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An Analysis of the Determinants of Commercial Bank Profitability in the Eurozone in 2009-2016

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Zásady pro vypracování

Introduction
I. Theoretical part

- Identify and analyse the internal and external determinants of commercial bank profitability on the base of the critical literature review.

II. Practical part

- Investigate the extent of the impact of determinants of commercial bank profitability operating in the Eurozone during the selected period 2009-2016.
- Evaluate whether commercial bank profitability in the Eurozone during 2009-2016 was influenced more by the internal or by the external determinants.
- Compare the importance and relation of the chosen determinants to commercial bank profitability in so-called PIIGS countries and the rest of the Eurozone.

Conclusion

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DE BRUYCKERE, Valerie et al. Bank/sovereign risk spillovers in the European debt crisis. *Journal of Banking and Finance* [online]. 2013, vol. 37, issue 12, p. 4793-4809 [cit. 2019-10-24]. DOI: 10.1016/j.jbankfin.2013.08.012. Retrieved from: https://www.sciencedirect.com/science/article/pii/S0378426613003439

MENICUCCI, Elisa a Guido PAOLUCCI. The determinants of bank profitability: empirical evidence from European banking sector. *Journal of Financial Reporting and Accounting* [online]. 2016, vol. 14, issue 1, p. 86-115 [cit. 2019-10-24]. DOI: 10.1108/JFRA-05-2015-0060. Retrieved from: https://www.emerald.com/insight/content/doi/10.1108/JFRA-05-2015-0060/full/html

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Abstract

By using fixed effects estimator with the robust standard errors, this paper analyses 586 commercial banks from the Eurozone during the period from 2009 to 2016. In order to take the European sovereign debt crisis into account, the sample is further divided into three groups, the whole Eurozone, the countries heavily hit by the debt crisis, and the rest of the Eurozone. Results are compared in order to see different trends, which these determinants follow. Chosen drivers of profitability are widely examined proxies representing both internal and external factors. Comparison of evidence from the whole Eurozone with the literature shows persisting importance of the bank size, equity ratio, level of loan loss reserves and the GDP growth. The result comparison between three sets of countries indicates that banks headquartered in the vulnerable countries benefit from the high loan ratio, whereas the banks from the rest of the Eurozone seem to be more conservative. Also, banks from the whole Eurozone seems to be more influenced by the external drivers, concretely GDP growth and inflation, whereas the banks in the vulnerable countries are mainly influenced by the internal factors. Cost to income ratio was also proved to be significant primarily for banks in vulnerable countries. These differences might be caused by the impact of the European sovereign debt crisis. To conclude, the detailed analysis and the usage of recent data brings up-to-date findings from the constantly changing European banking sector.

Keywords

bank profitability, determinants, commercial banks, Eurozone, European Union, European debt crisis, PIIGS countries

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List of abbreviations

BLUE – best linear unbiased estimator

CTIR – cost to income ratio

ECB – European Central Bank

EMU – economic and monetary union

EU – European Union

FE – fixed effects

GDP – gross domestic product

GMM – generalised method of moments

IMF – International Monetary Fund

INF – inflation

LLR – loan loss reserves

logTA – logarithm of total assets

NIM – net interest margin

NIRTA – net interest revenue divided by average total assets (net interest margin)

NLTA – net loans over total assets

PIIGS – Portugal, Italy, Ireland, Greece, Spain

ROA – return on assets

ROAA – return on average assets

ROAE – return on average equity

ROE – return on equity

SGP – Stability and Growth Pact

TETA – total equity divided by total assets

TLLRGL – total loan loss reserves divided by gross loans

TPTP – taxes divided by pre-tax profit

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1. Introduction

1.1 Background

The fact that banks' performance plays a fundamental role within the financial sector was number of times proved in practice. Unfortunately, banks' performance was often in the centre of attention just after it helped to trigger the financial crisis. Recent global financial crisis shed a light on the complexity of bank operations, their substantial impact on the economic situation and the robustness of the financial contagion connected. Since banks are business entities, their existence and survival are dependent on further growth and generated profit. When banks remain profitable, there is easy access to credit, the level of uncertainty is kept down, the national productivity is improved and the economy is flourishing. Considering the relation between the safety and soundness of a banking sector and a stability of a financial system, nowadays authorities pay adequate attention to the bank performance. In order to protect rather bank-based Europe, European banking sector experienced significant structural changes together with the new regulations. According to the literature, European banking sector became more concentrated and the non-interest income started to be more important. Due to the ongoing integration of the Eurozone and the European Single Market, it is important to control the banks' financial performance not only in particular countries but in the whole European Union or the Eurozone. The Eurozone offers so far unexamined set of countries, which combines the most developed economies with unstable and vulnerable countries. The significant impact on Eurozone had recent European sovereign debt crisis. Some governments were forced to bail out heavily hurt banks headquartered in their territory, which deepened the country risk and the bank risk. This helped to trigger the sovereign debt crisis, which quickly spilled over the European continent. In order to prevent these financial downturns, it is of the utmost importance to constantly monitor and to be aware of banks' financial situation. Since the economic conditions are constantly changing, the significance and impact of various factors on the bank profitability are changing too. It is, therefore, crucial to always bring new and up-to-date results.

1.2 Research objectives and aim

The main objective of this research is to: 'Explore to what extent the chosen determinants affect the profitability of the commercial banks in the monetary union of

Eurozone in the selected period from 2009 to 2016.' This objective has the potential to help the European Union (EU) and government authorities to detect meaningful internal or external determinants of the bank profitability in recent years, and help them to adjust policies in order to stabilise the bank profitability and so the financial situation within the countries of the Eurozone. To enrich the scope of this objective, this research additionally provides a closer look on determinants of bank profitability in the so-called PIIGS (Portugal, Italy, Ireland, Greece, Spain) countries, which were in the centre of attention in the European sovereign debt crisis. It compares the obtained results with the rest of the Eurozone, as well as with the evidence acquired from the Eurozone as a whole. The aim of this dissertation is to investigate the impact of drivers of profitability of commercial banks operating in the Eurozone in the direct post-crisis period.

1.3 Research questions

The research questions were structured in a way to provide the most beneficial interpretation of the results. Following four research questions were built.

Q1 – To what extent is the profitability of the commercial banks in the Eurozone between 2009 and 2016 influenced by chosen determinants?

Q2 – Is the profitability of the commercial banks in the Eurozone between 2009 and 2016 influenced more by the internal or by the external determinants?

Q3 – Does the importance and the relation of the chosen variables to the bank profitability change compared to the previous and similar conducted studies?

Q4 – Is the importance and relation of the chosen determinants to the bank profitability different in so-called PIIGS countries and the rest of the Eurozone?

By the time of writing this dissertation, no other studies on bank profitability in the Eurozone have been published. Therefore, by 'similar study' this research means a study which was conducted on the determinants of bank profitability in the European Union in the different time periods. The reason for choosing the EU is that the Eurozone and the EU shares the same countries, which forms the comparable environment and allows adequate result comparison.

1.4 Contribution

This dissertation contributes to the literature by examining a unique set of countries, which together have not been tested before. It also divides Eurozone into the two specific parts, countries hit by the sovereign debt crisis (PIIGS countries) and the rest of the Eurozone (non-PIIGS countries). This further division enables to see whether the European debt crisis had a different impact on determinants of bank profitability in the PIIGS countries. On top of this detailed analysis, this paper uses recent data, which brings fresh insight onto the drivers of bank profitability in the European banking sector.

1.5 Data and methodology

The data were downloaded from the Fitch Connect database, which provides unified bank data from all over the world. Since data in Fitch Connect are persistently updated, at the time of data search 586 banks were generated for the selected area of the Eurozone. Other macroeconomic data as GDP growth per capita and inflation were found in The World Bank website (The World Bank Group, 2019a; The World Bank Group, 2019b). Not all the data were accessible, therefore a set of unbalanced panel data was generated. Data was further divided into the 3 groups: Eurozone, non-PIIGS countries and PIIGS countries. Firstly, descriptive statistics and profitability trends are described. Secondly, the correlation matrices for the detection of serious multicollinearity problems are displayed. Then the regression model was estimated with the fixed effects estimator with the robust standard errors, which controls for heteroscedasticity and within panel autocorrelation. The results are compared with the findings from similar studies and also within all three sample groups.

1.6 Main findings

The main determinants of bank profitability in the Eurozone are bank size, equity ratio, level of loan loss reserves, GDP growth and the level of inflation. The importance and impact of these determinants persisted across time, which is proved by the result comparison with the similar studies. Banks in the Eurozone seem to be more affected by the external determinants. The evidence from PIIGS countries and the rest of the Eurozone reveal some major differences. PIIGS countries appear to be more affected by the internal determinants, where the most important drivers include loan ratio, equity ratio, level of loan loss reserves, cost to income ratio and the level

of inflation. After the further division of the Eurozone sample, bank size lost its significance. Furthermore, banks' profitability in PIIGS countries is positively affected by the loan ratio, whereas banks from non-PIIGS countries experience opposite effect. Similarly, GDP growth per capita significantly influence banks' profitability in non-PIIGS countries, however, it almost entirely lost its significance in the case of PIIGS countries. Detailed description and comparison of findings can be found in the results section.

1.7 Thesis structure

The paper is organised as follows: The first part starts with the introduction. The second part is devoted to the literature review, which consists of the institutional background of the Eurozone, the overview of the European sovereign debt crisis and the PIIGS countries, the role of banks in the economic system, the general overview of the European banking sector and the detailed review of the determinants of bank profitability. The third part deals with the the methodology and data description, which includes the methodology review, the estimation model, detailed description of the chosen variables and used methodology together with the potential statistical issues. The fourth part presents the final results, which also includes descriptive statistics, profitability trend analysis, presentation of the correlation matrices and the regression results. Finally, the last part focuses on the conclusion, which gives a brief summary of the subject of this dissertation, used methodology and main findings. It also lists the limitations of this dissertation and provides future research suggestions.

2. Literature review

This part talks about the institutional background of the Eurozone as monetary union, its objectives, the role of the central banks and ECB in the European banking and convergence criteria for adopting euro as the national currency. The role of banks in the economy and the characteristics of the European banking industry are specified further. The main part is devoted to the detailed review of the drivers of bank profitability and relevant empirical literature.

2.1 Institutional background of the Eurozone

The euro currency was firstly introduced in 1999, when it was initially adopted by the 11 EU member states as their new single currency, by which adopting they formed the Euro area. These countries were followed by Greece (2001), Slovenia (2007),

Cyprus and Malta (2008), Slovakia (2009), Estonia (2011) and the most recently by Latvia (2014) and Lithuania (2015) (European Commission, 2019a). Nowadays is the euro area formed by the 19 EU member states, which are also part of the Economic and Monetary Union (EMU). Additionally, Monaco, Andorra, Vatican, and San Marino negotiated specific monetary agreements with the EU, in order to be able to adopt euro as their currency, however, these countries are not part of the Euro area since not taking part in the EU (European Commission, 2019a).

Being a member of the Eurozone allows economies to be more integrated. This requires a uniformed monetary policy which is governed by the European Central Bank (ECB) together with the national central banks, but it also requires individual economic policy controlled by member states (European Commission, 2019a). The main objective of monetary policy is to maintain price stability. Where the ECB, as being the supervisor of the credit institutions across the EU, supports safety and soundness of the European banking system while respectively separating the supervisory and monitoring duty (European Central Bank, 2019). The economic policy of the Eurozone member states can be adjusted to the individual needs of the country while it has to support the universal objectives of growth, stability, and employment. The main instrument to accomplish agreed cooperation is the Stability and Growth Pact (SGP) (European Commission, 2019a). This document incorporates fiscal discipline rules, which compliance with is obligatory for all the EU member states and non-compliance is penalized just for the members of the Euro area (European Commission, 2019a).

In order to adopt the euro currency, member states have to fulfil the convergence criteria which measures the preparedness of the country and which are measured by a set of macroeconomic indicators (European Commission, 2019b). The main four criteria are price stability, government debt and deficit, exchange rate stability, and durability of the convergence, which is measured by long-term interest rate (European Commission, 2019b). After meeting the convergence criteria, all the EU member states except the United Kingdom and Denmark are obliged to join the Eurozone (European Commission, 2019b). The transition process requires complex economic, social and legal convergence of the remaining countries and therefore the Maastricht Treaty does not specify individual target dates for adoption of the euro (European Commission, 2019c). When the conditions are fulfilled, exchange rate of

the home currency is fixed to the euro and the monetary policy is consequently devoted to the ECB, which with the help of the national central banks, maintain the price stability in the Euro area (European Commission, 2019d). By adopting the euro currency, member states deepen the integration process and functioning of the Union's Single Market. Global financial crisis unveiled institutional weaknesses of the Eurozone, which subsequently led to the European sovereign debt crisis. Therefore, new instruments were adopted, the assistance to the severely affected countries was provided and the process of integration of the Economic and Monetary Union was strengthened, in order to be prepared for possible future downturns. Since most of the studies are focused on the period before the financial crisis, research conducted on the subsequent 8 years after the global financial crisis on the determinants of the bank profitability in the Eurozone might help to reveal whether banks are in good financial condition and whether these determinants have changed over time.

2.2 European sovereign debt crisis and PIIGS countries

Except for the global financial crisis, Europe experienced another local financial downturn, which is referred as the European sovereign debt crisis. De Bruyckere, Gerhardt, Schepens and Vander Vennet (2013) explain, that some countries were compelled to save banks in their territory, which were severely hit by the financial crisis. This led to the rise in national debt and further link between bank and country risk. States as Portugal, Italy, Ireland, Greece and Spain (PIIGS countries) became to be classified as the most vulnerable. Furthermore, De Bruyckere et al. (2013) indicate the year 2009 as the start of the sovereign crisis, when Greek government confessed distinctively larger national debt, than reported. With Kosmidou, Kousenidis, Ladas, and Negkakis (2019) they coincide, that large interventions under the surveillance of International Monetary Fund (IMF), European Commission and ECB (also known as troika) were needed. De Bruyckere et al. (2013) specify that two bailout packages were received by Greece, which was followed by Portugal and Ireland. Lane (2012) further specifies that Irish banking was highly dependent on short-term international funding, which triggered the deepening national debt. Another important and one of the biggest Eurozone economies was also hurt. Spain experienced small or even negative GDP growth, high unemployment rate and high budget deficit, which led to the bailout package in 2012 (Gruppe and Lange, 2014). Subsequently, sovereign debt crisis was spilled over to another big player, Italy.

Vulnerable PIIGS countries still try to slowly rebound national sovereignty and financial independence. Since the European sovereign debt crisis had significant impact on the Eurozone, this study examines determinants of bank profitability in three different sets of countries. Concretely 19 countries of Eurozone, 5 PIIGS countries and 14 non-PIIGS countries of Eurozone separately.

2.3 Role of the banks in the economic system

The importance of the banks in the economy might be explained by the conventional theory of financial intermediation. According to Gurley and Shaw (1955), banks collect savers' money surplus in the form of deposits and address them to borrowers, which have the money deficit. Banks are financial intermediaries which by adding further social value to the capital also enables capital to be used more efficiently. As Schmidt, Hackethal and Tyrell (1999) argue, capital markets might efficiently take over the capital intermediation and transformation under specific circumstances. Thus, the importance of banks as the financial intermediaries is based on the assumption, that only self-financing and direct financing takes place and that the only possible intermediators are banks (Schmidt et al., 1999).

As the technology and financial markets became more developed, the theory of financial intermediation was adjusted. Diamond (1984) further developed this theory based on the cost minimisation of the information gathered, used for tackling the incentive problem. Since the intermediator (the bank) has a monitoring function, it has a cost advantage of collecting the mass information from borrowers, lenders or the market, in comparison to the individuals. Individuals might apart from high monitoring costs face also the free-rider-problem and due to these reasons, banks might have net cost advantage compared to the direct financing. Diamond (1984) adds, that the diversification within the bank (intermediator) is essential for having the net advantage since the diversification can monitor the incentive problem and make monitoring of the borrowers feasible. Schmidt et al. (1999) summarize the literature upon this topic in a statement, that banks are able to solve an incentive and information problem between the lenders and borrowers under specific conditions better, than it would be solved by using capital markets, non-bank financial intermediaries or direct financing. As mentioned by Diamond (1984), banks' ability of monitoring and evaluation might be used in the cases, when capital markets are unable to do so. Banks are also important liquidity provider, due to the deposits

taken. Since banks need to be profitable in order to meet their roles, it is important to be aware of the determinants of their profitability. Athanasoglou, Brissimis, and Delis (2008) add that profitable banks in the economy may help to stabilise the financial system and may be able to withstand economic downturns and shocks.

However, Schmidt et al. (1999) mention that the role of the banks in advanced economies like the US might seem to be continuously fading. And since the US market is usually considered to be the leader in setting the pace of the other economies, it could be thought, that the disintermediation, securitisation and the stronger impact of the non-bank financial intermediators might lead to the reduction of banks in developed economies and also reduction of their importance (Schmidt et al., 1999). Allen and Gale (1995) show, that the difference between financial systems in developed economies depends on the importance and development of financial markets and intermediaries. They define two extreme examples, US and Germany. From continental Europe was chosen Germany, which represents mostly bank-oriented country with less developed financial markets. However, US banking industry is far less concentrated with developed financial markets and therefore financial system is strongly market-based (Allen and Gale, 1995). This might explain the assumption about the declining role of banks in economies, where the financial system is quickly innovated. Another factor which might influence the differences between financial systems might be legal system. Levine (1998) found close relationship between bank development and the legal system. Countries which legal system is more focused on creditors' rights when talking about corporate bankruptcy have better developed banks than the countries with lax law-enforcement (Levine, 1998). It might be argued, that Anglo-sax common law emphasises the right of the creditors to greater degree than the European civil law, however, European civil law dispose with stronger law and contract enforcement (Levine, 1998).

Hartmann, Maddaloni, and Manganelli (2003) add that diminishing boundaries, financial liberalisation, demographic changes, and technological innovations also led to the transformation, which changed the traditional banking and financial intermediation.

2.4 Overview of the European banking industry

Launch of the European Economic and Monetary Union together with the financial liberalisation and deregulation helped to the financial system transformation

(Hartmann et al., 2003). Bikker and Haaf (2002) draw attention to possible consequences on competition and concentration in the European banking sector, especially for local markets and retail services. One of the already evident consequences was the trend of mergers and acquisitions. Increased concentration and new strong global players might negatively influence the financial stability (Bikker and Haaf, 2002). Goddard, Molyneux, Wilson and Tavakoli (2007) state that the European banking industry has become closely integrated, although, in retail banking, barriers like lack of consumers' trust in foreign banks still persists. They show a different point of view, that the banks' operating activities became dispersed in more countries, which reduces market risk exposure to unexpected turmoil in domestic economy. Integration might also help to reduce the cost of capital and therefore boost the economic growth, together with better income insurance and access to foreign credit markets for the countries which join the Euro area (Hartmann et al., 2003).

Fiordelisi, Marques-Ibanez, and Molyneux (2011) add, that the extensive integration, deregulation and technological change increased competition within the banking industry, which attracted banks to operate at their efficient production line. However, this pressure of high competition might also lead to a large risk taking. Which was opposed by Petria, Capraru, and Ihnatov (2015), who found a positive influence of competition on bank profitability in the EU. Fiordelisi's et al. (2011) further findings showed that rise in the bank capital helps to lower the moral hazard incentives, which precedes even the cost efficiency improvements. Therefore, well-capitalised banks could easier reach cost reduction than under-capitalised banks. European banks have according to Goddard et al. (2007) responded to more competitive environment by the rapid growth and mergers and acquisitions. Together with Smith, Staikouras, and Wood (2003) was observed the trend that European banks' non-interest income became more important in their final income structure. Since the net interest margins faced increased competition, banks focused more on off-balance sheet business or bancassurances. Empirically, the proportion of non-interest income rose from 28% in 1992 to more than 40% in 10 years time (Goddard et al., 2007). This fee and commission income orientation might help banks to stabilise profit flows (Goddard et al., 2007).

Concerning the ownership, in the European banking operate together public, private, cooperative and mutual firms in one competitive market, while the literature does not clearly show the best performing type of ownership (Goddard et al., 2007). In the European banking industry, the issue can be seen in the fact that profit-oriented banks started to draw their attention to the wealthy customers, which might be due to financial liberalisation or higher emphasis on shareholders' value. This led to further specification, where households and small businesses were reliant on specified institutions as cooperative banks or saving banks (Carbo, Gardener, and Molyneux, 2007; Goddard et al., 2007). Since the process of further integration is still ongoing, the European banking industry remains to be the dynamic environment for the researchers, where new, important and up-to-date findings can be obtained from any perspective.

2.5 Determinants of the bank profitability

Since banks play a fundamental role in the economy, it is of the utmost importance to be aware of the factors, which influences their profitability. Determinants of banks' profitability have been examined in the wide range of literature, where most of the studies were conducted on the one country and only a few were conducted on specific political area or set of countries. Haslem (1968) did an empirical analysis of the profitability in commercial banks, testing the significance of 4 effects which might contribute to the bank profitability, concretely management, location, size and time effects, finding all of them being significant. However, the purpose was not to specify how to improve the profitability, nor to determine the actual determinants. More authors have contributed to develop this area. Short (1979) found that concentration measures, ownership of the bank, discount and the long-term government bond rate were remarkable in connection with the bank profit rates from Japan, Canada, and Western Europe. Where the leverage ratio was surprisingly not significant whereas the ownership was significant. In connection, the Short's (1979) paper, Bourke (1989) also examined external factors as concentration, regulation, competition in 12 countries on three continents, concretely Europe, Australia, and North America. Bourke (1989) tested some Short's (1979) findings, which were proved only in general meaning. The reason might be the different time scale, sample and the choice of slightly different dependent variables. In relation to the papers mentioned, Molyneux and Thornton (1992) examined the determinants of the European bank

profitability, where they compared their results with the Short's (1979) and Bourke's (1989) outcomes. Molyneux ant Thornton (1992) confirmed the positive relation of interest rates and concentration to the return on capital. On the other hand, their findings differ in sense that ownership was proved to be positively related to the return on capital. Despite the similar set of countries, independent variables and statistical principle, no consensus has been reached by addressed continuous examination of the results. This reflects the constant changes in the economic environment and individual bank factors, which impact banks' profitability. And due to the changes in the European banking sector and constant economic alternations, this research tries to bring up-to-date and relevant results on the determinants of the Eurozone bank profitability.

There is an indefinite number of possibilities of the relevant determinants which might have an impact on the banks' profitability and their different classifications. In more detail, Athanasoglou et al. (2008) and Capraru and Ihnatov (2015) divide these factors into the 3 groups, bank-specific, industry structure and separately macroeconomically related factors. However, this research classifies determinants into the internal and external factors, similarly as Bourke (1989), Molyneux and Thornton (1992), Staikouras and Wood (2004), Pasiouras and Kosmidou (2007) or Menicucci and Paolucci (2016). Specifically, internal determinants represent individual or micro factors, which are directly related to the specific bank strategies and decisions. This research chose bank size, loan ratio, capital ratio, loan loss provisions and cost to income ratio. On the other hand, the external determinants are out of the banks' control which represents economic and legal factors. This paper tests the tax effect, GDP growth per capita and annual inflation rate.

2.6 Measures of profitability

2.6.1 Return on assets

Return on assets (ROA) became the standard measure of profitability across the financial sector. Early studies about bank profitability like Bourke (1989), Molyneux and Thornton (1992) used both standard and value-added return on assets, in order to best capture the bank profitability. Value added version included staff expenses and loan losses which were added to income before tax. Similarly, Miller and Noulas (1997) who examined large banks in the USA, or Demirguc-Kunt and Huizinga (1999) used primarily ROA as their profitability measure. Athanasoglou et al. (2008) add that

ROA might be a misleading measure, due to possible bias caused by off-balance sheet activities. Nowadays, the net profit is mostly preferred rather than profit before tax in the numerator. Another alternative is using the average value of the total assets as denominator. Golin and Delhaise (2001) present return on average assets (ROAA) as the meaningful measure of profitability. Petria et al. (2015) mention that ROAA might be indication of management effectiveness since it expresses profit generated by total assets. Dietrich and Wanzenried (2011) add, that ROAA shows the profit generated from 1€ worth of assets.

2.6.2 Return on equity

Return on equity (ROE) is together with ROA standard measure of the profitability. In connection to bank profitability, early studies like Short (1979), Bourke (1989), Molyneux and Thornton (1992) used so-called return on capital. Which was measured by net income, or the income before tax in the numerator and the total capital, or capital plus reserves and borrowings in the denominator. Demirguc-Kunt and Huizinga (1999) in their wide analysis of banks from 80 countries in 1988-1995 used rather ROA than ROE. They argued that banks in developing countries operate with quite low capital, while being aware of the implicit state guarantees. Which could easily inflate their ROE and bias the results. Even ROE could be calculated from the average equity in the denominator. Dietrich and Wanzenried (2011) add, that return on average equity (ROAE) underestimate higher risk taken by high leverage and the regulation effect on leverage since banks with the low leverage commonly declare high ROAA but low ROAE. Petria et al. (2015) oppose, that off-balance sheet assets are not part of the ROA, although they still take a significant part of the European banks' profits. This might make ROE more effective measure of profitability than ROA. Despite the several opposing opinions about the trustworthiness of this measure, ROE is nowadays actively used as a measure of profitability.

2.6.3 Net interest margin

Net interest margin (NIM) became to be frequently used measure of bank profitability in the late 1990s. Measured as the net interest income divided by total assets, or either average total assets. Authors like Angbazo (1997), Demirguc-Kunt and Huizinga (1999), Dietrich and Wanzenried (2011), Capraru and Ihnatov (2015), Menicucci and Paolucci (2016), Adelopo, Lloydking and Tauringana (2018) or Batten and Vo (2019) used this measure as one of their main dependent variables. Angbazo

(1997) define NIM as the summary measure defining the bank's net interest rate of return. Banks set NIM in order to cover the costs of financial intermediation. Angbazo (1997) adds that as banks' risk exposure increases, fair NIM should increase generated income and therefore enhance the capital base. On the other hand, Demirguc-Kunt and Huizinga (1999) take NIM as the measure of bank efficiency. They claim, that decline in NIM may be caused by the tax cost reduction, which may reflect improved banking activity, or high loan default rate. Garcia and Guerreiro (2016) state that NIM indicates the amount of profit generated by banks' core business, which consists of interest activities. This research use for the indication of net interest margin two shortcuts NIM and NIRTA, which are used interchangeably.

2.7 Factors affecting profitability

This section talks about several factors, which were often tested in the literature, to discover the importance and their effect on bank profitability. This dissertation tried to pick several bank internal independent variables represented as ratios, measuring banks' liquidity, asset quality, efficiency, and capital adequacy. To take a macroeconomic environment into account, three determinants were chosen.

2.7.1 Bank size

The literature review indicates bank size as one of the most examined determinants of banks' profitability. Bank size is taken into account usually due to the premise of the benefits from economies of scale and scope (Bourke, 1989). Evidence from Altunbas, Gardener, Molyneux, and Moore (2001) says, that small European banks are proved to benefit from scale economies. Whereas large banks benefit mostly from technical progress rather than economies of scale. However, Goddard et al. (2007) claim that the reduction of operational inefficiencies has greater cost saving potential, than the cost savings from economies of scale. Their estimation is that even 100% increase in scale would not benefit the bank by more than 5% average cost reduction. Menicucci and Paolucci (2016) add that significant economies of scale might be positively connected to profitability, whereas significant economies of scope might negatively influence profitability due to the greater diversification and higher risk. Their empirical evidence supports economies of scale, claiming, that bank size is the most important determinant of European bank profitability. Pasiouras and Kosmidou (2007) oppose by finding a negative relationship between size and profitability in both, domestic and foreign European banks. Athanasoglou et al. (2008)

found that bank size effect is not significant. Shehzad, De Haan, and Scholtens (2013) looked at relationship between size, growth, and profitability of the commercial banks in 148 countries in 22 years. According to their findings, in developing countries the bank size does not affect the bank profitability. Whereas in the OECD countries, bigger banks seem to be more profitable than their smaller competitors. Thorough the years of various empirical research papers, no consensus has been reached so far. This research, therefore, brings new insight into the unexamined area of Eurozone and the impact of banks' size on banks' profitability.

2.7.2 Size of the loan portfolio

The size of the loan portfolio might play an important role in influencing bank profitability since the loan issuance is considered to be the banks' main business. However, Goddard et al. (2007) point that due to the large competition, European banks main source of profit became non-interest income. However, the size of the loan portfolio might also indicate different issues within the bank. Athanasoglou et al. (2008) indicate loan to asset ratio together with loans to deposits as a measure of liquidity and credit risk. Generally, banks with adequate liquidity level and low credit risk are exposed to lower risk. Which might lead shareholders to require a lower rate of return, which could lower the weighted average cost of capital. With the consideration of risk-return hypothesis, lower risk generates lower return. The effect of loan portfolio is often measured as loan growth. Staikouras and Wood (2004) claim, that rapid loans' growth increases the risk and therefore increases the cost of funding, which might result in negative impact on profitability. Menicucci and Paolucci (2016) add that rapid growth in the proportion of loans might also lead to their poor quality and thus lower profitability. Their empirical evidence on top 35 European banks showed positive but insignificant relation to ROE and ROA. Together with the evidence from Demirguc-Kunt and Huizinga (1999), loan to asset ratio had significant positive relation to NIM. On the other hand, Staikouras and Wood (2004) proved loan ratio to be negatively related to profitability. Foos, Norden, and Weber (2010) tested the relation between abnormal loan growth, asset risk, and bank profitability and solvency. By examining around 16000 banks from top 16 countries, they found that abnormal growth of the loan portfolio is significantly and negatively related to the profitability. As the literature review shows, the influence of the loan portfolio can affect banks' profitability either negatively and positively.

2.7.3 Capital adequacy

The capital ratio can be characterised as an indication of the capital strength of the bank, indicting risk and the leverage connected. Bank face lower risk when it has higher proportion of the shareholders' equity, which increases its solvency and solidity. Banks might, therefore, enjoy lower cost of funding (Pasiouras and Kosmidou, 2007). When this cost reduction becomes influential, stronger profitability can be reached. This would indicate the positive relationship between profitability and capital ratio. Empirically, Bourke (1989), Demirguc-Kunt and Huizunga (1999), Pasiouras and Kosmidou (2007), Garcia-Herrero, Gavila and Santabarbara (2009) and Dietrich and Wanzenried (2011) proved that well-capitalised banks were functioning better. In contrast, risk-return hypothesis is in direct conflict, where the low risk generates low return and therefore predicts the negative relationship between capital ratio and bank profitability. It can be said, that managers' and shareholders' inclination towards risk might influence the bank profitability, by manipulation of the level of reserves, capital ratio or liquidity ratio (Staikouras and Wood, 2004; Pasiouras and Kosmidou, 2007; Dietrich and Wanzenried 2011; Menicucci and Paolucci, 2016). Although, the introduction of Basel III. capital requirements do not allow managers to manipulate major performance ratios because it sets its minimal value. Therefore, this argument might lose its relevance.

In the 15 European countries, the capital adequacy was the strongest determinant for the domestic banks, but it was positive and significant also for foreign banks (Pasiouras and Kosmidou, 2007). In the European environment, these findings are consistent with Staikouras and Wood (2004) and Menicucci and Paolucci (2016), and in a worldwide environment with Demirguc-Kunt and Huizinga (1999). Suggesting that better capitalised banks are more profitable. The same trend was spotted in West African States, where Adelopo et al. (2018) proved significant and positive relation of the capital ratio to all measures of profitability (ROA, ROE, NIM).

On the other hand, Petria et al. (2015) found in the EU environment insignificant positive relation to ROE, which might reflect the fact that shareholders do not longer profit from the leverage effect. Relation to ROA was found to be positive and significant. Capraru and Ihnatov (2015) did not find capital adequacy to be significant in any case, neither before the influential enlargement of the EU in 2004, nor after.

Since the effect of the capital ratio is not clearly empirically proved, this research might bring new relevant results.

2.7.4 Quality of the loan portfolio

Quality of the loan portfolio can be measured by the proportion of the bank's loan loss reserves (LLR). Its proportion to total loans is often used to indicate the asset quality. Staikouras and Wood (2004) used it for the measure of capital risk. They add that during the economic downturn, banks face higher default risk which might set loan loss provisions to grow. Their empirical evidence showed that the proportion of LLR to total loans is negatively and significantly related to banks' ROA. Miller and Noulas (1997) note that variations in bank profitability depend on the variations in the level of loan loss provisions. In large US banks, LLR was negatively related to ROA (Miller and Noulas, 1997). Curcio and Hasan (2015) emphasize that loan loss provisions are one of the most important bank's accrual expenses. They also warn that the value of this account is vulnerable to the managerial discretion. Curcio and Hasan (2015) summarize four main reasons for managerial discretion. These are signalling effect, capital regulation, taxes, and income smoothing. That might be the reason why so much attention is paid to this proxy. Also Fiordelisi et al. (2011) used loan loss provisions to total loans as main backward-looking bank credit risk indicator, which they also indicated as a subject to managerial discretion. From empirical findings, Menicucci and Paolucci (2016) confirm that loan loss provisions ratio is estimated to be negatively related to profitability since the higher ratio signalises lower credit quality. Dietrich and Wanzenried (2011) also confirm, that during financial crisis have this ratio increased, which negatively impacted Swiss bank profitability. From the European environment, Petria et al. (2015) also support negative and strongly significant effect on bank profitability. As during the financial crisis banks provided too many loans with the poor quality, nowadays the quality became superior over the issued amount. In case bank holds high-quality loans on their balance sheet, high loan loss provisions ratio might be positively related to profitability, considering the risk-return hypothesis (Menicucci and Paolucci, 2016). This positive relation was supported by Haffernan and Fu (2010) who examined Chinese banks, saying that loan loss provisions supported bank performance. An explanation might be different risk attitude, where according to risk-return hypothesis banks with riskier attitude enjoy higher profitability while maintaining the provisions

for larger losses. Alternatively, banks could create a bubble of undeclared bad debt, which would maintain the profitability through increase of toxic assets (Haffernan and Fu, 2010). By extensive examination of this measure, the level of loan loss reserves is proved to be an important determinant of the bank profitability.

2.7.5 Cost efficiency

Cost efficiency could be measured by the cost to income ratio. This proxy is considered to be the measure of banks' cost management efficiency, where a high ratio indicates less efficient management (Petria et al., 2015). It displays cost of operational expenses, which includes mainly staff salaries, administrative costs or property costs in relation to total income. Cost efficiency could be taken into account also by using stochastic frontier approach (Tan, Floros, and Anchor, 2017). By examining 15 European countries, Altunbas, Goddard, and Molyneux (1999) found that technological innovations could bring banks about 3,6% of cost reduction annually. However, even remarkable cost reduction from technological innovations over the last decades does not seem to undercut negative relation of cost to income ratio to bank profitability (Altunbas et al., 1999). Pasiouras and Kosmidou (2007) highlighted cost to income ratio to be the most significant and negatively related determinant of profitability for foreign banks, which might be because of the diseconomies caused by monitoring and operating from the distance. Together with Capraru and Ihnatov (2015), Petria et al. (2015) and Adelopo et al. (2018) they interpret negative relationship with all measures of profitability used.

2.7.6 Impact of tax

Since the tax rate significantly differs in countries across the world, it might be thought that banks facing a higher tax rate would be less profitable than banks facing a relatively low tax rate. As Demirguc-Kunt and Huizinga (1999) mention, this complex determinant was not used in any other previous similar study, before theirs. Their worldwide empirical evidence showed positive and significant impact of taxation on banks' interest margins and profitability. Whilst, in the end it reduced bank profitability. The tax rate was found to rise together with the interest margins and profitability, although less rapidly in rich economies (Demirguc-Kunt and Huizinga, 1999). Albertazzi and Gambacorta (2010) analysed bank taxation and profitability in the 8 Euro area counties, United Kingdom and United States in 22 years time scale. It was found that taxation has a meaningful impact on profit structure and taxation on

profit equals taxation on loans. Concretely, fee-generating services were proved to have negative relation to tax rate. Other empirical findings revealed, that raise of the corporate income tax positively affects loans interest rate, negatively influence lending volume and has no effect on deposit market. Furthermore, NIM was affected negatively at high tax rates and positively at low tax rates (Albertazzi and Gambacorta, 2010). Together with Demirguc-Kunt and Huizinga (1999) was proved, that banks possess the ability to shift their tax burden, and so by more than 90% (Albertazzi and Gambacorta, 2010). For this reason, Albertazzi and Gambacorta (2010) admit that corporate tax rate differences could not explain bank profitability distribution across countries.

Another study conducted by Albertazzi and Gambacorta (2009) showed a weak relation of taxation to ROE since the bank is compensating the tax burden by fee-generating or other services. Effects of taxation on bank profitability in Switzerland was lately examined by Dietrich and Wanzenried (2011) since the tax rate varies across the Swiss cantons. The empirical evidence showed that taxation has a negative effect on banks profitability at the 1% significance level. With Demirguc-Kunt and Huizinga (1999) they concluded, that high tax rate brings lower net profit. However, together with Albertazzi and Gambacorta (2010) and Demirguc-Kunt and Huizinga (1999) they proved, that banks largely shift their tax burden onto borrowers, depositors, and buyers of fee-generating services. Therefore, taxation seems to have a small impact on banks' profitability. Since this determinant was not widely tested in the literature, this research is believed to reveal how and whether is the banks' profitability affected by corporate income tax rate, which differs widely across the Eurozone.

2.7.7 GDP growth

As already mentioned, banks' profitability is significantly influenced by the macroeconomic situation of the economy. Taking this into account, most of the related literature used GDP growth as a proxy for economic prosperity. The assumption that bank profitability would be positively affected by economic growth, anchored its strong position between mostly examined determinants (Rasiah, 2010). Reasonability of this assumption might be strong in times of economic growth and stability. However, it might be ambiguous during the economic downturn, when due to reduced productivity, both lending and national productivity are contracted

(Adelopo et al., 2018). In case the uncertainty in the economy persists, profitability can be negatively affected (Adelopo et al., 2018). Staikouras and Wood (2004) emphasize the importance of the GDP by saying, that it has an impact on supply and demand for both loans and deposits. Furthermore, the banks' asset quality depends on the economic cycle position. Albertazzi and Gambacorta (2009) conducted their study on bank profitability and the business cycle. They also conclude that the unfavourable economic conditions might worsen loan portfolio quality, which might result in credit losses and lower profitability. They add that bank profit components are released at low frequencies, which makes the monitoring of the macroeconomic impact on profitability hard. Bank profits were found to be pro-cyclical, where the GDP affect the level of loan loss provisions and net interest income (Albertazzi and Gambacorta, 2009).

Empirical evidence from Switzerland by Dietrich and Wanzenried (2011) and from Greece by Athanasoglou et al. (2008) proved that GDP growth per capita is positively related to bank profitability. In the EU banks, Capraru and Ihnatov (2015) and Petria et al. (2015) similarly, found GDP growth per capita to be positively related to ROA and ROE. On the other hand, Pasiouras and Kosmidou (2007) proved the negative effect of GDP growth on European bank profitability. Which might be due to the short examined period, only four years long. Staikouras and Wood (2004) also found GDP growth to be negative for both commercial and saving European banks. As proved by the literature review, no consensus has been reached in the relationship between European banks profitability and economic cycle, measured by GDP growth. Since this research includes direct post-crisis period and following period of national debt crisis, it might reveal new points of view and conclusions.

2.7.8 Inflation

Other macroeconomic variable taken into consideration is inflation. As Albertazzi and Gambacorta (2009) present, the Euro area had a rapid decline in inflation from the average of 5,3% in 1980s and 1990s to 2,3% in early 2000. The ECB is being the authority to control the inflation over the Eurozone, which tries to stabilise it at the level of 2%. However, the inflation peaked at 4,1% in July 2008 followed by sharp plunge in July 2009, when Euro area experienced deflation at the level of 0,6%. From this point, inflation rose back to 3% in November 2011 when after it gradually plummeted to -0,6% in January 2015. The Eurozone nearly hit the targeted level of

2% inflation only in April 2017 (Statistical Data Warehouse, 2019). This research, therefore, covers period of major inflation fluctuations.

Perry (1992) states that the relationship between inflation and bank profitability depends on whether it is anticipated or unanticipated. In case of anticipated inflation, the bank has the opportunity to adjust interest rates quicker than its cost would increase and thus it can remain profitable. In the case of unanticipated inflation operating costs are increasing more rapidly than revenues, which influences bank profitability negatively. Athanasoglou et al. (2008) add that the level of anticipation of inflation depends on the maturity of the economy.

From international empirical evidence Bourke (1989), Molyneux and Thornton (1992) and Demirguc-Kunt and Huizinga (1999) proved inflation to be positively related to bank profitability. Athanasoglou et al. (2008) also declared expected positive relation of inflation to Greek bank profitability. Which is thought to be due to the successful managerial steps which led to the adjustment of the interest rates according to the anticipated inflation. Batten and Vo (2019) say that banks in Vietnam do not bear the inflation costs since inflation was positively linked to the net interest margin measure. In the EU market, Petria et al. (2015) declare that inflation does not influence bank profitability, whereas Capraru and Ihnatov (2015) support international empirical evidence findings. Although, in the European market Pasiouras and Kosmidou (2007) found inflation to be negatively related only to foreign banks, whereas positively related to the domestic banks' profitability. The reason might be the superior knowledge of the domestic market and macroeconomic situation, which could derive more precise inflation expectations. Considering the different maturities of the economies in the Eurozone and inflation fluctuations during the examined period, this dissertation is believed to bring interesting findings on top of the indecisive empirical evidence.

3. Data and methodology

3.1 Introduction

Firstly, the data section specifies the data sources, its limitations, the sample description and the reason behind the tested time period. Secondly, the methodology part talks about the various statistical methods used in the similar studies which tested determinants of bank profitability. Subsequently, the estimated statistical

model is displayed together with the description and the justification of chosen variables. The last part in the methodology section presents detailed steps of procedures done with the data, e.g. estimation technique, tests for heteroscedasticity, multicollinearity, and autocorrelation.

3.2 Data

Data needed for conducting this research were downloaded from the FitchConnect Database, which is considered to have coverage of more than 36000 publicly or privately-owned banks with the historical data of more than 30 years. The financial data come in a standardised form, which allows comparison between the financial institutions (Fitch Solutions, Inc., 2019). To include all possible commercial banks in the Eurozone, wholesale commercial banks, universal commercial banks, retail and consumer banks, and bank holding companies were selected from the variety of different types of entities. By applying the lowest applicable range on the bank financials, all possible, at that time data from 586 commercial banks in the Eurozone area were generated. Data needed for external determinants of bank profitability, concretely GDP growth per capita and annual inflation rate were collected from the World Bank website, however the data source was indicated to be the International Monetary Fund and International Financial Statistics and data files (The World Bank Group, 2019a; The World Bank Group, 2019b). The sample includes all available bank data, with no intentional sample restrictions. However, the limitation of the Fitch Connect database is that it does not incorporate all banks' financial data during the whole tested period. This means that this paper is working with unbalanced panel data. The time period of 2009-2016 is chosen because Fitch Connect database does not provide bank financials data older than 2009. Another reason for choosing this time period is to bring up-to-date results for the area of Eurozone and to examine the determinants in the direct post-crisis period. Data were after reshaped from wide to long format in the Stata15 programme. Data were finally divided into following three groups, all countries of Eurozone, PIIGS countries on its own and the non-PIIGS countries (the rest of the Eurozone). PIIGS countries represent the acronym used for countries which were subject to government debt crisis, which hit the Eurozone after the global financial crisis. These 5 countries (Portugal, Ireland, Italy, Greece, Spain) are specifically tested in order to find, whether their bank profitability was influenced by different factors as the commercial bank profitability in the rest of the Eurozone

and whether the worsening economic conditions in these states had an impact on the whole Eurozone.

3.3 Methodology review

Panel data are largely analysed by using ordinary least squares (OLS) method, fixed or random effect estimation or generalised method of moments, known as GMM estimation. The opinions about the eligibility of these methods vary across the literature dealing with the analysis of the bank profitability. Short (1979) claimed that linear functions estimate as good models as any other methods. Authors like Bourke (1989), Molyneux and Thornton (1992), Demirguc-Kunt and Huizinga (1999) used linear model in their estimation. However, Athanasoglou et al. (2008) claim that these models lack internal consistency in the selection of variables and also do not further examine the effect of macroeconomic indicators. Additionally, these models do not account for possible profit persistence, which might result in biased and inconsistent estimates (Athanasoglou et al., 2008). Statistically, in order to find the best linear unbiased estimator (BLUE), OLS method lies on many assumptions. Wooldridge (2016) specifies them as so-called Gauss-Markov assumptions.[1] If one of assumptions fails, it might lead to possible biased results of OLS. Even if the OLS estimators remain BLUE after failing the assumption, it will not have the smallest variance among the other linear estimators available (Wooldridge, 2016; Gujarati, 2015).

In order to account for some of the limitations of the OLS regression model, authors like Miller and Noulas (1997), Staikouras and Wood (2004) or Trujillo-Ponce (2013) used either OLS and fixed effects (FE) estimation model. Where they compared the results and described the differences. Miller and Noulas (1997) claimed that using the fixed effects model allowed them to capture the effect of the bank location, without adding the additional dummy variable. By comparison of the OLS and the FE estimation, they were able to reveal, whether the exclusion of the independent variables caused due to the averaging data process, produced biased results of the

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The specific Gauss-Markov assumptions are as follows

- [1] regression model is linear in parameters
- there is a random sample of n observations
- assumption of no multicollinearity among the regressors
- zero conditional mean, meaning that error term has anticipated value of 0
- the error variance is homoscedastic, given any value of regressors

OLS estimation. Similarly, Staikouras and Wood (2004) claim that a comparison of these two models helps to indicate possibly biased results due to the omission of bank-varying variables in the OLS estimations. Trujillo-Ponce (2013) used FE regression in order to account for specific bank and year characteristics, by employing within group estimator. However, he found minimal differences between the results of GMM and FE estimations. His final regression was in the end estimated by using the GMM.

Authors like Athanasoglou et al. (2008), Garcia-Herrero et al. (2009), Dietrich and Wanzenried (2011), Batten and Vo (2019) used the GMM estimator from Arellano and Bond (1991) in their studies. As Athanasoglou et al. (2008) already criticised the OLS estimation technique, they rather used GMM model, in order to count for the possibility of profit persistence. Which should be addressed by using the one period lagged profitability. Garcia-Herrero et al. (2009) describe that the problems with endogeneity, profit persistence, and the unobserved heterogeneity are tackled by the GMM estimator. Further explained, this method uses lagged values of the dependent variables and other possibly endogenous variables in levels and in differences (Garcia-Herrero et al., 2009). Batten and Vo (2019) primarily used GMM estimator, but they also reported the results of the FE estimation. The differences between these two techniques were quite observable, mainly in the sign of the coefficients. However, Garcia-Herrero et al. (2009) used except for GMM estimator also fixed, random effects and OLS estimation, just in order to compare the results with other studies. They claim that results were rather similar.

Another group of authors e.g. Pasiouras and Kosmidou (2007), Petria et al. (2015), Menicucci and Paolucci (2016), Ali and Puah (2019) or Adelopo et al. (2018) reported their estimations using the fixed or random effect estimators. Many authors mentioned above estimated their models by using fixed or random effects, not only for comparison purposes. Wooldridge (2016) classifies fixed effects estimator as the pooled OLS estimator based on the time-demeaned variables. It also belongs to the methods, which count for the estimation of the unobserved effect. In contrast to the random effect estimator, the fixed effects allows the unobserved effect to be correlated with the explanatory regressors and so in any time period (Wooldridge, 2016). Wooldridge (2016) therefore states that FE is more credible for accounting for ceteris paribus effect. Gujarati (2015) further explains that FE estimator accounts for

the heterogeneity effect while the pooled OLS neglects it. Adelopo et al. (2018) advocate for the FE estimator by saying, that FE secures that only time varying regressors account for the changes in the dependent variable. Additionally, FE also recognises industry, economic, and bank-specific factors for each bank and the country across the reviewed period (Adelopo et al., 2018).

3.4 Estimation model

In order to analyse the impact and importance of the determinants of commercial bank profitability in the Eurozone, PIIGS countries and non-PIIGS countries, following linear regression model was estimated:

$$\delta_{by} = \alpha_0 + logTA_1 I_{by} + NLTA_2 I_{by} + TETA_3 I_{by} + TLLRGL_4 I_{by} + CTIR_5 I_{by} + TPTP_6 E_{by} + GDP_1 E_{by} + INF_2 E_{by} + \varepsilon_{by}$$

Where the δ_{by} represents a dependent variable measured with three alternative measures of profitability - return on average assets, return on average equity and net interest margin of the bank *b* at the year *y*. This means that three models were tested in each set of countries. The constant in the model is stated as α_0 and βI_{by} indicates chosen independent internal variable of the bank *b* at the year *y*. βE_{by} represents the external independent determinants of the bank *b* at the year *y* and ε_{by} stands for the error term. Shortcuts and the formulas used for calculating the chosen determinants of bank profitability are specified below.

3.5 Dependent variables

Return on average assets (ROAA)– As already reviewed, return on assets is in general highly popular measure of the profitability. ROA is measured as net income to total assets. This paper uses the average value of the assets in order to include changes in their value thorough the year. The average value of assets was also used by the authors as Pasiouras and Kosmidou (2007), Athanasoglou et al. (2008), Dietrich and Wanzenried (2011), Menicucci and Paolucci (2016) or Batten and Vo (2019). In order not to be concentrated only on the bank's ability to generate profit from its assets, other profitability measures were taken into consideration.

Return on average equity (ROAE) - Return on equity indicates the return on shareholders' capital. ROE is measured as net income over the total equity. As in the previous case, this paper uses an adjusted version of ROE by using the average

value of total equity. Again, the average value is used with the objective to include possible equity changes during the fiscal year. The average value is preferred in newer studies, as for example by Dietrich and Wanzenried (2011), Capraru and Ihnatov (2015) or Petria et al. (2015).

Return on assets and return on equity are widely and mostly used proxies for the measurement of profitability. To prove this statement, authors like Smirlock (1985), Bourke (1989), Albertazzi and Gambacorta (2009), Trujillo-Ponce (2013), Shehzad et al. (2013), Adelopo et al. (2018), Batten and Vo (2019) and many more used these measures in any form mentioned above.

Net interest margin (NIRTA)– This research measure net interest margin according to the only possible measure option from Fitch Connect database, automatically calculated by Fitch Connect. The proxy used in this dissertation is measured as net interest revenue, divided by the average value of the total assets. This paper uses the same proxy as Angbazo (1997), Dietrich and Wanzenried (2011) or Menicucci and Paolucci (2016), who also used average values of the total assets.

3.6 Independent Variables

Bank size (logTA)– This dissertation measures the size of the bank by the logarithm of the bank's total assets. The widely dispersed values of the total assets in the sample of the Eurozone commercial banks might negatively affect the statistical results, so the logarithm of the total assets was used instead. Authors as Miller and Noulas (1997), Staikouras and Wood (2004), Capraru and Ihnatov (2015), Petria et al. (2015), Adelopo et al. (2018), Rekik and Kalai (2018) or Ali and Puah (2019) similarly rather used the logarithm form. Even though, literature still measures the bank size by the accounting values of the total assets (Smirlock, 1985; Pasiouras and Kosmidou, 2007; Dietrich and Wanzenried, 2011). The early paper from Haslem (1968) measured bank size by the size of the deposits. When examining banks from countries with different currencies, currency conversion is needed. Short (1979) or Shehzad et al. (2013) converted the bank's total assets to millions of US dollars in order to obtain conjoint currency.

As mentioned in the literature review, despite the fact that the impact of the bank size on bank's profitability is unclear, this research expects a positive relationship between these two variables.

Loan ratio (NLTA) – The size of the loan portfolio is measured as the net loans to total assets rather than the growth of the total loans. The same measure was used by Miller and Noulas (1997), Staikouras and Wood (2004), Demirguc-Kunt and Huizinga (1999), Menicucci and Paolucci (2016) or Ali and Puah (2019). Curcio and Hasan (2015) say that the impact of the loan to asset ratio on profitability depends on the quality of the loans. Since no consensus has been reached in the literature review, this paper expects either a negative or positive relation to profitability.

Capital adequacy (TETA) – Capital adequacy is measured as the total equity over total assets. This measure is widely used across the reviewed literature, in this exact calculation form (Demirguc-Kunt and Huizinga, 1999; Pasiouras and Kosmidou, 2007; Dietrich and Wanzenried, 2011; Petria et al., 2015; Capraru and Ihnatov, 2015; Batten and Vo, 2019). In spite of the contrary empirical results, this study expects a positive relationship with bank profitability.

Loan loss provisions (TLLRGL) - Measured as total loan loss reserves over the gross loans, this proxy is used to indicate the quality of the banks' loan portfolios. As it could be seen from the literature review, this ratio has a significant effect on banks' profitability. Athanasoglou et al. (2008) used loan loss provisions to total loans as a measure of credit risk. From empirical studies, also authors like Bikker and Haaf (2002), Dietrich and Wanzenried (2011), Fiordelisi et al. (2011) or Petria et al. (2015) used this measure as the internal determinant of bank profitability. Since the negative relationship is empirically strongly supported, this paper assumes negative relationship between loan loss reserves and bank profitability.

Cost to income ratio (CTIR) - Cost to income ratio in this dissertation represents cost efficiency proxy. Authors in the literature review measured cost efficiency by stochastic frontier analysis used concretely by Altunbas et al. (1999), or Tan et al. (2017). Or by using the cost to income ratio, which was also labelled as the measure of managerial efficiency. Cost to income ratio was used often in newer studies, like Pasiouras and Kosmidou (2007), Petria et al. (2015), Capraru and Ihnatov (2015) or Adelopo et al. (2018). Mentioned studies reported a negative relationship between the cost to income ratio and measures of bank profitability and this paper similarly expects negative effect on the Eurozone commercial bank profitability.

Taxation effect (TPTP) – The proxy measuring the taxation effect is defined as paid taxes divided by profit before tax. Since this variable is not often examined, there is not enough supporting literature and calculation formulas. The calculation formula was used by Demiruc-Kunt and Huizinga (1999) who additionally measured the taxation effect interacted with GDP growth per capita, which allowed them to evaluate the tax impact in wealthy and poor countries. The same measure as proposed was used by Dietrich and Wanzenried (2011) and Albertazzi and Gambacorta (2010). Negative tax effect on profitability is expected.

GDP growth per capita (GDP) – The macroeconomic impact is measured by the growth of gross domestic product per capita. GDP growth was used in order to compare and differentiate bank profitability in developing and developed countries. For example, Demirguc-Kunt and Huizinga (1999) put their independent variables over the GDP growth to see the differences between economic situations. As an individual independent external variable, for GDP growth controlled also Staikouras and Wood (2004), Albertazzi and Gambacorta (2009) or Batten and Vo (2019). Since the GDP growth indicator might be slightly misleading because of the different population in each state, GDP growth per capita allows more accurate comparison of the economic situation in the Eurozone countries. Newer studies conducted on the European banks like Petria et al. (2015) and Capraru and Ihnatov (2015) used preferably per capita measure. Even Demirguc-Kunt and Huizinga (1999) used per capita measure in their international empirical evidence. A positive relationship between the GDP growth per capita and bank profitability is expected.

Inflation rate (INF)- Another external variable tested is the annual inflation rate. Inflation data for each country were downloaded from the World Bank database. According to The World Bank's Group (2019b) website, inflation was measured by the consumer price index (CPI), which shows the change in the cost of obtaining the basket of goods or services, which might be fixed or changed in time. The reviewed study from Capraru and Ihnatov (2015) also derived inflation data from the World Bank database whereas Demirguc-Kunt and Huizinga (1999) used the World Bank National Accounts. Studies from Pasiouras and Kosmidou (2007), Albertazzi and Gambacorta (2009), Shehzad et al. (2013) or Capraru and Ihnatov (2015) also used the same measure as this dissertation. On the other hand, Demirguc-Kunt and Huizinga (1999) measured inflation as the annual inflation of the GDP deflator. Since

the impact of the inflation rate upon the bank profitability has been indecisive, this study expects both negative and positive impact.

Table 1 - Detailed description of the chosen variables

Variable	Description	Calculation formula	Expected effect on profitability
	Dependent variables		
ROAA	Return on average assets	Net profit / Average Total Assets	NA
ROAE	Return on average equity	Net Profit / Average Total Equity	NA
NIM	Net interest margin	Net Interest Revenue / Average Total Assets	NA
	Independent variables		
logTA	Bank size	Logarithm of the Total Assets	+
NLTA	Loan Ratio	Net Loans / Total Assets	+ / -
TETA	Capital Ratio	Total Equity / Total Assets	+
TLLRGL	Loan loss provisions	Total Loan Loss Reserves / Gross Loans	-
CTIR	Cost to income ratio	Total Costs / Total Income	-
TPTP	Tax impact	Paid Taxes / Profit Before Tax	-
GDP	GDP Growth	GDP Growth per Capita	+
INF	Inflation	Inflation rate	+ /-

Source: Author's selection

3.7 Used methodology

Data were edited and purified from the outliers, which might mislead the final results. After the elimination of the outliers, descriptive statistics and data description was generated. In order to plot the trends of the profitability measures across the examined years, trend graphs for all 3 sets of countries are displayed. After this, correlation matrices were generated, which were supposed to reveal the potential high dependency between the individual determinants. In order to analyse unbalanced panel data, this dissertation used panel data regression models to estimate the coefficients in the regression (Gujarati, 2015). As common in the literature, each equation, for each dependent variable and each set of countries was estimated with fixed effects and random effects model. Gujarati (2015) describes the importance of panel data by the general statement, which says that panel data helps to explore the dynamics of change since it consists of cross-sections of observations. To estimate these regression models, Stata15 programme was used. Gujarati (2015) explains that if there is an assumption that X regressors and cross-section specific error component are not correlated, the random effect might be convenient, whereas when there is assumption that they are correlated, fixed effects model might be more relevant.

3.8 Hausman test

To statistically decide whether random or fixed effects model is more convenient, a Hausman test is performed. This test reveals chi-square distribution with degrees of freedom reflecting number of regressors and the p-value (Gujarati, 2015). When chi-squared value tops critical chi-squared value for the level of significance, fixed effects model is preferred (Gujarati, 2015). And so because the random error terms might also be correlated with some of the regressors (Gujarati, 2015). Together, when the p-value is statistically significant, fixed effects model is preferred (Gujarati, 2015).

Hausman test performed on ROAA and ROAE models clearly indicated to use the fixed effects model as a more efficient estimator, however in the context of NIRTA, the covariance matrix result was not positive definite. In order to provide credible Hausman test, command sigmamore was used. As specified at Stata15 manual, sigmamore command provides “proper estimate of contrast variance for tests of exogeneity and overindentification in instrumental-variables regression” (StataCorp

LLC, 2019, p. 2). Hausman test with the sigmamore option for NIRTA, similarly indicated to use fixed effects estimator.

This research controlled for main problems which might be addressed to panel data regressions. Since the Hausman tests indicated to use fixed effects model estimator, modified Wald test for detection of the groupwise heteroscedasticity in the fixed effects regression model in Stata15 was run. Also, the Wooldridge test for serial correlation was calculated. Additionally, a correlation matrix was created in order to control for possible multicollinearity between regressors.

3.9 Autocorrelation

Autocorrelation occurs when the error terms are correlated. As Gujarati (2015) presents, the direct consequences are that the *t* values are too high, suggesting that the coefficients are more statistically significant as they should be. Which can lead to biased *t* and *F* test. Wooldridge test for serial correlation in panel-data models was applied. As described in Stata15, the test controls for correlation in idiosyncratic errors of the panel data model (Drukker, 2003). After computing the autocorrelation test for all the estimated regressions, in all cases was detected an autocorrelation problem.

3.10 Heteroscedasticity

Another possible problem to deal with when using panel data regression estimation is the problem with heteroscedasticity. After computing the modified Wald test, in all estimated models was detected significant heteroscedasticity problem. Gujarati and Porter (2010) explain that heteroscedasticity occurs when the error variance is non-constant, in other words, when it varies from observation to observation. They also claim, that heteroscedasticity mostly occurs in cross-sectional data rather than in time series data.

However, it is possible to obtain heteroscedasticity-corrected standard errors, by obtaining the estimation with robust standard errors. In order to control for both autocorrelation and heteroscedasticity problem at the same time, model for all dependent variables was estimated by the fixed effects estimation with the robust standard errors. This estimation controls for the problem with heteroscedasticity and for the possible autocorrelation in the idiosyncratic error term. All presented regression results are estimated with robust standard errors.

3.11 Multicollinearity

Another problem with panel data regressions might be imperfect multicollinearity. Gujarati and Porter (2010) define multicollinearity as perfect linear relationships between explanatory variables. Since the case of perfect multicollinearity between variables is rare in practice, it is mostly referred to near, or in other words imperfect collinearity. It is the case when variables share a high degree of dependency, although they are not perfectly linearly correlated. Gujarati and Porter (2010) list several practical consequences of high multicollinearity, as wide confidence intervals, insignificant *t* ratios or even wrong sign for regression coefficients. They also add that the multicollinearity is not tested for its presence, it is only measured for its degree. In practice there are several indicators of the possible degree of multicollinearity, however, this research used simple correlation matrices. The coefficient of correlation was calculated for any pair of the explanatory variables. As it could be seen from the correlation matrices tables in the results section, no serious degree of multicollinearity among the sample was detected.

3.12 Summary

The evaluation of the various relevant estimation methods and variable specifications was supposed to bring more light into the research topic and its possible methodologies. As it can be seen from the methodology review, chosen statistical method together with the selected dependent and independent determinants are supported by the extensive amount of literature. To be precise, detailed step-by-step process of analysing the data is described. The regression estimations were tested for possible statistical problems, which could lead to biased results. Since the tested statistical issues were tackled, it is believed that this dissertation brings efficient and unbiased results.

4. Results

4.1 Introduction

This section consists of descriptive statistics of the chosen determinants, trend analysis of the profitability measures, correlation matrices and regression results. Moreover, all results are calculated and displayed separately for the area of Eurozone, non-PIIGS countries and for the PIIGS countries itself. The reason behind this is, to compare the performance and importance of the regressors for each group of states defined above. As far as this paper was written, no similar analysis and

result comparison were conducted on the same groups of countries and the same time range.

4.2 Descriptive statistics

As it can be seen from the tables 2, 3 and 4, each variable has a different amount of observations, which is caused by the unavailable data from the Fitch Connect database. All the variables, except for the bank size measured by logTA are ratios, and they do not include extreme values. The shortcuts are explained in the footnote.[2]

When comparing the calculated means of the variables, the following results can be derived. From the measures of profitability, ROAA reached the level of more than 0.4% in both Eurozone and the non-PIIGS countries. However, the commercial banks in PIIGS countries reached lower ROAA compared to the rest of the Eurozone, and so by almost 0.2%. Significant differences could be spotted in the level of ROAE. Non-PIIGS countries performed significantly better, than the PIIGS states, and so by more than 2.5%. This indicates, that the banks headquartered in the PIIGS countries generated significantly less profit than the rest of the Eurozone. This difference might be caused by the European sovereign debt crisis, which remarkably hit the banks in the PIIGS countries. The differences in the values of net interest margin are negligible.

The mean of the of loan ratio and equity ratio seems to be similar in every group of states, however, the real problem reveals loan loss provisions. The credit quality which is indicated by the level of loan loss reserves, seems to be much worse in PIIGS countries than in the non-PIIGS countries. Even the proportion of the tax paid in PIIGS countries seems to be on average 5% higher than for the non-PIIGS countries. From macroeconomic indicators, GDP growth per capita of the Eurozone itself was on average 0.18%, whereas PIIGS countries experienced economic decline, which was on average -0.53% during the examined period. From descriptive statistics is obvious, that the banks in PIIGS countries performed much worse than their counterparts in the rest of the Eurozone. The means of inflation seems to be stable for all 3 set of countries, this might be caused due to the global regulation of

[2] ROAA is return on average assets (%), ROAE is return on average equity (%), NIRTA is net interest margin (%), logTA represents bank size, NLTA is loan ratio (%), TETA is equity ratio (%), TLLRGL is loan loss reserves to gross loans ratio (%), CTIR is cost to income ratio (%), TPTP indicates tax effect (%), GDP is GDP growth per capita (%), INF represents inflation rate (%)

the monetary policy by the ECB. The range of the GDP growth indicates, that countries of Eurozone experienced turbulent macroeconomic situations.

Eurozone

Table 2 - Descriptive statistics – Eurozone

Variable	Observations	Mean	Std. Dev.	Min	Max
ROAA	4173	0.423	1.596	-40.3	16.13
ROAE	4164	4.466	21.338	-460.23	288.89
NIRTA	4172	1.869	1.439	-3.38	29.64
logTA	4269	3.755	0.988	0.778	6.335
NLTA	4263	58.958	21.579	0	99.59
TETA	4272	9.249	7.894	-45.82	99.89
TLLRGL	3668	3.789	4.572	-2.25	56.23
CTIR	4262	65.576	61.439	-500	1700
TPTP	4223	29.072	66.689	-690.79	1700
GDP	4673	0.181	3.163	-14.559	23.94
INF	4673	1.137	1.127	-4.478	4.982

Source: Author's own calculations

Non-PIIGS countries

Table 3 - Descriptive statistics – non-PIIGS countries

Variable	Observations	Mean	Std. Dev.	Min	Max
ROAA	3018	0.475	1.548	-40.3	16.13
ROAE	3017	5.165	16.399	-248.02	288.89
NIRTA	3018	1.901	1.593	-3.38	29.64
logTA	3089	3.732	1.002	0.778	6.335
NLTA	3084	59.198	21.917	0	99.59
TETA	3091	9.239	7.836	-0.08	99.89
TLLRGL	2523	2.941	3.736	-2.25	36.39
CTIR	3083	65.156	64.082	-500	1700
TPTP	3047	27.738	50.812	-666.67	1700
GDP	3379	0.453	2.881	-14.559	8.465
INF	3379	1.176	1.024	-2.097	4.982

Source: Author's own calculations

PIIGS countries

Table 4 - Descriptive statistics – PIIGS countries

Variable	Observations	Mean	Std. Dev.	Min	Max
ROAA	1155	0.285	1.706	-20.76	13.6
ROAE	1147	2.628	30.684	-460.23	206.21
NIRTA	1154	1.786	0.919	-2.37	8.99
logTA	1180	3.813	0.947	1.577	6.127
NLTA	1179	58.332	20.667	0.08	99.04
TETA	1181	9.275	8.046	-45.82	86.01
TLLRGL	1145	5.658	5.583	0	56.23
CTIR	1179	66.673	53.929	-466.35	970.22
TPTP	1176	32.527	96.288	-690.79	1666.67
GDP	1294	-0.531	3.709	-8.998	23.94
INF	1294	1.034	1.354	-4.478	4.713

Source: Author's own calculations

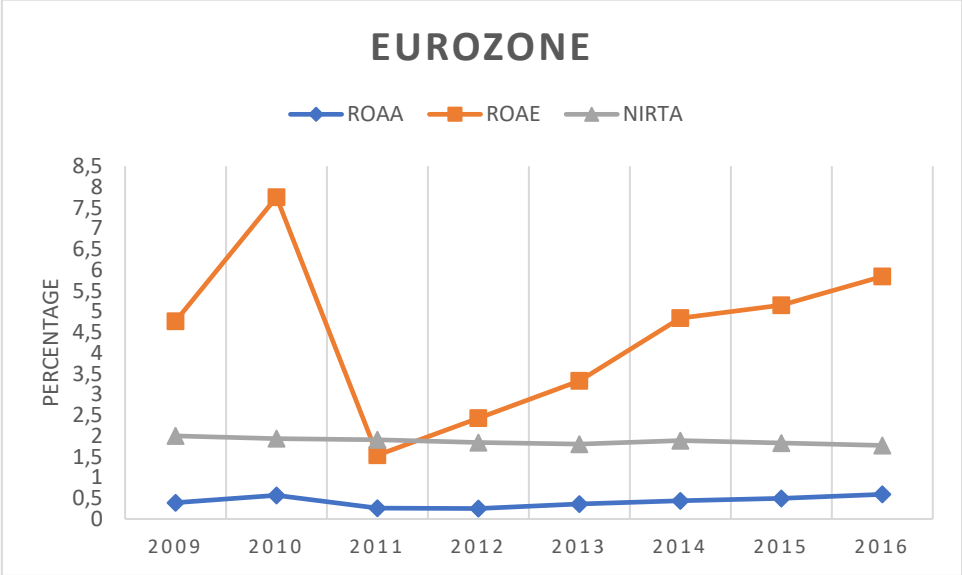
4.3 Profitability trends

Following graphs were created from the means of profitability measures grouped by the year. Despite showing general values, these graphs could display trends of bank profitability in the post-crisis period. Similarly, as in the descriptive statistics section, NIM stayed relatively flat, around 2% in each set of countries at each year. As mentioned by Goddard et al. (2007) and Staikouras and Wood (2004), the increased competition in the European market left interest margins relatively stable and encouraged banks to switch to the fee-generating services, as the new main source of income. The macroeconomic situation significantly influences the supply and demand for loans, which influences the net interest margins. From descriptive statistics can be seen that countries of Eurozone experienced severe GDP growth fluctuations. However, even these fluctuations did not influence NIM in any set of countries.

Return on average assets similarly does not experience severe fluctuations. The difference in the ROAA trend can be seen in the year 2010. In PIIGS countries, there was a decreasing tendency, while in the non-PIIGS countries ROAA slightly increased. From this point onwards, the ROAA moves jointly in all 3 varieties of countries.

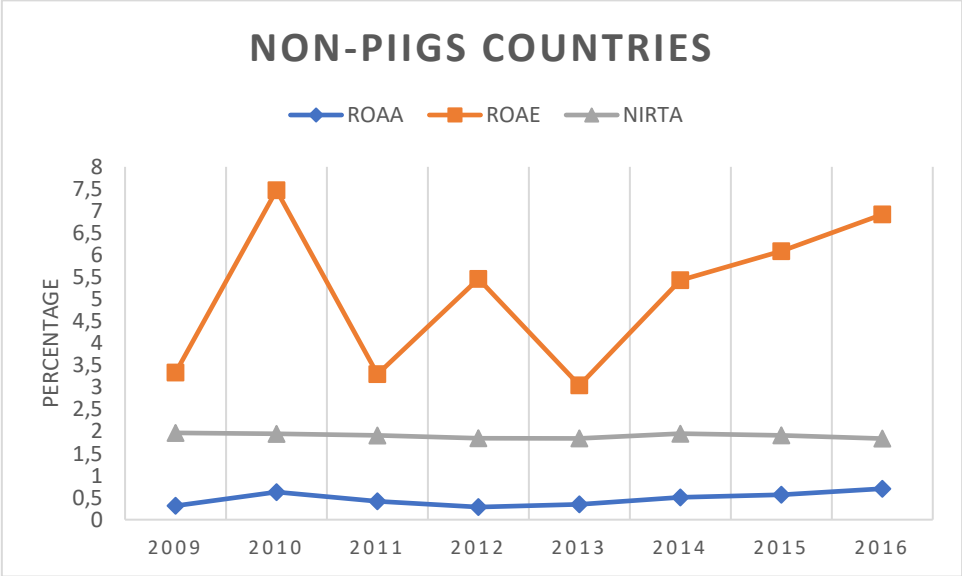
Mostly differential trend in all 3 cases experienced ROAE. From rather low baseline in 2009 in the Eurozone and the non-PIIGS countries, it rapidly went up the following year. Whereas, PIIGS countries experienced the opposite trend. From relatively high baseline in 2009, about 8.5%, it slightly declined in 2010. From this point, ROAE deeply declined in all 3 cases. In PIIGS countries, ROAE declined by almost 65% in the year 2012. The interesting development had ROAE in non-PIIGS countries. In 2012 ROAE grew by on average 2.2% and the following year it fell back to previous value. This trend was not spotted in the complete Eurozone sample. In the Eurozone ROAE has rising tendency since the year 2011, and in the non-PIIGS countries since the year 2013. However, ROAE in PIIGS countries is declining since the year 2013. This means, that banks in the PIIGS countries still experience some problems, which negatively affects their ROAE.

Figure 1 – Profitability trends of the commercial banks in the Eurozone



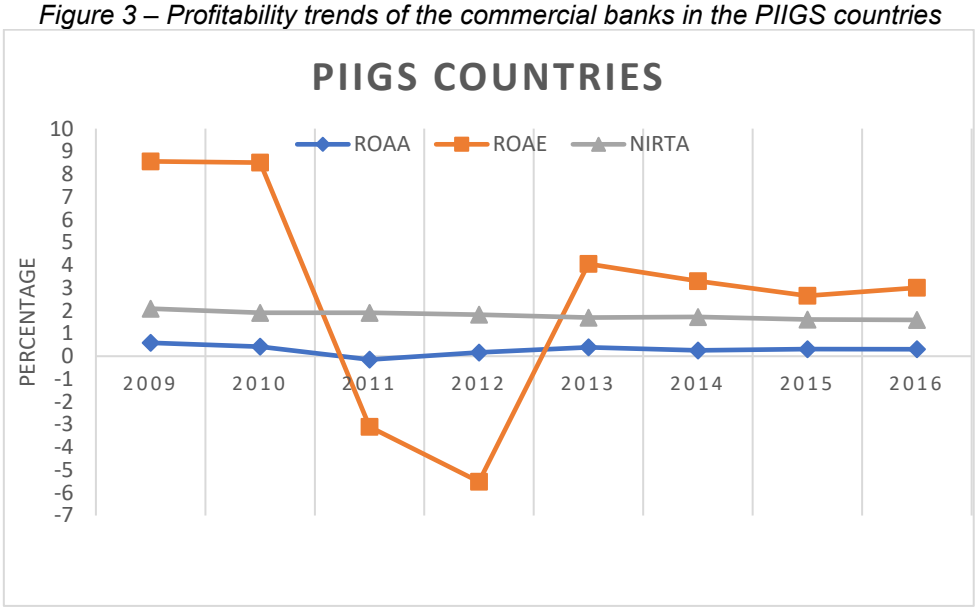
Source: Author's own elaboration

Figure 2 – Profitability trends of the commercial banks in the non-PIIGS countries



Source: Author's own elaboration

Figure 3 – Profitability trends of the commercial banks in the PIIGS countries



Source: Author's own elaboration

4.4 Correlation matrices

Correlation matrices were computed in order to find the possible correlation between variables. They were created in order to indicate the possible multicollinearity problem and in order to find inner interdependence between the chosen variables. Displayed matrices help to indicate which concrete pairs of variables are relatively highly correlated. The shortcuts are explained in the footnote[3]. Variables from the Eurozone sample shows a remarkable positive correlation between ROAA and ROAE, which was expected. That is why the NIRTA profitability measure is also included in the model. Another higher but expected correlation was detected between the equity ratio and ROAA and negative correlation between the equity ratio and the bank size. These findings are shared with the results from non-PIIGS countries and also with the PIIGS countries. Additionally, in the non-PIIGS sample is also detected relatively higher correlation between the level of loan portfolio and net interest margin. Despite this, no significant level of multicollinearity was detected.

[3] ROAA is return on average assets (%), ROAE is return on average equity (%), NIRTA is net interest margin (%), logTA represents bank size, NLTA is loan ratio (%), TETA is equity ratio (%), TLLRGL is loan loss reserves to gross loans ratio (%), CTIR is cost to income ratio (%), TPTP indicates tax effect (%), GDP is GDP growth per capita (%), INF represents inflation rate (%)

Eurozone

Table 5 - Correlation matrix – Eurozone

	ROAA	ROAE	NIRTA	LOGTA	NLTA	TETA	TLLRGL	CTIR	TPTP	GDP	INF
ROAA	1.000										
ROAE	0.6825	1.0000									
NIRTA	0.1576	0.0396	1.0000								
LOGTA	-0.1167	-0.0308	-0.2601	1.0000							
NLTA	0.0979	-0.0484	0.2416	-0.0543	1.0000						
TETA	0.3823	0.0595	0.2159	-0.3455	-0.0427	1.0000					
TLLRGL	-0.1304	-0.2028	0.2289	-0.0200	-0.0324	0.1707	1.0000				
CTIR	-0.1423	-0.1013	-0.0941	-0.0407	-0.0728	-0.0318	0.0267	1.0000			
TPTP	-0.0105	0.0107	0.0151	-0.0497	0.0665	-0.0230	-0.0659	-0.0120	1.0000		
GDP	0.1516	0.1401	-0.0169	-0.0045	-0.0615	0.0267	0.0112	0.0135	-0.0524	1.0000	
INF	-0.0723	-0.0957	0.0001	-0.0199	0.0122	-0.0558	-0.1366	0.0237	0.0102	-0.0731	1.0000

Source: Author's own calculations

Number of observations = 3541

Non-PIIGS countries

Table 6 - Correlation matrix – non-PIIGS countries

	ROAA	ROAE	NIRTA	LOGTA	NLTA	TETA	TLLRGL	CTIR	TPTP	GDP	INF
ROAA	1.0000										
ROAE	0.6670	1.0000									
NIRTA	0.2221	0.0745	1.0000								
LOGTA	-0.1362	-0.0317	-0.2878	1.0000							
NLTA	-0.0892	-0.0192	0.2228	-0.1313	1.0000						
TETA	0.4095	0.0488	0.2539	-0.3343	-0.0187	1.0000					
TLLRGL	-0.1674	-0.2485	0.4103	-0.0664	-0.0317	0.1335	1.0000				
CTIR	-0.1319	-0.0946	-0.0910	-0.0134	-0.1011	-0.0709	0.0057	1.0000			
TPTP	0.0104	0.0356	0.0070	-0.0781	0.0944	-0.0098	-0.1412	-0.0281	1.0000		
GDP	0.1626	0.1476	0.0404	-0.0948	-0.0666	0.0267	0.0034	-0.0192	-0.0289	1.0000	
INF	-0.0799	-0.0810	-0.0475	0.0233	-0.0489	-0.0779	-0.0419	0.0277	-0.0418	0.0804	1.0000

Source: Author's own calculations

Number of observations = 2430

PIIGS countries

Table 7 - Correlation matrix – PIIGS countries

	ROAA	ROAE	NIRTA	LOGTA	NLTA	TETA	TLLRGL	CTIR	TPTP	GDP	INF
ROAA	1.0000										
ROAE	0.7266	1.0000									
NIRTA	-0.0321	-0.0237	1.0000								
LOGTA	-0.0905	-0.0386	-0.1902	1.0000							
NLTA	-0.1192	-0.0934	0.3583	0.1284	1.0000						
TETA	0.3381	0.0834	0.0450	-0.3825	-0.1102	1.0000					
TLLRGL	-0.0562	-0.1540	-0.1244	0.0788	-0.0314	0.2878	1.0000				
CTIR	-0.1608	-0.1188	-0.1178	-0.1019	-0.0023	0.0780	0.0437	1.0000			
TPTP	-0.0253	-0.0010	0.0466	-0.0168	0.0418	-0.0438	-0.0363	0.0032	1.0000		
GDP	0.1208	0.1217	-0.2019	0.1097	-0.0653	0.0221	0.1219	0.0778	-0.0572	1.0000	
INF	-0.0669	-0.1150	0.1478	-0.0977	0.1201	-0.0173	-0.2387	0.0198	0.0595	-0.2554	1.0000

Source: Author's own calculations

Number of observations = 1111

4.5 Eurozone regression results

Table 8 displays the regression analysis results for the whole Eurozone, where the coefficients are presented with the star symbol, which indicates level of statistical significance. To be constant, in brackets are presented calculated robust standard errors. The meaning of the shortcuts and symbols are described in the note underneath the table. The extensive results are grouped according to the profitability measure.

Table 8 - Fixed effects estimator with robust standard errors – Eurozone

	ROAA	ROAE	NIRTA
logTA	1.035*** (0.3731811)	21.69875** (8.946943)	0.3067896 (0.3208402)
NLTA	0.002 (0.004712)	0.116091 (0.0903723)	0.0162023*** (0.0053712)
TETA	0.0910062*** (0.0179317)	1.223111*** (0.3850515)	0.0301975** (0.0122572)
TLLRGL	-0.0792015*** (0.026796)	-1.404412*** (0.3793323)	-0.0054798 (0.006032)
CTIR	-0.0032831 (0.0020756)	-0.0508417 (0.0337176)	-0.0008326* (0.0004258)
TPTP	0.0002343 (0.000188)	0.0066034 (0.0049423)	-0.0000461 (0.0000723)
GDP	0.0481544*** (0.0123436)	0.6840278*** (0.2250522)	-0.0103667** (0.004145)
INF	-0.0723081*** (0.0238039)	-1.872435*** (0.5266897)	0.0310502*** (0.0103951)
Nr of observations	3551	3542	3550
R^2	0.0418	0.0067	0.0122
F statistics	6.25	4.79	5.50
Prob > F	0.0000	0.0000	0.0000

Note: statistical significance: ***1% significance level, **5% significance level, *10% significance level ROAA is return on average assets (%), ROAE is return on average equity (%), NIRTA is net interest margin (%), logTA represents bank size, NLTA is loan ratio (%), TETA is equity ratio (%), TLLRGL is loan loss reserves to gross loans ratio (%), CTIR is cost to income ratio (%), TPTP indicates tax effect (%), GDP is GDP growth per capita (%), INF represents inflation rate (%)
Source: Author's own calculations

4.5.1 Eurozone results for the ROAA measure

When considering the size of the coefficients for ROAA measure, bank size is the only one determinant with a larger coefficient than 1. A decline in bank level of total assets by 1 unit, has a big impact on the ROAA measure. Other coefficients are rather small numbers, meaning that the change of these ratios would not have such

an important impact on ROAA. All the determinants are statistically significant, except for the loan ratio, cost to income ratio and taxation effect.

Bank size, as the most meaningful determinant, is as expected positively related to ROAA at 1% significance level. This positive size effect goes in line with the findings from Petria et al. (2015) who examined EU27 banks during the 2004-2011. Results are also supported by Capraru and Ihnatov (2015), who examined 15 EU countries during the 2001-2011. Similarly, the positive size effect on ROA is confirmed by Menicucci and Paolucci (2016). This could suggest that larger Eurozone commercial banks benefit from the economies of scale. Or that they use their well-known brand or their important market position (too-big-to-fail) (Goddard, Molyneux and Wilson, 2004). However, Pasiouras and Kosmidou (2007), who examined banks in the 15EU countries during 1995-2001 proved, that bank size negatively influenced both domestic and foreign banks' profitability. Their results, therefore, support that smaller banks benefit from the scale economies. Altunbas et al. (2001), who were testing efficiency in the European banking found smaller banks to enjoy economies of scale. Staikouras' and Wood's (2004) findings at first supported positive relation of the bank size and ROA, however, after the splitting banks into the 2 groups, smaller banks were proved to benefit from economies of scale. Since the banks in the Eurozone sample have not been further divided according to their size, larger banks in Eurozone are proved to enjoy higher ROAA. Furthermore, bank size seems to have the biggest impact on ROAA among all variables.

Loan ratio has similarly positive relation but is highly insignificant to ROAA measure. The same result was generated by Menicucci and Paolucci (2016), who tested the top 35 European commercial banks during the 2009-2013 period. This result is also consistent with the study from Korytowski (2018), who assessed determinants of the bank profitability in the post-crisis EU during 2011-2015. However, Staikouras and Wood (2004) with a wide scope of the European tested banks, found negative and significant impact on ROA. Despite this, this new finding shows that the loan ratio does not seem to influence ROAA of the commercial banks in the Eurozone.

Bank capital ratio seems to be positively related at the 1% level, which means that better capitalised banks reach higher ROAA. Confirming the findings of Molyneux and Thornton (1992), Pasiouras and Kosmidou (2007), Staikouras and Wood (2004), Petria et al. (2015) and Menicucci and Paolucci (2016). Capraru and Ihnatov (2015)

similarly found a positive effect, although not significant. This new finding strengthens the argument that well-capitalised banks have lower needs for external funding, which together with the lower default risk and lower required rate of return, lowers the weighted average cost of capital. This leads to higher profitability. Staikouras and Wood (2004) add that high capital ratio might help to reduce risk and entry barriers into new business opportunities and product lines, which might help to raise profitability. It can be concluded, that the relationship of the capital ratio and ROAA for banks in the Eurozone supports the findings of literature.

Level of loan loss provisions as a measure of credit risk has a highly significant negative relation to the ROAA. This interprets the expected outcome, that higher loan loss ratio signalizes lower credit quality, therefore it negatively influences ROAA. The finding is supported across the literature conducted on European banks (Staikouras and Wood, 2004; Capraru and Ihnatov, 2015; Petria et al., 2015; Menicucci and Paolucci, 2016). The opposing results were reported by Korytowski (2018), who found a positive but insignificant relationship between loan loss provisions and ROAA. Since loan loss ratio can be subject to managerial discretion, it might also play an important signalling role for the bank. But in this case, Curcio and Hasan (2015) proved that banks in the EU do not adjust provisioning policies in order to signal the private information. In the end, this result confirms most of the literature findings.

Cost to income ratio was found to have a negative and almost significant effect on ROAA. It can easily become significant in the other set of countries. In the study written by Pasiouras and Kosmidou (2007), cost to income ratio was the most important profitability determinant for foreign banks. The significant importance was also spotted by Korytowski (2018), who confirms the negative influence on ROAA. The negative relation to the European banks ROAA was also indicated by Capraru and Ihnatov (2015) and Petria et al. (2015). This negative impact, therefore, seems to be in line with the comparable literature.

Tax impact on ROAA is surprisingly positive, although not significant. The coefficient is also too small to make a remarkable difference in ROAA level. In the international evidence from Demirguc-Kunt and Huizinga (1999) tax effect significantly and positively influenced ROA. This positive influence means that the increase in tax rate

increases bank profitability. According to the Demirguc-Kunt and Huizinga (1999), this indicates that the tax burden is moved onto the banks' customers.

Macroeconomic GDP indicator was proved to be positively related to ROAA. Meaning that the higher the GDP growth per capita, the higher the level of ROAA. This supports the claim that during the economic prosperity there is easy access to credit connected with the higher demand for credit, which positively affects bank profitability. The existing literature highlight the same relationship between GDP growth and ROAA (Pasiouras and Kosmidou, 2007; Petria et al., 2015; Capraru and Ihnatov, 2015; Korytowski, 2018). Only study by Staikouras and Wood (2004) discovered a negative relationship. This can be explained by admitting, that due to the more competitive environment during the economic prosperity, profitability can be negatively affected. To summarize, this finding still appears to be consistent with the literature.

The inflation effect in the whole Eurozone is surprisingly negative and highly significant. This negative effect is in the literature interpreted as the inability of banks to adjust the interest rates due to the unanticipated inflation level. As described in the literature review, the Eurozone experienced several remarkable fluctuations of the inflation in the examined period. However, the impact on NIM is positive. This suggests that the interest margin was adjusted appropriately, to the inflation fluctuations. But since the ROAA is a broader measure, which includes also other bank profit streams than the profits from the interest, this argument does not hold. This shows that even though the bank might predict the inflation correctly and the interest rates were adjusted appropriately, the inflation still affected bank profitability negatively.

The argument about unanticipated inflation was supported by Pasiouras and Kosmidou (2007), who found domestic banks to have superior knowledge about the expected inflation, which helped them to sustain their profitability. The lack of knowledge about the economy hurt the ROAA of foreign banks, which was negatively influenced by inflation (Pasiouras and Kosmidou, 2007). The opposing positive impact of inflation is supported by Molyneux and Thornton (1992) and by Capraru and Ihnatov (2015), which is interesting since their study included the years of the global financial crisis. This finding seems to be inconsistent with the literature.

4.5.2 Eurozone results for the ROAE measure

In the case of the ROAE measure, bank size seems to be again the biggest and positive determinant. The bank size coefficient is more than 21, which suggest that 1 unit change in the level of total assets has even bigger impact on ROAE than on ROAA. However, the significance level dropped to 5% in this case. These findings are consistent with a study from Goddard et al. (2004), who examined banks in Germany, France, Italy, Spain, Denmark, and United Kingdom in the early 1990s and with the study from Menicucci and Paolucci (2016). However, Petria et al. (2015), Capraru and Ihnatov (2015) and Korytowski (2018) found size effect to be insignificant in relation to ROAE.

The change in the level of total loans to total assets does not affect the ROAE, which is coherent with the results from Menicucci and Paolucci (2016). Contrary, Korytowski (2018) proved negative but similarly insignificant effect of loan ratio on ROAE. The coherence within the literature remained only at the insignificancy of the size of the loan portfolio to ROAE.

As expected, the highly significant capital ratio positively influences the ROAE, which again supports the theory that well-capitalised banks enjoy greater profitability. It also become to be the second largest coefficient. It does correspond with the findings from Goddard et al. (2004) and Menicucci and Paolucci (2016). Capraru and Ihnatov (2015) and Petria et al. (2015) similarly obtained positive sign, however, the relation was rather insignificant. Despite this positive connection, capital ratio cannot be disproportionately high, since Goddard et al. (2004) warn, that high capital ratio might freeze the sources for potentially profitable investments. Interestingly, negative effect of capital ratio on banks' ROE was found in the extensive international study by Shehzad et al. (2013). The positive relationship with the ROAE appears to be consistent with the literature.

Loan loss provisions negatively affect also the ROAE measure. ROAE has the largest coefficient among the other profitability measures, which suggests that raise of TLLRGL by 1 unit, decreases the ROAE for more than 1,4%. The highest and negative coefficient for ROAE was also confirmed by findings from Capraru and Ihnatov (2015), Petria et al. (2015) and Menicucci and Paolucci (2016). This result, therefore, confirms the literature findings. This ratio belongs to the most significant and negative determinants of bank profitability for all countries of Eurozone. It is

therefore suggested for the European authorities to pay proper attention to the provisioning policies and regulations.

Cost to income ratio disposes with the negative sign, but with no relative significance to ROAE. This goes in line with the Petria et al. (2015), Capraru and Ihnatov (2015) and Korytowski (2018), who however found a significant relationship. These results are confirmed by wide international evidence from Shehzad et al. (2013), who also proved the negative effect of rising costs to banks' ROE. The overall result is not supported by similar literature.

Tax effect has a positive relation to the ROAE proxy. Again, also in case of ROAE it does not seem to have a meaningful impact, however, it supports the argument of shifting the tax burden onto the banks' customers.

GDP growth per capita turned out to be meaningful and reached its highest coefficient in relation to ROAE among the other profitability measures. The strongest positive impact on ROE is shared with the results from Petria et al. (2015), Capraru and Ihnatov (2015) and Korytowski (2018). This supports the previous evidence and the premise that GDP growth positively influences banks' profitability.

Inflation has a negative and significant impact on ROAE measure. Korytowski (2018) also proved negative and significant impact. Since the range of countries and time period of both studies are rather similar, this could support the argument that European banks experienced unanticipated inflation and therefore it reduced their profitability (both ROAA and ROAE). However, inflation has a positive impact on the NIM, which suggests that the interest rates were adjusted accordingly. As in the case of ROAA, ROAE as a proxy also represent a wider bank's profit stream. It can be therefore said, that despite the appropriate adjustment of the interest rates, the overall impact on profitability was negative. Evidence from Petria et al. (2015) and Shehzad et al. (2013) correspond with the negative impact, however, their coefficients were proved to be insignificant.

4.5.3 Eurozone results for the NIRTA measure

Concerning the net interest margin, bank size does not seem to play an important role for this measure in Eurozone banks. Indecisive results have been found by Menicucci and Paolucci (2016) and Capraru and Ihnatov (2015). Both their estimations were significant at 1% level, although with the opposing sign. Capraru

and Ihnatov (2015) found a negative influence on the NIM, suggesting that larger banks generate lower NIM. This finding remains inconsistent.

Finally, the loan ratio became significant, suggesting that bigger loan portfolio leads to a higher NIM. This means that loan effect varies according to the profitability measure. Menicucci and Paolucci (2016) got the same result, which they supported by the argument that the European market is strongly bank-based where banks predominantly transform deposits into the loans. Capraru and Ihnatov (2015) measure the size of the loan portfolio as total loans over the deposits, which is considered as the proxy of liquidity. The effect on NIM was found negative, which suggests that extensive lending reduces the liquidity from deposits and therefore raise the risk.

As in the previous two measure cases, the capital ratio can be confirmed to be an important internal bank variable, which positively influences bank profitability. This result might be useful for investors seeking investments in the Eurozone banking industry. Commercial banks in the Eurozone seems to profit from the distinct capital strength which indicates lower default risk and is in conflict of the risk-return hypothesis. This finding is supported by Menicucci and Paolucci (2016), however, opposed by Capraru and Ihnatov (2015), where the effect was negative. The reason might be that Menicucci and Paolucci (2016) examined European banks during a similar period, like this study.

The loan portfolio quality does not have a meaningful impact on NIM, but the negative coefficient sign is in line with the case of other profitability measures. Menicucci and Paolucci (2016) with Capraru and Ihnatov (2015) confirm a significantly negative impact of loan loss provisions.

Cost to income ratio is in all three cases negative, but it significantly affects only NIM. However, the coefficient is that small, that increase by one unit in the CTIR would lead to only 0.0008 decrease in NIM. Similarly, small effect was proved by Capraru and Ihnatov (2015).

The different tax rates do not have a significant impact on all 3 profitability measures in the Eurozone. Notably, the expected negative effect is present only in the case of NIM. By examining the most industrialized countries, Albertazzi and Gambacorta

(2010), proved tax effect to have the negative impact on NIM at rather high level of tax rate, and positive effect at the relatively low tax rate.

GDP growth per capita in the Eurozone negatively influence NIM. This might support the argument from Staikouras and Wood (2004), that in the times of higher economic prosperity banks face higher competition, which might lead to lower NIM.

Increase in inflation positively affects NIM, unlike the other 2 profitability measures. This would be in contrast with the argument, that the Eurozone countries experienced unanticipated inflation and therefore their profitability was negatively affected. Positive relation to NIM suggests, that NIM was adjusted effectively to maintain the profitability generated from NIM. The reason is that NIM represents quite narrow measure of profitability. Even though the interest rates were adjusted appropriately, it was not enough for banks to remain profitable, since the inflation negatively hurt the other streams of profit. International evidence from Demirguc-Kunt and Huizinga (1999) similarly proved the positive effect of inflation on NIM. Capraru and Ihnatov (2015) share the results, although the effect was insignificant.

4.5.4 Eurozone results summary

In order to answer the research questions, evidence from the Eurozone shows that the profitability of banks is mainly influenced by the bank size, level of equity, level of loan loss reserves and by GDP growth and inflation. All listed determinants are proved to be significant at least for 2 measures of profitability. By the size of the coefficients, it can be said that the bank size has the biggest impact on ROAA, and equity ratio, loan loss provisions, inflation, and bank size mostly influence the level of ROAE. Due to the constant significance for all three measures of profitability, macroeconomic indicators seem to influence the bank profitability more, than the other internal determinants. The results comparison shows that the impact of equity ratio, loan loss reserves and GDP growth on commercial bank profitability rather confirms findings from similar studies. Findings of the impact of the bank size and inflation remain rather indecisive with the comparison from similar studies. Other variables were proved to have rather small and inconsistent impact on the bank profitability in the Eurozone.

4.6 Non-PIIGS countries regression results

Table 9 indicates regression results for the non-PIIGS countries. The coefficients are displayed with the star symbol, which indicates the statistical significance level. Robust standard errors are displayed in the brackets under the estimated coefficients. The results are grouped according to the independent variables.

Table 9 - Fixed effects estimator with robust standard errors - Non-PIIGS countries

	ROAA	ROAE	NIRTA
logTA	0.4528701 (0.338319)	-3.964787 (6.065391)	0.2831885 0.4942437
NLTA	-0.0065583* (0.003687)	-0.0281991 (0.066414)	0.0167711* 0.008687
TETA	0.0802314*** (0.0149828)	0.4397273** (0.190448)	0.0265244 0.0178394
TLLRGL	-0.1420335*** (0.0246617)	-2.195961*** (0.4784235)	0.0066349 0.0103212
CTIR	-0.0027306 (0.0024124)	-0.0332961 (0.0367713)	-0.000529 0.0003943
TPTP	0.0000148 (0.0002743)	0.0000947 (0.004558)	-0.0001858 0.0001903
GDP	0.0746774*** (0.0160368)	1.087405*** (0.2082737)	-0.0041482 0.0070413
INF	-0.0856316*** (0.0277486)	-1.617638*** (0.5931848)	0.0168109 0.015996
Nr of observations	2431	2430	2431
R^2	0.1565	0.0866	0.0200
F statistics	10.92	7.64	1.25
Prob > F	0.0000	0.0000	0.2705

Note: statistical significance: ***1% significance level, **5% significance level, *10% significance level ROAA is return on average assets (%), ROAE is return on average equity (%), NIRTA is net interest margin (%), logTA represents bank size, NLTA is loan ratio (%), TETA is equity ratio (%), TLLRGL is loan loss reserves to gross loans ratio (%), CTIR is cost to income ratio (%), TPTP indicates tax effect (%), GDP is GDP growth per capita (%), INF represents inflation rate (%)
Source: Author's own calculations

The determinants of bank profitability are now tested without the vulnerable PIIGS countries which were subject to the European debt crisis. The results show some major differences and can bring an objective insight into the bank profitability situation for the strong European leaders.

4.6.1 Non-PIIGS countries - results for the bank size

Bank size again holds the biggest coefficient regarding ROAA, but compared to the Eurozone, it lost its significance. Interestingly, the size effect was spotted to

negatively influence ROAE, which is in contrast with the findings from the Eurozone. The size effect was again proved to have the biggest coefficient among all the variables influencing the level of ROAE, however, it turned out to be insignificant. Similarly, the size effect does not influence NIM, which is consistent with the findings from the Eurozone. To summarize, size effect does not have a significant impact on any measure of the profitability of the banks in non-PIIGS countries, whereas in the Eurozone it played a strong role.

4.6.2 Non-PIIGS countries - results for the loan ratio

Concerning the loan ratio, it significantly and negatively affects the ROAA in the non-PIIGS counties, which is in direct contrast with the results from the Eurozone. An explanation could be taking loan ratio as the indicator of liquidity and credit risk. The higher loan ratio would mean a lower level of liquidity and higher credit risk, which would negatively affect profitability. But banks appear to be sensitive only in case of ROAA and NIRTA. NIRTA measure is positively affected by the loan to asset ratio, which agrees with the evidence from the Eurozone. This would support argument from Meniucci and Paolucci (2015), which says that since the EU market is rather bank-based, EU banks convert more deposits into loans, which might positively influence NIM. Lastly, the loan ratio has no meaningful impact on ROAE. Overall, banks from non-PIIGS countries appear to be more sensitive to the loan ratio than banks from the whole Eurozone.

4.6.3 Non-PIIGS countries - results for the equity ratio

As in the Eurozone, the equity ratio retained its significance and positive effect on ROAA and ROAE even for banks from non-PIIGS countries. The effect on NIM is still positive, but in contrast to Eurozone, it became insignificant. This evidence still confirms the argument, that banks headquartered in the EU, non-PIIGS countries and Eurozone benefit from the higher level of shareholders' equity.

4.6.4 Non-PIIGS countries - results for the loan loss reserves

The level of loan loss provisions is proved to be negative and significant for both ROAA and ROAE proxies. The highest coefficient was reached in case of the ROAE measure, which confirms that small change in the level of LLR affects ROAE measure the most. This supports the fact that worsen credit quality indicated by high loan loss provisions negatively affects bank profitability. NIM is not affected by the

loan loss provisions. All findings mentioned above correspond with the evidence from the Eurozone.

4.6.5 Non-PIIGS countries - results for the cost to income ratio

Cost to income ratio does not seem to play an important role within the determinants of ROAA and ROAE. In both cases, CTIR has a negative effect, which is in line with the results from the Eurozone and the studies reviewed. The only difference in the results is that the CTIR lost its significance to NIM when tested in the non-PIIGS sample. It can be concluded that cost to income ratio has no effect on any of the tested profitability measures in the non-PIIGS countries.

4.6.6 Non-PIIGS countries - results for the tax effect

As it can be seen from table 9, tax determinant does not impact any of the profitability proxies. The positive influence on ROAA and ROAE and negative on NIM exactly copy the results reached in the Eurozone. According to the uniformed results, it can be said that banks' profitability in the post-crisis Eurozone, was not influenced by the different tax rates.

4.6.7 Non-PIIGS countries - results for the GDP growth per capita

As it is known, Eurozone as the monetary union is already highly integrated. Therefore, it was not even expected that macroeconomic determinants in the case of Eurozone would influence non-PIIGS banks differently. As expected, GDP growth per capita had a positive and significant impact on banks' ROAA and ROAE, similarly with the evidence from Eurozone. The negative effect on NIM also persisted, but for the non-PIIGS countries, it became insignificant. Overall, the results for GDP growth per capita variable are rather consistent in both sets of countries.

4.6.8 Non-PIIGS countries - results for the inflation

Inflation negatively affects ROAA and ROAE, which might indicate that the stronger industrialized countries of the Eurozone experienced unanticipated levels of inflation, which hurt their profitability. Even though the result for NIM is positive, it lost its significance value. The fluctuations in the inflation rate seem to hit the Eurozone and non-PIIGS countries evenly. This finding, therefore, revealed that financial contagion in the Eurozone might be a dangerous problem.

4.6.9 Non-PIIGS countries - results summary

Meaningful drivers of the bank profitability in non-PIIGS countries are the level of loan ratio, equity ratio, and loan loss reserves together with the GDP growth and inflation.

Results comparison between the Eurozone and non-PIIGS countries showed major distinctions in the size effect, which apparently lost its significance. And the loan ratio effect, which on the other hand for the non-PIIGS countries became significant. Otherwise, results on the remaining variables are proved to collide with no major distinctions.

4.7 PIIGS countries regression results

Table 10 displays the regression estimation results for the final group of banks from the PIIGS countries. The coefficients are presented with the star symbol, which again indicates the level of statistical significance. Robust standard errors are displayed in the brackets under the coefficients. The regression results are grouped according to the independent variables.

Table 10 - Fixed effects estimator with robust standard errors – PIIGS countries

	ROAA	ROAE	NIRTA
logTA	1.456198 (0.884631)	65.94127*** (22.79515)	0.2920232 (0.4121796)
NLTA	0.0185425* (0.0100871)	0.4835148** (0.199836)	0.015061*** (0.0029275)
TETA	0.1064804*** (0.0389748)	3.0787*** (1.092504)	0.0325988** (0.0163764)
TLLRGL	-0.0195779 (0.0398165)	-0.9389398* (0.5587368)	-0.01239** (0.0060647)
CTIR	-0.0052089* (0.0030759)	-0.1095018 (0.0693433)	-0.0019323* (0.0009946)
TPTP	0.0002778 (0.0003042)	0.0097238 (0.0076692)	0.000029 (0.0000701)
GDP	0.0135348 (0.0147001)	0.1501993 (0.321052)	-0.0137204*** (0.0051909)
INF	-0.062375* (0.0376058)	-2.374699** (0.9623205)	0.0411455*** (0.0112092)
Nr of observations	1120	1112	1119
R^2	0.0063	0.0000	0.0577
F statistics	2.18	2.05	17.99
Prob > F	0.0318	0.0439	0.0000

Note: statistical significance: ***1% significance level, **5% significance level, *10% significance level ROAA is return on average assets (%), ROAE is return on average equity (%), NIRTA is net interest margin (%), logTA represents bank size, NLTA is loan ratio (%), TETA is equity ratio (%), TLLRGL is loan loss reserves to gross loans ratio (%), CTIR is cost to income ratio (%), TPTP indicates tax effect (%), GDP is GDP growth per capita (%), INF represents inflation rate (%)
Source: Author's own calculations

The last sample of the analysed banks are banks headquartered in the vulnerable PIIGS countries hit by the European debt crisis. As it can be seen from the

profitability trend analysis, banks in PIIGS countries were hurt more intensively during the 2010-2013 than the banks from the rest of the Eurozone. On the other hand, banks from non-PIIGS countries experienced different profitability trend than the whole Eurozone. The comparison of results from all three samples might help to shed light on the effects of the European debt crisis on the determinants of bank profitability.

4.7.1 PIIGS countries - results for the bank size

In all 3 measure cases, bank size was again proved to have a positive effect, together with the highest coefficients. These positive large coefficients are shared with the banks from the Eurozone and even non-PIIGS countries. This only confirms the uniform outcome, that all Eurozone banks are potentially able to benefit from a bigger size. However, after the further division of the original Eurozone sample, into the non-PIIGS and PIIGS countries, size effect lost its significance.

4.7.2 PIIGS countries - results for the loan ratio

Interestingly, the loan ratio has shown uniformed and positively significant relation to all three measures of profitability. While in both Eurozone and non-PIIGS countries was meaningfully and positively affected only NIM, in PIIGS countries loan ratio played more important role.

With the higher level of loans, banks are exposed to a lower level of liquidity together with high credit risk. This finding goes in line with the risk-return hypothesis, which suggests that banks in PIIGS countries were exposed to higher risk, but they also gained higher profits. This is in contrast with the evidence from the non-PIIGS countries, where the impact on ROAA and ROAE was strongly negative. The first major difference between countries affected by the European debt crisis and the rest of the Eurozone is their credit risk exposure and its impact on ROAA and ROAE. Non-PIIGS countries appear have conservative attitude, where high loan ratio increases the risk and therefore negatively affect profitability, whereas PIIGS countries seem to benefit from risk-return hypothesis.

4.7.3 PIIGS countries - results for the equity ratio

The equity ratio is again meaningfully and positively correlated with all 3 proxies. This positive result is shared with both bank samples. Equity ratio, therefore, provides uniformed common results, which advocates that generally well-capitalised banks in the Eurozone area enjoy higher level of profitability.

4.7.4 PIIGS countries - results for the loan loss reserves

Loan loss reserves negatively affect all 3 measures of profitability, which verifies the expected results. This negative influence was also observed in the Eurozone and in the case of ROAA and ROAE also in non-PIIGS countries. The differences are mainly in the significance connected with the measures. In PIIGS countries the level of loan loss reserves finally meaningfully influences also the NIM together with the ROAE. Interestingly, ROAA is not significantly affected in PIIGS countries, while in other 2 data sets it does. Despite these differences, another common finding can be confirmed. And so that the level of loan loss reserves generally in the Eurozone countries negatively affects banks' profitability, with no difference due to the sovereign debt crisis.

4.7.5 PIIGS countries - results for the cost to income ratio

Cost to income ratio uniformly and negatively influences the profitability in all three measures. This impact fully corresponds with the evidence from Eurozone and non-PIIGS countries. Notably, in PIIGS countries CTIR became more significant, concretely in relation to NIM and ROAA. To conclude, banks profitability in non-PIIGS countries was not meaningfully influenced by the CTIR ratio, whereas in PIIGS countries CTIR played an important role.

4.7.6 PIIGS countries - results for the tax effect

Taxation again with no significance positively affect all 3 measures. While NIM was affected negatively in Eurozone and non-PIIGS countries, in PIIGS countries alone is NIM affected positively. Evidence supports the results from the previous sample estimations. To summarize, different tax rates did not have a significant impact on none of the profitability measures in all three bank samples. This can support the conclusion that all banks, even the ones in vulnerable PIIGS countries possess the ability to transfer the tax burden onto their customers.

4.7.7 PIIGS countries - results for the GDP growth per capita

ROAA and ROAE proxies show a positive correlation with the GDP growth, whereas the NIM is negatively influenced. This macroeconomic effect appears to be consistent across the all tested samples, however, the level of significance interestingly differs. While in the Eurozone is GDP growth one of the most significant variables, for PIIGS banks it is rather an insignificant factor. The reason might be the volatile and often negative GDP growth in PIIGS countries.

4.7.8 PIIGS countries - results for the inflation

For PIIGS banks inflation seems to be the most significant macroeconomic variable. It negatively affects ROAA and ROAE, and positively NIM. This evidence is exactly in line with the outcomes from the Eurozone and non-PIIGS countries. Since inflation is regulated mainly by the ECB, this uniformity might not be a surprise.

4.7.9 PIIGS countries - results summary

Banks from PIIGS counties seem to be mostly influenced by the level of loan ratio, equity ratio, loan loss reserves, cost to income ratio and the level of inflation. ROAA is mostly influenced by the capital ratio and ROAE by the capital ratio, inflation, and bank size. In contrast to the evidence from the Eurozone, banks from PIIGS countries seem to be influenced mainly by the internal determinants. Only the results of the impact of equity ratio, loan loss reserves, inflation and tax effect are in line with the evidence from the non-PIIGS countries and the whole Eurozone. The main difference is that the banks in PIIGS countries seem to benefit from the high loan ratio which supports the risk-return hypothesis, whereas the banks in non-PIIGS countries are negatively affected by the high proportion of loans. This indicates that banks in the non-PIIGS countries appear to be more conservative. Another important difference is that CTIR is significant only for banks in the PIIGS countries. Surprisingly, bank profitability in PIIGS countries is not primarily influenced by the GDP growth nor the bank size. Both factors almost lost their significance.

5. Conclusion

Economic situation highly depends on the safety and soundness of the banking system. It is therefore important to control banks' financial performance and their activities. Lessons can be learnt from the financial crises, which were triggered by bank risky operations. Even though the regulation of banks was remarkably tightened, banks always seem to find ways how to overcome given boundaries. As being the economic entities, banks need to remain profitable. Considering the constant changes in the economic environment, it is important to persistently bring up-to-date results about the drivers of bank profitability.

This study analysed determinants of profitability of 586 commercial banks from the Eurozone monetary union, in the direct post-crisis period from 2009 to 2016. The profitability was measured by 3 different proxies (ROAA, ROAE, NIRTA) in relation to the 8 independent variables. This study used widely examined both internal and external variables, in order to compare the impact of these determinants with older studies. Additionally, banks were divided into three groups: the whole Eurozone, PIIGS countries and non-PIIGS countries. This further selection was done in order to find, whether the European sovereign debt crisis had a specific impact on bank profitability in the remarkably hurt PIIGS countries. Data were generated from the Fitch Connect database, which provides uniformed bank data from all over the world. Due to the unavailability of some data in Fitch Connect, this paper used unbalanced panel data. The linear regression model was estimated and the fixed effects and random effects estimations were calculated. The Hausman test straightforwardly indicated that the fixed effects estimator is suitable. For the final model estimation, fixed effects estimator with robust standard errors was used. The model was tested for the presence of multicollinearity, heteroscedasticity, and autocorrelation, where issues with multicollinearity were not found and for the other 2 problems was controlled by using fixed effects estimator with the robust standard errors.

The results showed that the most important meaningful determinants for Eurozone were bank size, capital ratio, loan loss reserves, GDP growth per capita and the level of inflation. The study tested five internal and three external determinants and the impact of GDP growth and inflation was uniformly significant for all three profitability measures. This uniformed finding suggests that bank profitability in the whole Eurozone was largely influenced by the external variables. The most significant

positive determinants were the equity ratio and GDP growth per capita. The most significant determinants with negative influence were the level of loan loss reserves and inflation.

Majority of the results from non-PIIGS countries collide with the findings from the whole Eurozone. The major difference is that bank size effect lost its significance, and the loan ratio became more significant. Which illustrates that banks in the industrialized European countries are more sensitive to the level of loans.

Evidence from PIIGS countries declares that the most important and positively related drivers are loan ratio and equity ratio. And the most important negative driver was inflation. A bit less significant drivers were the level of loan loss reserves and cost to income ratio. In contrast to the evidence from the Eurozone, bank size again lost its significance for both PIIGS and non-PIIGS countries. Surprisingly, banks in PIIGS countries seem to benefit from the high level of loan ratio, whereas the non-PIIGS countries experience the opposite effect. This finding might suggest that during the European debt crisis, PIIGS countries benefited from the higher risk caused by the high level of loan portfolio. Similarly, cost to income ratio is significant only for the PIIGS banks. Another difference is that the GDP growth surprisingly does not influence the bank performance in PIIGS countries. As described, the internal result comparison showed some significant differences.

Results presented in this dissertation might be beneficial for the European and legal authorities, which could now be aware of the actual importance and effect of the drivers of bank profitability. It can be also useful for the countries, which are considering the adoption of the euro, as their national currency. Since it might help them to concentrate mostly on the significant drivers of bank profitability.

As a limitation of this dissertation can be seen the incompleteness of the bank financials data, which was caused due to data unavailability directly in the source database. Another limitation could be the methodology used, which according to the literature might not control for possible estimation issues as endogeneity or profit persistency.

Constantly changing European economic environment might remain to be a good source for the continuous examination of the determinants of the bank profitability. It

is suggested to use different methodology and more recent time scale in order to further examine the actual drivers of the European bank profitability.

References

Adelopo, I., Lloydking, R., & Tauringana, V. (2018). Determinants of bank profitability before, during, and after the financial crisis. *International Journal of Managerial Finance, 14*(4), 378-398. doi:10.1108/IJMF-07-2017-0148

Albertazzi, U., & Gambacorta, L. (2009). Bank profitability and the business cycle. *Journal of Financial Stability, 5*(4), 393-409. doi:10.1016/j.jfs.2008.10.002

Albertazzi, U., & Gambacorta, L. (2010). Bank profitability and taxation. *Journal of Banking & Finance, 34*(11), 2801-2810. doi:10.1016/j.jbankfin.2010.06.003

Allen, F., & Gale, D. (1995). A welfare comparison of intermediaries and financial markets in Germany and the US. *European Economic Review*, *39*(2), 179-209. doi:10.1016/0014-2921(94)00095-H

Ali, M., & Puah, C.H. (2019). The internal determinants of bank profitability and stability: An insight from banking sector of Pakistan. *Management Research Review, 42*(1), 49-67. doi:10.1108/MRR-04-2017-0103

Altunbas, Y., Gardener, E.P.M., Molyneux, P., & Moore, B. (2001). Efficiency in European banking. *European Economic Review, 45*(10), 1931-1955. doi:10.1016/S0014-2921(00)00091-X

Altunbas, Y., Goddard, J., & Molyneux, P. (1999). Technical change in banking. *Economics Letters, 64*(2), 215-221. doi:10.1016/S0165-1765(99)00076-2

Angbazo, L. (1997). Commercial bank net interest margins, default risk, interest-rate risk, and off-balance sheet banking. *Journal of Banking & Finance, 21*(1), 55-87. doi:10.1016/S0378-4266(96)00025-8

Arellano, M., & Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *The Review of Economic Studies, 58*(2), 277-297. doi:10.2307/2297968

Athanasoglou, P.P., Brissimis, S.N., & Delis, M.D. (2008). Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *Journal of International Financial Markets, Institutions & Money, 18*(2), 121-136. doi:10.1016/j.intfin.2006.07.001

Batten, J., & Vo, X.V. (2019). Determinants of Bank Profitability- Evidence from Vietnam. *Emerging Markets Finance and Trade, 55*(6), 1417-1428. doi:10.1080/1540496X.2018.1524326

Bikker, J.A., & Haaf, K. (2002). Competition, concentration and their relationship: An empirical analysis of the banking industry. *Journal of Banking & Finance, 26*(11), 2191-2214. doi:10.1016/S0378-4266(02)00205-4

Bourke, P. (1989). Concentration and other determinants of bank profitability in Europe, North America and Australia. *Journal of Banking and Finance, 13*(1), 65-79. doi:10.1016/0378-4266(89)90020-4

Capraru, B. & Ihnatov, I. (2015). Determinants of bank's profitability in EU15. *Analele Stiintifice Ale Universitatii Al I Cuza Din Iasi - Sectiunea Stiinte Economice, 62*(1), 93-101. doi:10.1515/aicue-2015-0007

Carbo, S., Gardener, E.P.M., & Molyneux, P. (2007). Financial Exclusion in Europe. *Public Money & Management, 27*(1), 21-27. doi:10.1111/j.1467-9302.2007.00551.x

Curcio, D. & Hasan, I. (2015). Earnings and capital management and signaling: The use of loan-loss provisions by European banks. *The European Journal of Finance, 21*(1), 26-50. doi:10.1080/1351847X.2012.762408

De Bruyckere, V., Gerhardt, M., Schepens, G., & Vander Vennet, R. (2013). Bank/sovereign risk spillovers in the European debt crisis. *Journal of Banking & Finance, 37*(12), 4793-4809. doi:10.1016/j.jbankfin.2013.08.012

Demirguc-Kunt, A. & Huizinga, H. (1999). Determinants of Commercial Bank Interest Margins and Profitability: Some International Evidence. *The World Bank Economic Review, 13*(2), 379-408. doi:10.1093/wber/13.2.379

Diamond, D.W. (1984). Financial Intermediation and Delegated Monitoring. *Review of Economic Studies, 51*(3), 393-414. doi:10.2307/2297430

Dietrich, A., & Wanzenried, G. (2011). Determinants of bank profitability before and during the crisis: Evidence from Switzerland. *Journal of International Financial Markets, Institutions & Money, 21*(3), 307-327. doi:10.1016/j.intfin.2010.11.002

Drukker, D.M. (2003). Testing for serial correlation in linear panel-data models. *The Stata Journal , 3*(2), 168-177. Retrieved from https://www.stata-journal.com/sjpdf.html?articlenum=st0039

European Central Bank. (2019). *ECB mission*. Retrieved from https://www.ecb.europa.eu/ecb/orga/escb/ecb-mission/html/index.en.html

European Commission. (2019a). *What is the euro area?*. Retrieved from https://ec.europa.eu/info/business-economy-euro/euro-area/what-euro-area_en

European Commission. (2019b). *Convergence criteria for joining*. Retrieved from https://ec.europa.eu/info/business-economy-euro/euro-area/enlargement-euro-area/convergence-criteria-joining_en

European Commission. (2019c). *Who can join and when?*. Retrieved from https://ec.europa.eu/info/business-economy-euro/euro-area/enlargement-euro-area/who-can-join-and-when_en

European Commission. (2019d). *Converting to the euro*. Retrieved from https://ec.europa.eu/info/business-economy-euro/euro-area/enlargement-euro-area/introducing-euro/adoption-fixed-euro-conversion-rate/converting-euro_en

Fiordelisi, F., Marques-Ibanez, D., & Molyneux, P. (2011). Efficiency and risk in European banking. *Journal of Banking & Finance, 35*(5), 1315-1326. doi:10.1016/j.jbankfin.2010.10.005

Fitch Solutions, Inc. (2019). *Fitch Solutions*. Retrieved from https://www.fitchsolutions.com/solutions/counterparty-risk-solution-credit-risk-analysis?gclid=EAIaIQobChMIgZLV1fjZ3wIVqL_tCh2hTg6CEAAYASAAEgIKMPD_BwE

Foos, D., Norden, L., & Weber, M. (2010). Loan growth and riskiness of banks. *Journal of Banking & Finance, 34*(12), 2929-2940. doi:10.1016/j.jbankfin.2010.06.007

Garcia-Herrero, A., Gavila, S., & Santabarbara, D. (2009). What explains the low profitability of Chinese banks? *Journal of Banking & Finance, 33*(11), 2080-2092. doi:10.1016/j.jbankfin.2009.05.005

Garcia, M.T.M., & Guerreiro, J.P.S.M. (2016). Internal and external determinants of banks' profitability: The Portuguese case. *Journal of Economic Studies, 43*(1), 90-107. doi:10.1108/JES-09-2014-0166

Goddard, J., Molyneux, P., & Wilson, J.O.S. (2004). Dynamics of Growth and Profitability in Banking. *Journal of Money, Credit and Banking, 36*(6), 1069-1090. Retrieved from https://www-jstor-org.libaccess.hud.ac.uk/stable/pdf/3839101.pdf?refreqid=excelsior%3Aad6c7577fa1698dc85e02021c8f5718a

Goddard, J., Molyneux, P., Wilson, J.O.S., & Tavakoli, M. (2007). European banking: An overview. *Journal of Banking & Finance, 31*(7), 1911-1935. doi:10.1016/j.jbankfin.2007.01.002

Golin, J. & Delhaise, P. (2001). *The bank credit analysis handbook: A guide for analysts, bankers and investors*. Retrieved from https://ebookcentral.proquest.com/lib/HUD/detail.action?docID=1157398#

Gruppe, M. & Lange, C. (2014). Spain and the European sovereign debt crisis. *European Journal of Political Economy*, 34, S3-S8. doi:10.1016/j.ejpoleco.2013.08.006

Gujarati, D. (2015). *Econometrics by example* (2nd ed.). London: Red Globe Press.

Gujarati, D.N., & Porter, D.C. (2010). *Essentials of econometrics* (4th ed.). New York: McGraw-Hill Education.

Gurley, J.G., & Shaw, E.S. (1955). Financial Aspects of Economic Development. *The American Economic Review,45*(4), 515-538. Retrieved from https://www-jstor-org.libaccess.hud.ac.uk/stable/1811632?pq-origsite=summon&seq=1#metadata_info_tab_contents

Haffernan, S.A., & Fu, X. (2010). Determinants of financial performance in Chinese banking. *Applied Financial Economics, 20*(20), 1585-1600. doi:10.1080/09603107.2010.505553

Hartmann, P., Maddaloni, A., & Manganelli, S. (2003). The Euro-area Financial System: Structure, Integration, and Policy Initiatives. *Oxford Review of Economic Policy, 19*(1), 180-213. doi:10.1093/oxrep/19.1.180

Haslem, J.A. (1968). A Statistical Analysis of the Relative Profitability of Commercial Banks. *The Journal of Finance, 23*(1), 167-176. doi: 10.1111/j.1540-6261.1968.tb03004.x

Korytowski, M. (2018). Banks' profitability determinants in post-crisis European Union. *International Journal of Finance & Banking Studies, 7*(1), 1-12. doi:10.20525/ijfbs.v7i1.847

Kosmidou, K., Kousenidis, D., Ladas, A., & Negkakis, C. (2019). Do institutions prevent contagion in financial markets? Evidence from the European debt crisis. *The European Journal of Finance, 25*(7), 632-646. doi:10.1080/1351847X.2018.1552171

Lane, P.R. (2012). The European Sovereign Debt Crisis. *Journal of Economic Perspectives, 26*(3), 49-68. doi:10.1257/jep.26.3.49

Levine, R. (1998). The Legal Environment, Banks, and Long-Run Economic Growth. *Journal of Money, Credit and Banking, 30*(3), 515-538. doi:10.2307/2601259

Menicucci, E., & Paolucci, G. (2016). The determinants of bank profitability: empirical evidence from European banking sector. *Journal of Financial Reporting and Accounting, 14*(1), 86-115. doi:10.1108/JFRA-05-2015-0060

Miller, S.M., & Noulas, A.G. (1997). Portfolio mix and large-bank profitability in the USA. *Applied Economics, 29*(4), 505-512. doi:10.1080/000368497326994

Molyneux, P., & Thornton, J. (1992). Determinants of European bank profitability: A note. *Journal of Banking and Finance, 16*(6), 1173-1178. doi:10.1016/0378-4266(92)90065-8

Pasiouras, F., & Kosmidou, K. (2007). Factors influencing the profitability of domestic and foreign commercial banks in the European Union. *Research in International Business and Finance, 21*(2), 222-237. doi:10.1016/j.ribaf.2006.03.007

Perry, P. (1992). Do Banks Gain or Lose from Inflation?. *Journal of Retail Banking,14*(2), 25-30. Retrieved from https://search-proquescom.libaccess.hud.ac.uk/docview/214532994/fulltextPDF/165482D70CA643B7PQ/1?accountid=11526

Petria, N., Capraru, B., & Ihnatov, I. (2015). Determinants of banks' profitability: Evidence from EU 27 banking systems. *Procedia Economics and Finance, 20*, 518-524. doi:10.1016/S2212-5671(15)00104-5

Rasiah, D. (2010). Review of Literature and Theories on Determinants of Commercial Bank Profitability. *Journal of Performance Management, 23*(1), 23-49. Retrieved from https://search-proquest-com.libaccess.hud.ac.uk/docview/749772445?pq-origsite=summon

Rekik, M., & Kalai, M. (2018). Determinants of banks' profitability and efficiency: Empirical evidence from a sample of Banking Systems. *Journal of Banking and Financial Economics, 1*(9), 5-23. doi:10.7172/2353-6845.jbfe.2018.1.1

Schmidt, R.H., Hackethal, A., & Tyrell, M. (1999). Disintermediation and the Role of Banks in Europe: An International Comparison. *Journal of Financial Intermediation, 8*(1-2), 36-67. doi:10.1006/jfin.1998.0256

Shehzad, C.T., De Haan, J., & Scholtens, B. (2013). The relationship between size, growth and profitability of commercial banks. *Applied Economics, 45*(13), 1751-1765. doi:10.1080/00036846.2011.637896

Short, B.K. (1979). The Relation Between Commercial Bank Profit Rates and Banking Concentration in Canada, Western Europe, and Japan. *Journal of Banking and Finance, 3*(3), 209-219. doi:10.1016/0378-4266(79)90016-5

Smirlock, M. (1985). Evidence on the (Non) Relationship between Concentration and Profitability in Banking. *Journal of Money, Credit and Banking, 17*(1), 69-83. doi:10.2307/1992507

Smith, R., Staikouras, C., & Wood, G. (2003). Non-interest income and total income stability. *Bank of England. Quarterly Bulletin, 43*(3), 332-332. Retrieved from https://search-proquest-com.libaccess.hud.ac.uk/docview/215024187/fulltext/9B7981AF7ECC40C2PQ/1?accountid=11526

Staikouras, C.K., & Wood, G.E. (2004). The Determinants Of European Bank Profitability. *International Business & Economics Research Journal, 3*(6), 57-68. Retrieved from https://clutejournals.com/index.php/IBER/article/view/3699/3743

StataCorp LLC. (2019). *Hausman specification test*. Retrieved from https://www.stata.com/manuals13/rhausman.pdf

Statistical Data Warehouse. (2019). *Selected Indicators for the Euro Area*. Retrieved from https://sdw.ecb.europa.eu

Tan, Y., Floros, C., & Anchor, J. (2017). The profitability of Chinese banks: Impacts of risk, competition and efficiency. *Review of Accounting and Finance, 16*(1), 86-105. doi:10.1108/RAF-05-2015-0072

The World Bank Group. (2019a). *GDP per capita growth (annual %)*. Retrieved from https://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG?end=2016&locations=SE-FI-EU-AT-BE-CY-EE-FR-DE-GR-IE-IT-LV-LT-LU-MT-NL-PT-SK-SI-ES&start=2009

The World Bank Group. (2019b). *Inflation, consumer prices (annual %)*. Retrieved from https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG?end=2016&start=2009

Trujillo-Ponce, A. (2013). What determines the profitability of banks? Evidence from Spain. *Accounting and Finance, 53*(2), 561-586. doi:10.1111/j.1467-629X.2011.00466.x

Wooldridge, J.M. (2016). *Introductory econometrics: A modern approach* (6th ed.). Boston: Cengage Learning.

Appendix 1

This appendix displays all the Hausman tests computed for this dissertation.

Hausman test – Eurozone – ROAA

```
.                                          EUROZONE ROAA
hausman fixed random

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference          S.E.
-------------+------------------------------------------------------------
       logTA |    1.034848     .0649298        .9699179        .1862192
         NLTA |    .0017971    -.0040859         .005883        .0021083
         TETA |    .0910062     .0841607        .0068455        .0049997
       TLLRGL |   -.0792015    -.0718913       -.0073102        .0048641
         CTIR |   -.0032831    -.0037287        .0004456        .0001672
         TPTP |    .0002343     .0001478        .0000865        .0000434
          GDP |    .0481544     .0507426       -.0025882        .0017798
          INF |   -.0723081    -.0793545        .0070465         .004517
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       52.12
               Prob>chi2 =      0.0000
```

Hausman test – Eurozone – ROAE

```
                              EUROZONE ROAE
hausman fixed random

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference          S.E.
-------------+------------------------------------------------------------
       logTA |    21.69875    -.0729939        21.77175        4.125576
         NLTA |     .116091     -.049185         .165276        .0514605
         TETA |    1.223111     .3309471        .8921637        .1387213
       TLLRGL |   -1.404412    -1.186302       -.2181105         .134569
         CTIR |   -.0508417     -.053426        .0025843        .0045873
         TPTP |    .0066034     .0037032        .0029002         .001133
          GDP |    .6840278     .9209168        -.236889        .0480766
          INF |   -1.872435    -2.213019        .3405835        .1028588
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       90.49
               Prob>chi2 =      0.0000
```

Hausman test – Eurozone – NIRTA

```
                          EUROZONE NIRTA
hausman fixed random

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference          S.E.
-------------+------------------------------------------------------------
       logTA |    .3067896    -.0835565        .3903461        .0755867
        NLTA |    .0162023     .0160667        .0001356        .0004851
        TETA |    .0301975     .0252919        .0049056        .0012641
      TLLRGL |   -.0054798    -.0014071       -.0040727        .0008153
        CTIR |   -.0008326    -.0009505         .000118               .
        TPTP |   -.0000461    -.0000424       -3.65e-06               .
         GDP |   -.0103667    -.0092598       -.0011069               .
         INF |    .0310502     .0251243        .0059258        .0008496
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       51.53
                Prob>chi2 =      0.0000
                (V_b-V_B is not positive definite)
```

Hausman test – Eurozone – NIRTA sigmamore

```
. hausman fixed random, sigmamore

Note: the rank of the differenced variance matrix (7) does not equal the number of
       coefficients being tested (8); be sure this is what you expect, or there may
       be problems computing the test.  Examine the output of your estimators for
       anything unexpected and possibly consider scaling your variables so that the
       coefficients are on a similar scale.

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference          S.E.
-------------+------------------------------------------------------------
       logTA |    .3067896    -.0835565        .3903461         .076898
        NLTA |    .0162023     .0160667        .0001356        .0005213
        TETA |    .0301975     .0252919        .0049056        .0013552
      TLLRGL |   -.0054798    -.0014071       -.0040727        .0009875
        CTIR |   -.0008326    -.0009505         .000118        .0000323
        TPTP |   -.0000461    -.0000424       -3.65e-06        6.91e-06
         GDP |   -.0103667    -.0092598       -.0011069         .000421
         INF |    .0310502     .0251243        .0059258        .0014298
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       89.85
                Prob>chi2 =      0.0000
```

Hausman test – non-PIIGS countries – ROAA

NON-PIIGS ROAA

```
hausman fixed random

                ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference          S.E.
-------------+------------------------------------------------------------------
       logTA |    .4528701     .0338217        .4190485        .2119232
        NLTA |   -.0065583    -.0056653       -.0008931        .0023562
        TETA |    .0802314     .0770416        .0031898        .0059444
      TLLRGL |   -.1420335     -.106396       -.0356375        .0064463
        CTIR |   -.0027306    -.0027494        .0000189        .0000871
        TPTP |    .0000148    -.0000689        .0000837        .0000737
         GDP |    .0746774     .0758918       -.0012144         .001734
         INF |   -.0856316    -.0917795        .0061479        .0048746
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       49.85
                Prob>chi2 =      0.0000
```

Hausman test – non-PIIGS countries – ROAE

```
                                NON-PIIGS ROAE
hausman fixed random

                ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference          S.E.
-------------+------------------------------------------------------------------
       logTA |   -3.964787     -.066934       -3.897853        3.839194
        NLTA |   -.0281991    -.0292639        .0010647        .0470227
        TETA |    .4397273     .1942466        .2454808        .1213169
      TLLRGL |   -2.195961     -1.35168       -.8442808        .1428845
        CTIR |   -.0332961    -.0352082        .0019122         .002338
        TPTP |    .0000947    -.0002467        .0003414        .0018284
         GDP |    1.087405     1.065741        .0216634        .0338153
         INF |   -1.617638    -1.644519         .026881        .0986778
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       47.14
                Prob>chi2 =      0.0000
```

Hausman test – non-PIIGS countries – NIRTA

```
                          NON-PIIGS NIRTA
hausman fixed random

                ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference          S.E.
-------------+------------------------------------------------------------
       logTA |    .2831885    -.1351325        .4183209        .1042848
        NLTA |    .0167711     .0170016       -.0002305        .0005931
        TETA |    .0265244     .0233361        .0031883        .0016546
      TLLRGL |    .0066349     .0167958       -.0101609        .0010896
        CTIR |    -.000529    -.0005575        .0000284               .
        TPTP |   -.0001858    -.0001795       -6.32e-06               .
         GDP |   -.0041482    -.0013041       -.0028441               .
         INF |    .0168109     .0087671        .0080438               .
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =     1318.94
                Prob>chi2 =      0.0000
                (V_b-V_B is not positive definite)
```

Hausman test – non-PIIGS countries – NIRTA sigmamore

```
. hausman fixed random, sigmamore

                ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference          S.E.
-------------+------------------------------------------------------------
       logTA |    .2831885    -.1351325        .4183209        .1086601
        NLTA |    .0167711     .0170016       -.0002305        .0007164
        TETA |    .0265244     .0233361        .0031883        .0019738
      TLLRGL |    .0066349     .0167958       -.0101609        .0017806
        CTIR |    -.000529    -.0005575        .0000284        .0000208
        TPTP |   -.0001858    -.0001795       -6.32e-06        .0000181
         GDP |   -.0041482    -.0013041       -.0028441        .0008014
         INF |    .0168109     .0087671        .0080438        .0021409
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =      148.30
                Prob>chi2 =      0.0000
```

Hausman test – PIIGS countries – ROAA

PIIGS ROAA

```
hausman fixed random

Note: the rank of the differenced variance matrix (7) does not equal the number of coefficients
      being tested (8); be sure this is what you expect, or there may be problems computing the
      test.  Examine the output of your estimators for anything unexpected and possibly consider
      scaling your variables so that the coefficients are on a similar scale.

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference          S.E.
-------------+------------------------------------------------------------
       logTA |    1.456198     .0861044        1.370094        .3689783
        NLTA |    .0185425     .0001391        .0184034        .0040978
        TETA |    .1064804     .0988977        .0075827        .0085062
      TLLRGL |   -.0195779    -.0389969        .0194191          .00759
        CTIR |   -.0052089    -.0065375        .0013286        .0007234
        TPTP |    .0002778     .0001918         .000086        .0000337
         GDP |    .0135348     .0228778        -.009343        .0030712
         INF |    -.062375    -.0657715        .0033966        .0072906
------------------------------------------------------------------------------
                          b = consistent under Ho and Ha; obtained from xtreg
           B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       27.62
                Prob>chi2 =      0.0003
                (V_b-V_B is not positive definite)
```

Hausman test – PIIGS countries – ROAA sigmamore

```
. hausman fixed random, sigmamore

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference          S.E.
-------------+------------------------------------------------------------
       logTA |    1.456198     .0861044        1.370094        .3713107
        NLTA |    .0185425     .0001391        .0184034        .0041368
        TETA |    .1064804     .0988977        .0075827        .0086079
      TLLRGL |   -.0195779    -.0389969        .0194191        .0077099
        CTIR |   -.0052089    -.0065375        .0013286        .0007365
        TPTP |    .0002778     .0001918         .000086        .0000509
         GDP |    .0135348     .0228778        -.009343        .0032926
         INF |    -.062375    -.0657715        .0033966        .0079303
------------------------------------------------------------------------------
                          b = consistent under Ho and Ha; obtained from xtreg
           B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       38.16
                Prob>chi2 =      0.0000
```

Hausman test – PIIGS countries – ROAE

PIIGS ROAE

```
hausman fixed random

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference          S.E.
-------------+------------------------------------------------------------
       logTA |    65.94127     .7897063        65.15156        9.720887
        NLTA |    .4835148    -.0619336        .5454484        .1169702
        TETA |      3.0787     .9352515        2.143448         .327463
      TLLRGL |   -.9389398    -1.316574        .3776338        .2419401
        CTIR |   -.1095018     -.102551       -.0069508        .0213298
        TPTP |    .0097238     .0069882        .0027356               .
         GDP |    .1501993     .7304071       -.5802078         .091654
         INF |   -2.374699    -3.101376        .7266777         .172849
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       88.87
                Prob>chi2 =      0.0000
                (V_b-V_B is not positive definite)
```

Hausman test – PIIGS countries – ROAE sigmamore

```
. hausman fixed random, sigmamore

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference          S.E.
-------------+------------------------------------------------------------
       logTA |    65.94127     .7897063        65.15156        10.10164
        NLTA |    .4835148    -.0619336        .5454484        .1224411
        TETA |      3.0787     .9352515        2.143448        .3443829
      TLLRGL |   -.9389398    -1.316574        .3776338        .2574579
        CTIR |   -.1095018     -.102551       -.0069508        .0231739
        TPTP |    .0097238     .0069882        .0027356        .0022307
         GDP |    .1501993     .7304071       -.5802078         .119058
         INF |   -2.374699    -3.101376        .7266777        .2642148
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       81.74
                Prob>chi2 =      0.0000
```

Hausman test – PIIGS countries – NIRTA

```
                         PIIGS NIRTA
hausman fixed random

                ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference          S.E.
-------------+------------------------------------------------------------
       logTA |    .2920232    -.0963764        .3883996        .1289855
        NLTA |     .015061     .0155513       -.0004904        .0011109
        TETA |    .0325988     .0193866        .0132122        .0022877
      TLLRGL |     -.01239    -.0142887        .0018987        .0016131
        CTIR |   -.0019323    -.0022891        .0003568        .0001769
        TPTP |     .000029     .0000486       -.0000195               .
         GDP |   -.0137204    -.0130875       -.0006329               .
         INF |    .0411455     .0304245        .0107211        .0003311
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       32.24
                Prob>chi2 =      0.0001
                (V_b-V_B is not positive definite)
```

Hausman test – PIIGS countries – NIRTA sigmamore

```
. hausman fixed random, sigmamore

Note: the rank of the differenced variance matrix (7) does not equal the number of
        coefficients being tested (8); be sure this is what you expect, or there may
        be problems computing the test.  Examine the output of your estimators for
        anything unexpected and possibly consider scaling your variables so that the
        coefficients are on a similar scale.

                ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference          S.E.
-------------+------------------------------------------------------------
       logTA |    .2920232    -.0963764        .3883996        .1318841
        NLTA |     .015061     .0155513       -.0004904        .0011725
        TETA |    .0325988     .0193866        .0132122        .0024486
      TLLRGL |     -.01239    -.0142887        .0018987        .0018453
        CTIR |   -.0019323    -.0022891        .0003568         .000199
        TPTP |     .000029     .0000486       -.0000195        .0000102
         GDP |   -.0137204    -.0130875       -.0006329        .0007617
         INF |    .0411455     .0304245        .0107211        .0020912
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       49.29
                Prob>chi2 =      0.0000
```