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Abstract

The main goal of this research paper is to ascertain the determinants of differences in bank profits between the EU countries in the period from 1998-2013. The research paper will focus on the three regions of countries including the group of European countries from the Northwest, Mediterranean countries and new entrants of the European Union. All current member states of the EU will be included in my research, with the new entrant group including all countries entering the European Union since 2004. The regions of countries and the ROA determinants will be compared in the pre-recession (1998-2006), the recession (2007-2008) and the post-recession (2009-2013) time period.

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I. Introduction

The European banking system has changed profoundly in the last two decades. The European Union started the Financial Services Action Plan in 1999 and brought the Markets in Financial Instruments Directive into force in November 2007. According to the European Commission, "its aim is to improve the competitiveness of EU financial markets by creating a single market for investment services and activities, and ensuring a high degree of harmonised protection for investors in financial instruments, such as shares, bonds, derivatives and various structured products" (European Commission, 2015). The EU set in motion a system in which, according to Goddard, Molyneux and Wilson (2004), deregulation, technological change and the globalization of goods and financial markets have affected all aspects of the operation of banks, and accordingly have impacted profitability.

The European banking system has moved away from its traditional banking practices like accepting deposits and issuing loans. Since 2007, European banks have also generate non-interest income through services like investment banking and consulting. This shift in practices has affected competition and therefore bank concentration of the banking markets. The impact on competition and concentration might have changed the banks' performance over the years. There are also other bank-specific or macroeconomic factors that have an influence on the profitability of banks. Bankruptcies in a country from the European Union are financed by other countries, in some cases, which makes it important to look at what factors impact bank profits. Germany has financed a lot of Greece's debts and bankruptcies and other countries like Greece might depend on the financially healthy members of the European Union in the future. To prevent more banks from going under and the European Union to crumble, this research is important when showing what factors caused the variability in bank profitability across European countries.

Korbinian Ibel, Director General of the Single Supervisory Mechanism of the participating EU member states, noted that "one-size-fits-all does not work, given the diversity and the complexity of the financial institutions supervised by the ECB Banking Supervision" (Bank Governance Leadership Network, 2). This is mainly because there are also other bank-specific characteristics that affect a bank's risk. Across the members of the EU, macroeconomic factors will affect profitability as well. Factors like these will include differences in GDP growth, interest rates, and inflation. My research will only take into account inflation as a macroeconomic variable, as the research is mainly focused on the variables of the concentration of banking markets and risk level of banks.

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the three regions of countries including the group of European countries from the Northwest, Mediterranean countries and new entrants of the European Union. All current member states of the EU will be included in my research, with the new entrant group including all countries entering the European Union since 2004. The regions of countries and the ROA determinants will be compared in the pre-recession (1998-2006), the recession (2007-2008) and the post-recession (2009-2013) time period.

II. Theory

When assessing the determinants of bank profitability in the European Union, the theory of the firm is appropriate to use. This theory explains the nature of a firm and states that firms exist and try to maximize profits in any way possible. A firm's profits are equal to its total revenue minus its total costs. In pursuance of profit maximization, firms are therefore looking to maximize its revenues and reduce or stabilize its costs.

Existing literature supports the use of the theory of the firm when looking at the profitability of the banking industry. To determine banking efficiency and profitability, Hughes and Mester (2013) use the structural performance equation that "can be fitted to the data as an average relationship, which assumes that all banks are equally efficient at minimizing cost or maximizing profit" (2013, 7). Bergendahl (1998) describes the five fundamental goals of an efficient bank: profit maximization, risk management, service provision, intermediation, and utility provision. Along with this, in the post-deregulation period, banks were looking to reduce and offset costs. Humphrey and Pulley (1997) recognize that the net effect of all responses to deregulation (and other contemporaneous influences) is reflected by the standard bank profitability measure of return on assets (ROA). With the use of return on assets, my research will contain the same measure of bank profitability as existing literature.

Based on the theory of the firm and the surveyed literature, I hypothesize that:

- There are significant differences in bank profitability between countries in the European Union.
- The observed differences in bank profitability over time and across countries will decrease when important determinants of profits like inflation rates, the banks' concentration and Z-scores are taken into account.

The first hypothesis is based on the likelihood that there is significant heterogeneity between banks in the European Union. This is necessary for any analysis to be made that is based on variations of bank profitability determinants among the 28 European Union nations. When controlling for the earlier mentioned bank-specific and macroeconomic variables, I can hypothesize that the magnitude of the fixed effects, nation and year, will decrease. When these hypotheses hold true, I will be able to analyze the differences in all factors, bank-specific and macroeconomic, which affect bank profitability in the different regions of the European Union.

III. Empirical Research Model

For the bank-specific and macroeconomic indicators utilized in this research, I will be analyzing the data on a country-level basis. The data ranges between the years of 1998 and 2013. All of my data for these variables are obtained from the World Bank DataBank, which "is an analysis and visualisation tool that contains collections of time series data on a variety of topics" (World Bank, 2016). The World Bank Group consists of five organizations and is designed by the United Nations "to finance projects that enhance the economic development of member states" (Britannica, 2016). With the World Bank's parent organization being the United Nations, this source should be trustworthy and appropriate as a database.

To look at differences in the determinants of bank profits across countries in the European Union, I will be setting up a panel study consisting of variables for each region and time period. Using the panel study, I will be able to run a regression analysis to estimate the relationship between my dependent variable and my independent variables. There are several existing empirical research articles that utilized a similar panel study to analyze the bank profitability determinants for a group of countries. Saona (2016) focused on the effect of intra- and inter-bank drivers of profitability of banks in Argentina, Brazil, Chile, Mexico, Paraguay, Peru, and Venezuela for the period of 1995 to 2012. Demirguc-Kunt & Huizinga (1999), Pasiouras & Kosmidou (2007), Regerh & Sengupta (2016), and Menicucci & Paolucci (2016) authored other articles that focus on a geographical region through a panel study. These research papers will be helpful to my own research, as they are focused on regions of countries, and mainly the European Union. My research will expand on this existing literature that focuses on a short period, or a time period a few decades ago. Instead, I will focus on the most recent country-level data from 1998-2013. My research will group the countries within the European Union, expanding on other research that only look at the European Union as a whole.

For my regression analysis, I will be using the return on assets as the dependent variable as a measure for bank profitability. Raluca (2013) notes that in the literature, bank profitability, typically measured by the return on (average) assets reported by a bank, is usually expressed as a function of internal and external determinants. For this research, the bank-specific factors will consist of the banks' risk levels and the concentration of the bank markets. My external determinants will include the countries' inflation rate. Authors like Tan (2016) and Regerh & Sengupta (2016) seem to focus on one or two specific determinants, while my research takes different factors from both the bank-specific and macroeconomic aspects into account. Regehr & Sengupta (2016) focus on bank size as a determinant of bank profitability, while Tan (2016) identifies his research as the first paper "among empirical banking studies to use stability inefficiency as the main risk indicator," and that the paper provides "robust results regarding the impact of competition on bank profitability by using both Lerner index and Herfindahl-Hirschman indexes as competition indicators" (2016, 85). There are other studies, however, that examine the impact on bank profitability by using "bank characteristics (such as size, leverage, type of business, foreign or domestic ownership), macroeconomic indicators, taxation and regulatory variables, financial structure variables, and legal and institutional indexes"

(Demirguc-Kunt & Huizinga, 379). For my research to remain feasible within the semester, it will be analyzing all of these variables.

The equation below is the basis of the regression estimation of return on assets as a function of bank-specific and macroeconomic indicators.

*RETURN ON ASSETS = α + β1 (BANK CONCENTRATION) + β2 (Z-SCORE) + β3 (INFLATION) + δ1 (REGION) + δ2 (TIME PERIOD) + δ3(REGION * TIME PERIOD)*

To look at differences in the determinants of bank profits across countries in the European Union, I will be setting up a panel study consisting of dummy variables for each nation and year. These variables have been transformed into dummy variables for region and time period. The research paper will focus on the three regions of countries including the group of European countries from the Northwest, Mediterranean countries and new entrants of the European Union. All current 28 member states of the EU will be included in my research, with the new entrant group including all countries entering the European Union since 2004. These countries include Bulgaria,

Table 1: Variables and Descriptions

Variable	Description
Dependent:	
Return on Assets (ROA)	Measurement of bank profitability. Calculated by dividing a company's annual earnings by its total assets.
Independent:	
Bank Concentration (%)	The top three banks' assets compared to the total bank assets in the country.
Z-Score	Measurement of a bank's financial health and risk, taking into account liquidity, profitability, reinvested earnings and leverage.
Inflation (%)	The year-over-year percentage increase in the consumer price index.
Group	The EU grouped by countries from the Northwestern region, the Mediterranean region and new entrants.
Time Period	Time divided in three periods: the pre-recession (1998-2007), the recession (2008-2009) and the post-recession (2010-2013) time period.
Group * Time Period	Interaction term of group and time period

Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia. The Northwestern European countries include Austria, Belgium, Denmark, France, Germany, Ireland, Luxembourg, the Netherlands, Sweden and the United Kingdom. The Mediterranean countries consist of Greece, Italy, Portugal, and Spain. The performance of these regions and the ROA determinants will be compared in the pre-recession (1998-2006), the recession (2007-2008) and the post-recession (2009-2013) time period. These specific time periods and regions are included in several interaction terms. With the regression analysis, we will be able to see the impact of being part of a specific group during a specific time period. For this research, the reference group will be the Northwestern European countries, which include most of the original founders of the European Union. The pre-recession period is selected as the reference time period for the regression analysis. Table 1 presents the descriptions of all variables used in the regression analysis.

IV. Descriptive Statistics

As Table 2 shows, the ROA means of the EU countries are notably different. The ROA means of Estonia and Greece are the major outliers. Estonia, as a part of the new entrant region, has reported the highest return on assets, with a mean of 3.26% over the last 16 years. Estonia experienced one of its worst years economically in 1999 after the Russian financial crisis, but has been developing fast since. Estonia joined the WTO in November 1999 and the European Union in 2004. This has impacted Estonia's economy and the banks' performance positively, resulting in higher returns on assets. Greece's banks have greatly underperformed compared to the other EU countries. Due to the

Table 2: Descriptive Statistics

Country	ROA (%)
Austria	0.64
Belgium	0.78
Bulgaria	1.24
Croatia	0.89
Cyprus	1.72
Czech Republic	1.01
Denmark	0.84
Estonia	3.26
Finland	-0.09
France	0.81
Germany	0.45
Greece	-2.55
Hungary	1.57
Ireland	0.47

Country	ROA (%)
Italy	0.78
Latvia	0.34
Lithuania	-0.31
Luxembourg	0.60
Malta	0.10
Netherlands	0.17
Poland	1.42
Portugal	0.19
Romania	1.47
Slovak Republic	0.47
Slovenia	1.11
Spain	0.85
Sweden	1.62
United Kingdom	1.00

Greek debt crisis, the banks reported negative return on assets of -2.55% over the full period. The banks' profitability in Greece tanked in the post-recession period due to the austerity packages that were implemented. With higher tax rates and cuts on workers' wages, the return on assets took a massive hit.

Tables 3 through 6 represent the descriptive statistics for return on assets, bank concentration, risk levels, and inflation rates for the countries divided in regions. Table 3 shows that the new entrants of the European Union have outperformed the Northwestern European and Mediterranean countries over the full period of 1998-2013. This performance is mainly due to the high ROA percentage of 1.72 in the prerecession period (1998-2006). The banks from the Northwestern countries show that they are able to generate more stable profits and that they have recovered from the slight dip in return on assets due to the recession. The Mediterranean countries, however, have generated negative return on assets in both the recession (2007-2008) and the post-recession (2009-2013). The Mediterranean countries took a larger hit in the post-recession, but these results seem to be driven by the Greek banks that generated sizable losses in this period.

Table 3: Descriptive Statistics (ROA %)

Region	Pre-recession		Recession		Post-recession		Full Period	
	ROA	Std Er	ROA	Std Er	ROA	Std Er	ROA	Std Er
North	0.86	(1.18)	-0.01	(1.40)	0.69	(0.63)	0.69	(1.13)
Medit	1.02	(0.70)	-0.32	(1.26)	-2.72	(7.37)	-0.24	(4.22)
New	1.72	(1.71)	-0.55	(5.23)	0.34	(1.59)	1.07	(2.56)

Table 4 presents the concentration levels of the banking markets in the three selected regions of the European Union. Throughout the full period, it is clear that the Mediterranean countries and new entrants have more highly concentrated banking markets than the European countries from the Northwest. This shows that the Northwestern European countries allow banks to compete, and that the market operates under monopolistic competition. The banks from the other regions operate more as an oligopoly, with a few large banks having most of the market power.

Table 4: Descriptive Statistics (Conc. %)

Region	Pre-recession		Recession		Post-recession		Full Period	
	Conc.	Std Er	Conc.	Std Er	Conc.	Std Er	Conc.	Std Er
North	56.45	(25.66)	59.35	(24.05)	58.97	(21.40)	57.44	(24.37)
Medit	73.20	(20.32)	70.58	(24.85)	68.65	(29.45)	71.69	(23.18)
New	75.32	(17.77)	76.59	(16.75)	77.59	(17.17)	75.99	(17.45)

In table 5, the banks' risk levels in the three regions are demonstrated through the Z-score. This measurement of a bank's financial health and risk, takes into account the liquidity, profitability, reinvested earnings and leverage of a bank. The lower the Z-score, the more risks banks from the region have taken. The Mediterranean countries and new entrants have reported lower Z-scores

compared to the Northwestern countries. Banks from the Northwest are therefore relatively less risky than banks from the Mediterranean and the new entrants regions.

Table 5: Descriptive Statistics (Z-Score)

Region	Pre-recession		Recession		Post-recession		Full Period	
	Z-sc	Std Er	Z-sc	Std Er	Z-sc	Std Er	Z-sc	Std Er
North	21.15	(11.94)	18.48	(12.55)	21.01	(13.15)	20.76	(12.30)
Medit	14.62	(13.32)	8.28	(11.01)	9.75	(9.46)	12.40	(12.18)
New	14.94	(11.00)	13.70	(13.56)	14.17	(14.16)	14.57	(12.21)

The inflation rates for the countries in the specific regions are presented in table 6. The Northwestern and Mediterranean countries seem to have comparable inflation rates. The new entrants, however, report significantly higher inflation rates in the pre-recession and recession period. This is mainly because the new entrants did not have to meet the requirements of the European Union for the inflation rates until entrance in 2004 or later. According to the European Central Bank, a member state needs a "sustainable and an average rate of inflation, observed over a period of one year before the examination, that does not exceed by more than 1.5 percentage points that of, at most, the three best performing Member States in terms of price stability" (ECB, 2016). It is clearly noticeable that the new entrants' inflation rates have converged over time with the inflation rates of the current members of the European Union.

Table 6: Descriptive Statistics (Inflation %)

Region	Pre-recession		Recession		Post-recession		Full Period	
	Infl.	Std Er	Infl.	Std Er	Infl.	Std Er	Infl.	Std Er
North	1.91	(0.97)	1.75	(2.11)	2.05	(1.02)	1.93	(1.18)
Medit	2.88	(0.68)	1.88	(1.94)	2.13	(1.38)	2.57	(1.15)
New	6.17	(8.20)	5.05	(3.78)	2.65	(1.53)	5.15	(6.81)

V. Results and Discussion

As mentioned before, first I will need to identify the heterogeneity in return on assets between the different regions of countries. The descriptive statistics in Table 2 and 3 showed a difference in ROA means between the specific countries and regions. The regression analysis identifies the impact of the variables compared to the reference group of the Northwestern European countries and pre-recession as the reference time period.

Model 1 includes the dummy variables for regions and time periods as independent variables. This model will be the first step in the analysis, using the fixed effects to determine the differences between being a new entrant and a Mediterranean country compared to a European country from the Northwest. The regression results from Model 1, presented in Table 7, show that the impact of being a new entrant is not statistically significant and therefore not statistically different from 0 when compared to the reference group. The fixed effect of being a Mediterranean country, however, shows

a statistical significance at the 95% level. Banks, when located in this region, will see a negative impact of -0.88% on their return on assets compared to banks being located in the Northwest. The recession and post-recession periods also show negative impacts of -1.56% and -1.24% significantly (99% level) and compared to the pre-recession period.

The interaction terms between region and time period are added, alongside the region and time period dummy variables in the regression model 2. My main reason for adding these interaction terms is to identify whether there are significant differences in changes of ROA between regions during the recession and post-recession years. New entrants in the recession and the post-recession period see a statistically significant negative effect on their banks' return on assets. In the recession period, the effect equals to -1.41%, while in the post-recession period the impact is -1.25% on return on assets when compared to the Northwestern European countries. This shows that the new entrants were hit hard by both the recession and post-recession period. The Mediterranean countries only showed a statistical significant interaction, with a negative effect of -3.56%, during the post-

Table 7: Regression (T-Statistics in parentheses)

Variable	Model 1	Model 2	Model 3
New Entrants	0.37	0.86***	1.01***
	(1.46)	(2.72)	(2.85)
Mediterranean	-0.88**	0.16	0.39
	(-2.36)	(0.33)	(0.80)
Recession	-1.56***	-0.86	-0.75
	(-4.45)	(-1.59)	(-1.39)
Post-recession	-1.24***	-0.17	-0.19
	(-4.50)	(-0.40)	(-0.44)
Recession_Med		-0.48	-0.40
		(-0.45)	(-0.38)
Recession_New		-1.41*	-1.48**
		(-1.89)	(-2.00)
Post-recession_Med		-3.56***	-3.60***
		(-4.21)	(-4.19)
Post-recession_New		-1.20**	-1.25**
		(-2.07)	(-2.08)
Concentration (%)			-0.01**
			(-1.99)
Z-Score			-0.09**
			(1.87)
Inflation (%)			0.06**
			(2.22)

Note: *** Significant at 99% level; ** Significant at 95% level; * Significant at 90% level

recession period compared to the reference group. The Mediterranean countries seem to have taken

a very large hit relative to the reference group during the post-recession "recovery" period. This negative effect is driven by the huge losses of Greece in this period. After adding the interaction terms in model 2, the impact of the fixed effects has changed compared to model 1. The recession, post-recession, and Mediterranean variables have become statistically insignificant. The interaction terms that are added have decreased the observed differences in bank profitability over time and across the Mediterranean countries. The new entrants variable, however, becomes statistically significant at 99% level) after adding the interaction terms. In model 2, the new entrants variable explains more of the difference with the Northwestern European countries in the pre-recession period. The new entrants have outperformed the Northwest in this period, which is reflected in the positive coefficient of 0.86 of the new entrant variable.

In model 3, one macroeconomic and two bank-specific variables are added to the regression. Descriptive statistics for these three variables are presented in table 3 through 6. The regression results for model 3 presented in table 7 show that the inflation rate, bank concentration, and Z-score are statistically significant at the 95% level. A higher bank concentration will have a small negative impact of -0.01% on the banks' return on assets. Even though the coefficient is small in magnitude, the negative impact is against the expectations. Boyd et al. (2006) and Berger et al. (2009) agree that a higher banking concentration within a country leads to a stable financial system and higher bank profitability. Uhde and Heimeshoff (2009) confirm that in the period of 1997-2005 for 25 countries in the European Union, return on assets for banks grow alongside an increase in bank concentration. Vives (2010) acknowledges this and explains that greater profits associated with market power can increase banks' capital and subsequently their ability to absorb macroeconomic shocks. As shown in table 4, banks in the Northwestern region of Europe are part of a less concentrated market compared to banks in the Mediterranean and new entrant regions. This shows that the Northwestern European countries allow banks to compete and the market to operate under monopolistic competition. The banks from the other regions operate more as an oligopoly, with a few large banks having most of the market power. This seems to have had a slight negative impact on the banks' performance in the regions of Mediterranean countries and new entrants, based on the statistically significant coefficient of -0.01.

The higher bank concentration in the Mediterranean countries and new entrants, is one of the causes for these countries to report lower Z-scores of its banks than the Northwestern European countries. A low Z-score means that more risk is associated with the specific banks. A concentrated banking market encourages risk-taking by banks, as banks that are "too big to fail" have the assurance to be rescued in case of bankruptcy. The highly concentrated market has a negative effect on the risk of banks' portfolios and "banks having market power will increase interest rates on loans, which will in turn eliminate the least risky part of the banks' customers. The bank's loan portfolio and the default risk will surge, which will in turn increase the probability of bankruptcy" (Berger et al., 2009, 3). Table 7 shows that model 3 presents a negative coefficient of -0.06 for the banks' Z-score. With the banks in the Mediterranean countries and new entrants of the European Union reporting low bank Z-scores, the return on assets have increased due to the risk taking. As noted earlier, banks with market power will increase interest rates and see their profits grow. However, in Greece, the financial

market has collapsed and the government was unable to bailout its banks. The highly concentrated market and low Z-scores can therefore lead to higher bank profits, but also to great financial instability.

Adnma, Chioma, and Clementina (2014) argue that, according to the positivists' theory, inflation stimulates individuals and companies to produce goods of wealth instead of having money depreciate with time. Higher inflation will lead to lower real interest rates and encourage investments. These investments will require loans from banks, impacting the banks' profitability in a positive manner. This theory supports the positive inflation coefficient of 0.06 that is presented in model 3.

VI. Conclusions

The European banking system has changed profoundly in the last two decades. The banking system has moved away from its traditional banking practices like accepting deposits and issuing loans. This research paper sought to ascertain the determinants of differences in bank profits between the EU countries in the period from 1998-2013, mainly focusing on the bank concentration and risk levels after the changes in the European banking system. The countries have been categorized into three regions: European countries from the Northwest, Mediterranean countries and new entrants of the European Union. The regions of countries and the ROA determinants have been compared in the pre-recession (1998-2006), the recession (2007-2008) and the post-recession (2009-2013) time period.

The results demonstrate that there are significant differences in changes of ROA between regions in the European Union during the recession and post-recession years. The new entrants were hit hard by both the recession and post-recession period, relatively to the reference group of the Northwestern European countries. The Mediterranean countries seem to have taken a very large hit relative to the reference group during the post-recession "recovery" period. The negative effect of -3.56% during the post-recession period compared to the reference group, is mainly driven by the huge losses of Greece in this period.

The concentration of European bank markets, the banks' risk levels, and the countries' inflation rates are significant factors in estimating the return on assets of banks in the European Union between 1998 and 2013. Inflation will positively affect a bank's performance, with companies and individuals being encouraged to invest due to low real interest rates. A highly concentrated market will have a slight negative effect on profits, which is against expectations. A concentrated banking market encourages risk-taking by banks, when banks that are "too big to fail" have the assurance to be rescued in case of bankruptcy. The results show that taking on more risk, causing the banks to have a lower Z-score, will lead to higher bank profits. However, in Greece, the financial market has collapsed and the government was unable to bailout its banks. Banks will generate higher return on assets when having market power and increasing interest rates on loans, but this "will increase interest rates on loans, which will in turn eliminate the least risky part of the banks' customers. The bank's loan portfolio and the default risk will surge, which will in turn increase the probability of bankruptcy" (Berger et al., 2009, 3). The concentrated market and bank risk-taking can lead to higher

bank profits, but also to great financial instability. Therefore, the countries from the Mediterranean and new entrant regions should not encourage their banking markets to be highly concentrated. Competition is important to prevent banks from becoming "too big to fail" and from causing financial instability in the European Union.

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