
<i>Dependent variables</i>			
<i>Return on Assets</i>	$\frac{\text{Net profits before taxes}}{\text{Total assets}}$ (%)	<i>ROA</i>	
<i>Return on Equity</i>	$\frac{\text{Net profits before taxes}}{\text{Shareholders equity}}$ (%)	<i>ROE</i>	
<i>Bank-specific variables</i>			
<i>Size</i>	<i>Natural logarithm of total assets</i>	<i>Size</i>	+/-
<i>Size</i> ²	<i>Natural logarithm of (total assets)²</i>	<i>Size2</i>	+/-
<i>Operational Efficiency</i>	$\frac{\text{Operating expenses}}{\text{Total assets}}$	<i>OPEX</i>	-
<i>Credit Risk</i>	$\frac{\text{Loan loss provisions}}{\text{Gross loans}}$ (%)	<i>CR</i>	-
<i>Capitalization</i>	<i>Equity to asset ratio (%)</i>	<i>EA</i>	+/-
<i>Industry-specific variables</i>			
<i>Market Concentration</i>	$\text{Herfindahl index} = \sum_{i=1}^n (\text{market share})_i^2$ $\frac{\text{Market share of top 5 banks}}{\text{Market share of all banks}}$ (%)	<i>HH</i> <i>CONC5</i>	+ +
<i>Nationality</i>	<i>Dummy with the value of 1 when bank is in foreign ownership (≥ 50.01% of the shares)</i>	<i>Foreign</i>	-
<i>Stock Exchange Ownership</i>	<i>Dummy with the value of 1 when bank is listed at a stock exchange</i>	<i>Listed</i>	+/-
<i>Macroeconomic variables</i>			
<i>Inflation</i>	<i>Consumer Price Index</i>	<i>CPI</i>	+
<i>Cyclical movements</i>	<i>Growth of the Gross Domestic Product (%)</i>	<i>GDPG</i>	+
<i>Capital Scarcity</i>	<i>Long – term government bond yield (%) (10yr)</i>	<i>LTinterest</i>	+

4.0 Results

In this chapter we will first give an overview of the descriptive statistics. Secondly we will discuss our results found by running a GMM-estimator. At last we will present some robustness checks to confirm our results found.

4.1 Descriptive Statistics

Table 2 presents the descriptive results for the internal and external variables used in our model. The descriptive results are in line with previous research on bank profitability of European banks. When we look the post-crisis ROA of 0.63% we see that this is in line with return on assets Dietrich & Wanzenried (2011) found for the period of 1999-2009, but is below the return on assets Staikouras & Wood (2004) found for the 90's. Another interesting fact is that a large part of the variables differs among banks. For instance bank equity has an average value of 10.20%, but differs among banks from 2.01% to 66.15% of equity over assets. The same holds for Credit Risk and for the concentration ratio of the five largest banks. Especially when we look at Credit risk we see that the mean and median differ substantially. This implies that the amount of loan loss provisions banks hold over their gross amount of loans differs substantially among banks. Some banks even display negative amounts of loan loss provisions of -4.29%, which implies that they underprovide for their loan losses. A possible explanation for this could be the intense competition which pressures banks to make loans and loosen their credit standards. This is in line with the descriptive results on market concentration variables, which differ from a concentration ratio of 26.20% to 97.30%. It indicates that some banks may experience severe competitive pressure in their country and some banks may experience an oligopolistic market in some countries. At last we see that the greatest fraction of banks in our sample is non-listed and domestic. In our appendix we have added a cross-correlation matrix, table 3. We have written high levels of correlation in bold. Size shows a high correlation with Size² and the Herfindahl-Index shows a high correlation with the concentration ratio of the five largest banks. In order to avoid collinearity we run separate regressions only including one of the correlated variables.

Table 2, descriptive results

Variable	Mean	Median	Std. Dev.	Min	Max
ROA	0.63	0.52	1.15	-6.16	8.39
ROE	6.37	6.36	10.68	-73.50	52.02
Size	15.03	14.71	2.16	10.58	21.16
Size2	43.87	43.24	4.32	34.98	56.14
OPEX	2.69	2.00	4.25	0	40
CR	0.72	0.23	2.38	-4.29	31.47
EA	10.20	8.90	7.37	2.01	66.15
HH	580.82	412	449	250	2332
Conc5	43.83	39.60	15.84	26.20	97.30
Foreign	0.23	0	0.42	0	1
Listed	0.15	0	0.35	0	1
CPI	101.47	100.00	4.92	98.77	125.43
GDPG	1.54	1.50	1.47	-5.94	9.89
LTinterest	1.62	1.51	1.35	0.25	7.00

4.2 Empirical results

To investigate if individual effects are fixed or random we have conducted a Hausman-test, and found that the coefficients differ systematically. Therefore the null-hypotheses is rejected and the Fixed-Effect model is preferred. This is in line with our expectations discussed in chapter three. However as we have also discussed in our methodology, Fixed-Effect models can produce biased and inconsistent coefficients due to the dynamic nature caused by the presence of the lagged dependent variable. Therefore we proceeded with a two-step system-GMM-estimator and included robust standard errors.

Table 4 represents the empirical results for the determinants of bank profitability in the post-crisis period of 2013-2017 for a sample of 599 banks located in the Euro Area. In table 4 we have used ROA as our profitability measure. In order to examine if there is a difference between regressions with only internal factors and regressions including internal as well as external variables, we only included bank-specific determinants into our first regression (1), and included the industry-specific and macroeconomic variables afterwards. Secondly our specification tests show the stability of our coefficients. The Wald test shows that the model fits the panel data, as the coefficients differ statistically from zero. The Hansen-test shows no evidence of over-identifying restrictions, and its p-values stay in the range advocated by

Roodman (2006). The Arellano-Bond test for first and second autocorrelation show the presence of negative first order autocorrelation, but no presence of second order autocorrelation. Roodman (2006) mentions that first order autocorrelation is expected and evidence of it is uninformative. According to Arellano& Bond (1991) estimates are only inconsistent when second order autocorrelation is present. To avoid collinearity problems we ran separate regressions with the concentration ratio of the five largest banks (3), the Herfindahl-Index (2 and 4), size (1, 2, and 3) and size² (4).

Overall we see that our lagged profit variable is positive and significant in all the models. This indicates the persistence of previous profits on current bank profitability, and justifies ex-post the use of a dynamic panel model. Beside a significant relationship it is interesting to see what the value of delta (δ) is. Delta has a value of 0.26 when all categories of variables are included, and ROA as the dependent variable. It indicates that past profits are persistent to a moderate extent, and the Euro Area banking sector does not differ to a large extent from a perfect competitive market.

When we look at the bank-specific determinants in table 4 we see that three bank specific determinants are insignificant. **Size** is negative in all regressions. This indicates that larger banks do not benefit from economies of scale, but rather face diseconomies of scale due to more complex managerial and bureaucratic processes, which lowers their profitability. However the coefficient is not significant, which is not a striking result, because the average size of banks remained fairly stable over the years. **Size2** is also not significant, in which significance is more interesting than its coefficient. The insignificance tells us that size is not a quadratic form, which was proposed by Athanasoglou et al. (2008). However it does not mean that any other non-linear form is ruled out, but there are no theoretical reasons to assume size displays a non-linear form beyond a quadratic one. At last we have **operational efficiency** which is highly insignificant too. The high insignificance of the coefficient of OPEX and a value close to zero limits the explanatory power of the determinant to a minimum.

When we look at **credit risk** we see that is negatively and significantly related with bank profitability at a 1% significance level. This means that an increase in loan loss provisions as a percentage of gross loans decreases a bank's profitability. This finding is in line with our expectations and is also in line with previous literature. Early research did not include credit risk as a bank-specific factor but this result is an addition to the evidence which shows the importance of adding credit risk as an independent variable advocated by more recent literature.

Another bank-specific factor that showed positive and significant at the 5% level and 1% level when only bank-specific factors and all variables were included respectively, is **capitalization**. Banks with a higher capitalization were better able to deal with unexpected losses, and hence were more profitable.

When we look at the industry-specific variables we see that none of them turns out to have a significant influence on bank profitability. The findings on the **Herfindahl-Index** are in line with our expectations. However our HH coefficient has a value of 0.000, which is found in most empirical studies. (Staikouras & Wood, 2004; Dietrich & Wazzenried, 2011) Thus even when we would have found a significant relationship, the effect of market concentration on bank profitability would be zero. The same holds for the **concentration ratio** of the five largest banks, which shows a negligible coefficient of 0.01.

Our findings also indicate that **ownership of a bank** is an irrelevant factor for a bank's profitability. This statement holds for as well domestic or foreign ownership as listed or non-listed ownership. Interesting to see is that both variables show a positive relationship with profitability. These findings indicate that listed banks face more pressure to be profitable than non-listed banks. However it is less clear why foreign ownership causes banks to be more profitable. This finding is in contradiction with our expectations and the home field advantage hypothesis, which argues that domestic banks should be more profitable due to informational, cultural and language advantages. A possible explanation could be the technological edge that foreign banks have, which is mentioned by Demirgüç-Kunt & Huizing (1999), which may have helped foreign banks to become profitable again faster than their domestic competitors.

At last we have the macroeconomic variables. The findings reveal that none of the macroeconomic variables have a significant relationship with bank profitability. However, bearing in mind the insignificance, we want to point out some interesting findings. First of all we did find **inflation** to be negatively related with profitability, which is against our expectations. This indicates that banks were not able to forecast inflation in a beneficial way. The negative coefficient provides evidence in line with Perry (1992) who argues that unanticipated inflation could lead to negative shocks for outstanding loans, and decreases profits. Also **GDP growth** resulted in a negative coefficient, which is also against our expectations. In chapter five we will discuss a possible cause for the negative effect. **Capital scarcity** was the only macroeconomic variable that showed a positive relationship on bank profitability, indicating that more scarce resources lead to more economy-wide profits.

Table 4, empirical results (ROA)

ROA	Coef. (1)	Coef. (2)	Coef. (3)	Coef. (4)
ROA_{t-1}	0.198* (0.071)	0.264** (0.019)	0.267** (0.017)	0.264** (0.019)
Size	-0.258 (0.067)	-0.108 (0.531)	-0.106 (0.536)	
Size2				-0.054 (0.531)
OPEX	0.014 (0.716)	0.005 (0.890)	0.004 (0.904)	0.005 (0.890)
CR	-0.104*** (0.002)	-0.126*** (0.001)	-0.126*** (0.001)	-0.126*** (0.001)
EA	0.053** (0.027)	0.068*** (0.007)	0.069*** (0.006)	0.068*** (0.007)
HH		0.000 (0.790)		0.000 (0.790)
Conc5			0.001 (0.858)	
Foreign		0.132 (0.551)	0.132 (0.553)	0.132 (0.551)
Listed		0.292 (0.384)	0.292 (0.380)	0.292 (0.384)
CPI		-0.005 (0.637)	-0.005 (0.632)	-0.005 (0.637)
GDPG		-0.027 (0.374)	-0.027 (0.368)	-0.027 (0.374)
LTinterest		0.011 (0.587)	0.012 (0.575)	0.011 (0.587)
constant	5.702* 0.069	2.734 (0.367)	2.649 (0.373)	2.734 (0.367)
Wald Test	$\chi^2 (5) = 33.34$	$\chi^2 (11) = 55.73$	$\chi^2 (11) = 55.19$	$\chi^2 (11) = 53.73$
Hansen Test	p-value = 0.155	p-value = 0.163	p-value = 0.160	p-value = 0.163
Arellano-Bond(1)	z = -3.08	z = -2.96	z = -2.97	z = -2.96
	p-value = 0.002	p-value = 0.003	p-value = 0.003	p-value = 0.003
Arellano-Bond(2)	z = 1.12	z = 1.18	z = 1.19	z = 1.18
	p-value = 0.264	p-value = 0.236	p-value = 0.233	p-value = 0.236

***, **, * are significant at 1, 5 and 10 percent significance levels, respectively

4.3 Robustness Checks

In order to see if our model is robust we have already included robust standards errors, accounted for collinearity and included internal and external determinants separately. As additional robustness checks we investigate if the relationships still hold when we include ROE as a profitability measure, instead of ROA. Using ROE as a substitute for ROA to check the robustness is common in financial literature. (Bourke, 1989; Lin & Zhang, 2009; Anbar & Alper, 2011; Dietrich & Wanzenried, 2011) Primarily due to the nature of bank related literature. Many common robustness checks, like dividing the sample into sub-groups, can't be done because bank related literature often includes only a limited amount of banks .i.e. a limited amount of observations after accounting for subsidiaries. Therefore common robustness checks would lead to a significant drop in the number of observations and would significantly decrease the explanatory power of the sample. Therefore alternative measures of profitability are used to check the robustness.

However it must be pointed out that ROA is preferred, because ROE can disregard risks of high leverage as it is the unleveraged ROA. Especially variables that account for this leverage could turn insignificant, like the EA ratio. Nevertheless the DuPont model shows the close relationship of ROE and ROA. According to Padake & Soni (2015) the DuPont model divides the ROE in three parts and can be written as follows:

$$ROE = \frac{\text{Net profit before taxes}}{\text{Sales}} * \frac{\text{Sales}}{\text{Assets}} * \frac{\text{Assets}}{\text{Shareholder's equity}}$$
$$ROE = ROA * \frac{\text{Assets}}{\text{Shareholder's equity}}$$

This equation shows the close relationship of ROA and ROE. Therefore they should also have the same underlying's. When we look at figure 1, we can see that the average ROA and the average ROE follow a similar path over the years. The same finding was found by Athanasoglou et al. (2008).

In table 5 we see that most of the results found, when using ROA as a profitability measure, still hold when we use ROE as a profitability measure. This indicates the robustness of our estimates. When only internal factors are included we see that size becomes significant at the 10% confidence level, and shows a negative relationship with profitability. The negative relationship was also found when using ROA, but was insignificant. Another notable finding is

the insignificance of capitalization. It still displays a positive relationship with profitability, but is no longer significant. This was expected because capitalization accounts for a bank's leverage, when we use a deleveraged dependent variable.

Table 5, empirical results (ROE)

ROE	Coef. (5)	Coef. (6)	Coef. (7)	Coef. (8)
ROE_{t-1}	0.346*** (0.000)	0.386*** (0.000)	0.389*** (0.000)	0.386*** (0.000)
Size	-2.389* (0.092)	-1.194 (0.468)	-1.250 (0.446)	
Size2				-0.597 (0.468)
OPEX	-0.069 (0.831)	-0.052 (0.852)	-0.064 (0.823)	-0.052 (0.852)
CR	-0.993*** (0.003)	-1.047*** (0.001)	-1.049*** (0.001)	-1.047*** (0.001)
EA	0.038 (0.820)	0.109 (0.444)	0.116 (0.421)	0.109 (0.444)
HH		0.000 (0.697)		0.000 (0.697)
Conc5			0.011 (0.749)	
Foreign		1.305 (0.540)	1.385 (0.522)	1.305 (0.540)
Listed		2.735 (0.380)	2.860 (0.359)	2.735 (0.380)
CPI		-0.051 (0.634)	-0.048 (0.653)	-0.051 (0.634)
GDPG		-0.007 (0.979)	-0.005 (0.985)	-0.007 (0.979)
LTinterest		0.193 (0.422)	0.199 (0.409)	0.193 (0.422)
constant	57.063* 0.070	33.870 (0.254)	34.473 (0.243)	33.870 (0.254)
Wald Test	$\chi^2 (5) = 39.33$	$\chi^2 (11) = 58.72$	$\chi^2 (11) = 59.19$	$\chi^2 (11) = 58.72$
Hansen Test	p-value = 0.399	p-value = 0.302	p-value = 0.311	p-value = 0.302
Arellano-Bond(1)	z = -3.64	z = -3.57	z = -3.58	z = -3.57
	p-value = 0.000	p-value = 0.000	p-value = 0.000	p-value = 0.000
Arellano-Bond(2)	z = 1.85	z = 1.87	z = 1.87	z = 1.87
	p-value = 0.064	p-value = 0.062	p-value = 0.061	p-value = 0.062

***, **, * are significant at 1, 5 and 10 percent significance levels, respectively

5.0 Conclusion and Discussion

In this paper we have studied the determinants of bank profitability for a sample of 599 banks located in the Euro Area during the post crisis period, namely from 2013 until 2017. According to neoclassical and growth theory banks have no legitimate place, because they are no contributors to economic growth. However, they do facilitate economic growth by providing financial capital. This makes banks an interesting subject of study. In order for banks to provide credit they need to be profitable. Hence it is vital to have an understanding of the determinants of bank profitability. The determinants are divided in bank-specific, industry-specific and macroeconomic variables. Previous literature investigated these determinants and has shown the dynamic nature of them. However, given the dynamic nature, no research has investigated the determinants of bank profitability in the post-crisis period yet. Therefore we investigate the determinants of bank profitability during the post crisis period.

We also contributed to the existing literature by applying a modern econometric technique. The GGM-estimator was developed by Arellano and Bover (1995) and first applied in bank profitability literature by Athanasoglou et al. (2008). Hereafter it became the lead econometric technique. Traditional panel data models lead to biased and inconsistent estimators when using a lagged dependent variable. (Baltagi, 2001) The incorporation of a lagged dependent variable is necessary, because Berger et al. (2000) showed the tendency of previous bank profits to persist over time, due to market power informational opacity and sensitivity to local, state, and regional shocks. The system GMM approach also accounts for unobserved heterogeneity and possible endogeneity problems. Hence this method is up-to-date for dealing with empirical research on the determinants of bank profitability.

Our findings show that previous profits are persistent to a moderate extent and have a positive significant influence on current profitability. This indicates that even though previous profits are important, the market is close to a perfect competitive one. This finding is in line with that of Goddard et al. (2004), who found an equal bank persistent rate of 0.26 for European banks. However it differs from Dietrich & Wanzenried (2011), who found a delta of 0.09 and 0.16 for their sample of Swiss banks in the overall period and the crisis period respectively. The lower values found in Dietrich & Wanzenried (2011) could be explained by higher levels of market competition in the Swiss banking sector.

Other factors that showed significant for bank profitability are capitalization and exposure to credit risk. Size and operational efficiency showed an insignificant relationship with profitability. It should be mentioned that the coefficient of capitalization differs widely among the current literature. Our finding is in line with Athanasoglou et al. (2008), who studied a panel of Greek banks. However it is only half the effect found by Bourke (1989), Molyneux & Thornton (1992) and Staikouras & Wood (2004), who all studied the profitability of European banks. It is even in large contrast to Dietrich and Wanzenried (2011) who found a negative coefficient for capitalization for their sample of Swiss banks during the crisis. Thus capitalization shows to be a very dynamic variable. Interesting is the explanation for the negative coefficient found by Dietrich & Wanzenried (2011). They argue that it was due to the inability of Swiss banks to convert the increasing amount of deposits into higher profits, caused by a decrease in the demand of loans. Our findings indicate that banks could have regained the ability to transform additional deposits into profitable loans in the post-crisis period. However we look at Euro Area banks, so there might be a discrepancy between the behavior of Swiss banks and Euro Area banks.

Credit risk showed of significant negative influence on bank profitability. This is in line with the findings of Dietrich and Wanzenried (2011), who found exposure to credit risk only of significant influence during the financial crisis. Our results show that this change in influence has extended to the post-crisis period and that the financial crisis of 2008 had a long lasting effect on the determinants of bank profitability. The significance of credit risk and capitalization indicates that variables, which measure a bank's ability to deal with expected and unexpected losses, became of vital importance in the post-crisis period. This could be caused by the severe consequences the financial crisis of 2008 had on the financial system.

None of the industry-specific and macroeconomic variables had a significant influence on bank profitability. However it is interesting to discuss the findings on the Herfindahl-Index, Stock-exchange ownership and cyclical movements. Dietrich & Wazenried (2011) found the Herfindahl-Index of significant positive influence before the crisis, but of no significant influence during the crisis period. Our findings seem to indicate that this trend extended to the post-crisis period. They also found stock-exchange ownership to be of negative influence during the entire sample period. As mentioned in chapter two, the empirical literature including stock-exchange ownership as a determinant of profitability is scarce. We found an insignificant but positive relationship, which seems to be caused by increased pressure faced by publicly listed banks. Our finding on cyclical movements is interesting because it is against theoretical

expectations, but in line with some previous literature. (Staikouras & Wood, 2004; Li, 2007; Alper & Anbar, 2011) Even though only Staikouras & Wood (2004) found a negative relationship that was significant, none of them offered an explanation why GDP-growth turns out to be negative. A possible explanation could be that a higher GDP growth is correlated with a mature economic environment. Therefore these economies face more competitive pressure and therefore profitability will be lower. (Goldberg & Rai, 1996) This argumentation would be in line with our findings on the moderate persistence of past profits, which indicate no large deviations from a perfect competitive market.

Our paper shows the importance of internal factors for generating profits. However further research could investigate if these results hold when using a larger post-crisis time period, relative to our small time period of five years. The use of another database is therefore recommended, because Orbis Bank Focus had great limitations on the available time period in comparison with Bankscope. We also contributed by adding empirical evidence about the insignificance of some of the variables, such as size. Further research could omit these variables and extend the list of determinants with alternative determinants. At last our paper highlights the lack of consensus about the effect of stock-exchange ownership on bank profitability. Further research could shed more light on this.

6.0 References

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7.0 Appendix

7.1 Appendix 1

Table 3, cross-correlation matrix

	ROA	ROE	Size	Size2	OPEX	CR	EA	HH	Conc5	Foreign	Listed	CPI	GDPG	LT
ROA	1.00													
ROE	0.81	1.00												
Size	-0.04	0.03	1.00											
Size2	-0.04	0.03	1.00	1.00										
OPEX	0.18	0.05	-0.21	-0.21	1.00									
CR	-0.09	-0.22	-0.06	-0.06	0.24	1.00								
EA	0.31	0.00	-0.24	-0.24	0.43	0.25	1.00							
HH	-0.02	-0.06	0.17	0.17	0.02	0.13	0.03	1.00						
Conc5	-0.01	-0.06	0.17	0.17	-0.01	0.13	0.05	0.97	1.00					
Foreign	0.09	0.01	0.31	0.31	-0.02	0.04	0.10	0.24	0.27	1.00				
Listed	0.02	-0.01	0.35	0.35	0.06	0.06	0.04	0.21	0.22	0.28	1.00			
CPI	-0.08	-0.09	0.14	0.14	-0.05	0.01	-0.06	0.04	0.02	0.04	0.14	1.00		
GDPG	0.07	0.09	-0.07	-0.07	-0.01	-	0.01	0.07	0.06	-0.01	-0.05	-0.01	1.00	
LT	-0.12	-0.15	0.03	0.03	0.00	0.24	-0.03	0.37	0.41	0.08	0.14	-0.03	-0.50	1.00

7.2 Appendix 2

Figure 1, Relation average ROA and ROE

