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MÁSTER EN INSTITUCIONES Y MERCADOS FINANCIEROS

(COMPETITION AND RISK IN THE BANKING SECTOR AFTER THE GLOBAL FINANCIAL CRISIS: INTERNATIONAL EVIDENCE)

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Abstract

This work approaches an analysis on the relationships between bank market structures, competition and risk. The empirical development of this study relies on an Ordinary Least Squares (OLS) methodology run over a sample of 22 countries and, on a subsample of the European countries that were mostly affected by the crisis: Portugal, Ireland, Italy, Greece and Spain. Our findings may suggest that concentration, competition and risk strike as surprising as many results obtained are not what many regulators and supervisors could expect. In order to avoid the worse of the crisis' effect on the banking sector, governments took different approaches. Most of them attained restructuring and recapitalization process in different orders and ways. Furthermore, the crisis unfold a scenario were the banking sector shown itself as weak and with systematically risky.

Key words: Global Financial Crisis; Bank Market Concentration; Bank Competition; Bank Risk.

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1. INTRODUCTION

Financial industry is probably the cornerstone of a country's economy, where this occupies the spotlight and rest of industries revolve around it. The economic development of a country cannot be understood with having no notion of how the financial sector works. The real performance of this industry and the large dependence and interconnections it generates, and in particular, the role of banking sector is crucial to understand differences across countries in terms of economic growth and stability. Governments' interventions, economic crises and its consequently impacts on other sectors of a country, are extremely related to the financial sector. This is the main reason why the study and the understanding of the characteristics and functioning of both financial markets and financial intermediaries have adopted a primary role in the financial literature.

Throughout the last 15 years, banking sectors around the globe have been evolving and experiencing different kinds of world economic episodes and situations that have triggered several reactions from different publics and actors. Meanwhile, regulation and supervision have been playing a role that has not remained quiescent. Especially, the European banking sector seems to have accomplished a strategic performance in the world economy during this period and, particularly, as a consequence of the global financial crisis of 2007/2008.

It is true that in the beginnings of the century, European economies and their banking sectors went through important episodes of economic booms where resembled that nothing could harm or reverse the address their economies were taking, but also it is precise to acknowledge that this last period of financial crisis took them unaware of what loomed for the next decade. They had to undergo the harshest financial crash ever experienced in the modern economic world. This did not go unnoticed by regulators and supervisors. Indeed, the relevance of regulation and supervisory mechanisms on this sector rose and became the principal reason for avoiding future financial episodes which triggered this or even worse stages.

This last 15 years have enabled to reach out to a much deeper analysis of how banks have performed and transformed, and its reflection on the European banking sector, globally considered. Many of the financial institutions were enforced to merge with other banks to survive; others were intervened or rescued by public institutions; and others were acquired by better-positioned banks and even, many of them could not continue to exist. Regulation clearly played a role on this. As a result of all these transformations, we now find a banking sector in which market structure, competition, and risk might have been importantly affected during these years.

Since this latest financial event, the European banking sector has experienced important changes boosted by regulators with the aim of restraining malpractices and driving to a

safer, more efficient and transparent industry. New regulations such as Basel III Accords, about bank capital requirements and risks, and MIFID II, have been implemented since then. The question arising from this new legal and institutional setup is: *have they had the same result in all the banking sectors around the globe?*

These world potential economies' banking sectors faced different kinds of restructurings processes and policy interventions as their situations were quite unique. Even in the Euro zone, there were three different types of reshuffles owing to the variety of problems each individual country's banking sector faced. These restructurings mechanisms enabled these economies to overcome the financial crisis in different ways and at different costs reflected in the form of market concentration, competition, and risk.

But, *what has happened with the banking sector in Europe? And in the United States (US)? And in Asia? Are they more similar today? Or have they taken different paths? Do more regulation and supervision involve more competition and less concentration and lower levels of risk?*

The issues of concentration, competition, and risk have always attracted researchers' attention in the financial literature. Specifically, the study about whether the European banking sector is more concentrated or not, or whether it is safer today. Many researchers easily mistake concentration and competition, assuming that higher levels of concentration imply higher levels of competition and then, banking sectors are riskier. In their way of explaining this relationship, which is quickly assumed by most of professionals and scientific papers, the first variables they choose to measure concentration and competition, are cost, credit and the quality of financial services. They firmly believe that these variables reflect the situation of banks in their sector.

However, the fact is that concentration, competition, , and risk are very complex notions that cannot be easily explained. The proper measurement of these characteristics of the banking sector requires more than those three simple variables and their plausible interconnection might not be effortlessly found. There are different streams that many authors have approached in their attempt to explain this relationship and then, to show it in practice.

Despite having different approaches based on the kind of measures researchers use, there is no consensus of which one is better or worse to gauge them. Depending on the indicator chosen, the premises will be different and may address to different results. Therefore, the choice of an indicator over another will influence the conclusions reached regarding the implications of competition, concentration and risk.

The objective of this paper is, therefore, to empirically analyse if the European banking sector has changed after the global financial crisis in terms of market structure, competition and risk. The goal is to search for the specific interconnections emerging from these three different aspects of the banking industry trying to answer if the banking industry is more (less) concentrated and competitive and riskier (or less risky) than before the crisis period. We will also study if there is some kind of relationship between

concentration and competition in this sector. In addition to this, a descriptive comparison among the European banking sector, US and Japan will be provided. Moreover, it will delve further into the particular cases of three European countries which experienced different restructuring processes, and how it has been evolving since before the crisis, 2004, until the crisis recovery, 2015. Empirically, we also run an explanatory econometric model to test the above-referred relationships between banking market structure, competition and risk. We run this analysis over both the global sample of 22 countries and, particularly, over the European countries that were mostly affected by the crisis: these are the countries known as PIIGS (Portugal, Ireland, Italy, Greece and Spain). The findings of this paper suggest that concentration, competition and risk strike as surprising as many results obtained are not what many regulators and supervisors could expect once the above-mentioned regulations were applied with the aim to make the banking sector safer. Indeed, this might approach new premises about this interconnection between concentration and competition.

The usefulness of this paper in terms of policy implications remains on data availability, the assumptions established about the main variables of interest, and the results addressed in our empirical analysis.

Our work is structured as follows. In Sections 2, 3 and 4 , there will be a full-detail description about the global financial crisis period and about its effects in the European banking sectors. Moreover, we also revise and characterize the restructuring processes implemented in each country in order to overcome the worst consequences of the crisis and to try to avoid these last distress episodes to be repeated again. We also provide exhaustive definitions of market concentration, competition, and risk and the different perspectives about each of these variables that the financial literature has provided. In Section 5, there will be stated the sample of countries and years, as well as the main indicators chosen to measure banking market structure, competition and risk. We descriptively examine the evolution of the banking sectors in terms of these characteristics in three different ways: (1) comparing the Euro zone with the US and Japan's; (2) analyzing the three European countries which implemented different restructuring processes; and (3), studying the comparison between the Spanish banking sector with other country with a similar size. In this case, the French banking sector is the one chosen. In Section 6, an empirical model based on a regression analysis is performed in order to show if there is any relation between concentration, competition, and, and eventually with risk. This last section highlights assumptions taken in the analysis and facilitates us to reach sterling conclusions about these variables and the relationships emerging among them. It provides a synthesis of the European Banking Sector's current situation and what is expected in future. Finally, Section 7 concludes the work suggesting that the restructuring process, has increased stability by reducing risk, in general terms, but has created market conditions (lower competition-higher concentration) that have reshaped the landscape of the banking sector by remarking which countries have been most affected and in which terms.

2. CONTEXT

The banking sector is highly interconnected with the real economy due to the functions it carries out. Among of all of them, there are four that mainly contribute to this relationship: firstly, the reduction of transaction costs through economies of scale, which is an important function that, promotes the establishment of a payment system; secondly, the reduction of information asymmetries between agents (adverse selection and moral hazard) in order to foster agents' incentives alignment; thirdly, the way it channels economy growth through the accumulation of savings, the lending channel (they drive funds into investments) and the asset allocation channel (those funds are driven to the most profitable investments); finally, the banking industry, is the way depositors transfer funding across time and space by transforming short-term assets (such as deposits) into long-term assets (such as loans).

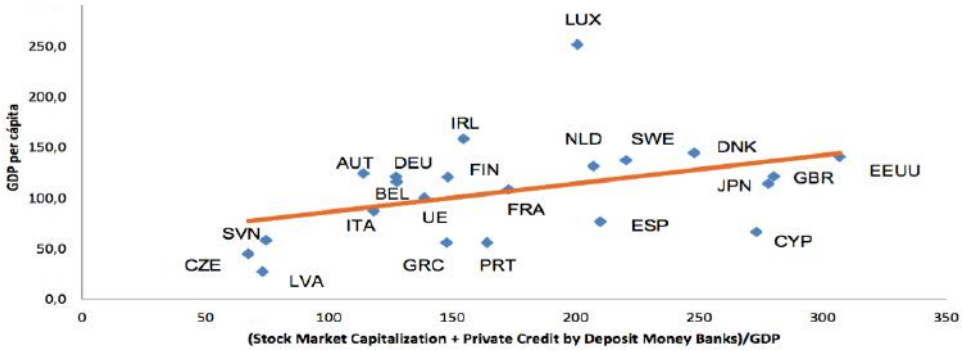
The effect of the existence of a developed banking industry will be significant for the real economy. Due to these functions, the macro variables investment and consumption are enhanced. On one hand, the banks will gather a higher amount of available funding, which reduces the cost of borrowing and, at the same time, allows financial institutions to lend to higher amount of agents with financing needs. On the other hand, individual agents are able to smooth their consumption patterns across time, which means that they are able to safe every year, at the same time as they are consuming avoiding long periods of low amount of consumption. For example, buying a house would suppose, without the existence of banks, that the agents would have to save a lot of money for a long time lowering their usual levels of consumption, then once they have it, buy it. If they ask for a mortgage they are able to buy it right away, and pay for its house year by year, which helps them to pay for the house, while keeping their usual levels of consumption.

This creates an intrinsic and intangible transmission system, generated by the relationship banks have with these macro variables. When financial intermediaries lend money and receive deposits, the growth of the economy is guaranteed. While, if the banking system is not working properly, then consumption and investment will drop significantly, harming the GDP of an economy. Then, we could state that there is a one direction effect between the health of the financial system and the stability of the whole economy.

Therefore, on one hand, the good situation of the financial sector can be thanked for its role in the development of the economic system and helping the boost of economic growth. On the other hand, it can be blamed for causing instability, and even driving the economy into a new economic crisis being the cause of the negative shocks.

These interactions with the real economy justify the fact that the banking sector has a special treatment towards other sectors. It is the subject for many studies and has its own institutions which take care of its supervision and regulation: "*The banking system as a whole is a "public good" that benefits the nation over and above the profits that it earns for the banks' shareholders. Systemic risks to the banking system are risks for the nation as a whole… The public interest in avoiding the failure of banks and other financial institutions argues strongly for government regulation and supervision of these institutions. Even Adam Smith explicitly advocated the regulation of banks because he recognized that their failure would have damaging effects on the economy more generally*" (Feldstein, 1991).

The banking system is one of the cornerstones of a country's economy: the most developed financial intermediaries are, probably the higher is the GDP of that country (Graph 1).



Graph 1-Relationship between financial and economic development- 2015. Source: World Bank

The main business of banks is "borrowing to lend", thus they are highly leverage institutions. Additionally, their main source of revenues is risk, then the banking system is more prone to take risks in order to obtain higher returns. The nature of this sector makes it more volatile and fragile than others. Having a fragile banking system can be a problem for any economy: the weaker the sector is the more exposed to negative shocks an economy will be. This explains the importance of this sector and justifies its special treatment. The main goal of controlling financial institutions is to make it the most sound and robust as possible, in order to avoid or mitigate future crisis and its potential negative effects on the real economy.

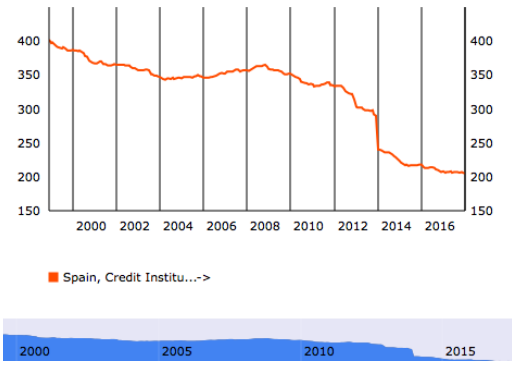
To know if our financial institutions are robust is, therefore, one of the key questions that policymakers should take into account. During the financial crisis of 2007-2008, banking sectors shown themselves very fragile and exposed to risk and that is why regulators and supervisors carried out policies and mechanisms in order to restore confidence in the

banking systems and to avoid the worst consequences of the financial distress episode in the real economy. Some other countries carried out the same measures and, at the same time, decided to restructure their sector in order to avoid future episodes of crisis by strengthening their banking sectors. After all changes, institutions hope that the effort makes up in the following economic downwards, and that the financial systems show themselves more prepared.

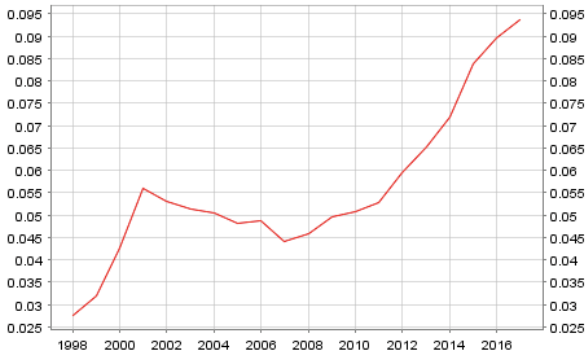
The aim of our work is to assess what is the actual situation after the financial crisis, in terms of risk and competition, of the countries that have carried out restructuring processes after the crisis: Do countries have a safer banking system after the restructuration of their banking systems? Are banks more exposed to risk, now that they are bigger and with a lower number of competitors?

The way to approach this analysis will be through the method of linear regressions. We want to be able to establish a certain relationship between competition and risk. If risk is one of the variables affecting competition, then it will be interesting to find out in which way. This method will allow us to discover if there is or there is not a correlation, and, if there is one, trying to determine if it is positive or negative. After obtaining the results we will conclude on what has been the effect of all the restructuring processes in the economy.

As an example of our thesis, the Spanish banking sector carried out, during the last financial crisis, an important restructuring process, which has had important consequences in terms of, the level of concentration in the market. As it is shown in the Graphs 2 and 3, concentration in the Spanish banking sector has arisen remarkably since 2010. In fact, the number of regions which have a HHI index above 1800 increased from 5 to 19. Consequently, the restructuring process in Spain has reduced the number of total financial institutions from 193 on 2008 to 134 on 2015. The number of institutions that have disappeared have been mainly saving banks, with a 44 institution decrease followed by credit cooperatives with a decrease of 16.



Graph 2-Evolution of Spanish HHI Banking Sector index. Source: Own elaboration using ECB data.



Graph 3- Evolution of the credit institutions in Spain. Source: Own elaboration using ECB data.

Higher concentration and a lower number of competitors may lead to lower competition in the banking system[1]. Also, lower competition in the banking sector may lead to higher incentives to increase the level of risk within financial intermediaries. Finally, higher risk comes along with weaker and less sound financial institutions. As the IMF stated: "*More competitive banks may be less solvent if the potential increase in the equity base—due to capital adjustments—is not large enough to compensate for the reduction in bank profitability. Also, banks subject to stronger competitive pressures may have a higher rate of nonperforming loans if the increase in the risk-taking incentives from the lender's side overcomes the decrease in the credit risk from the borrower's side.*" (Almarzoqui et al, 2015).

However, more concentration in the market may not necessarily mean lower levels of competition. In a scenario where there are few competitors, even two firms, the market price can be the one under perfect competition. The logic is simple: if the price set by both firms is the same but the marginal cost is lower, there will be an incentive for both firms to lower their prices and seize the market. Therefore, the only equilibrium in which none of the firms will be willing to deviate is when price equals marginal cost. This is known in economics as Bertrand's equilibrium or Bertrand's paradox[2].

Ironically, it seems that the same effect such as the restructuring process may either encourage competition in the sector or reduce it. If so, any of the two consequences would need to be analyzed in order to find out if the resulting level of competition benefits of harms the economy. In order to do so it will be, also, very important to relate the changes in competition with the changes in risk.

3. THE RESTRUCTURING PROCESS: IS, NOW, THE FINANCIAL SYSTEM SAFER?

The aftermath caused by the global financial crisis deeply affected several factors of the Spanish national economy. As widely known, among them, the labor market suffered a considerable increase in the unemployment rate and a decline in productivity. This fact negatively affected the economy and the income of the country because, on the one hand, the expense for the payment of unemployment to those people who have lost their job positions and on the other hand because of those unemployed who no longer contribute in the tax and productive process of the country. Additionally, the banking system was also seriously affected by the bursting of a credit bubble, causing the default rates to reach new high levels and therefore reducing the issuance of new loans.

In the beginning, it was believed that the impact would not be so deep thanks to the regulation and supervision system of the entities, but it soon became clear that a

[1] *A more detailed explanation about this relationship can be found in the Section* 4: *COMPETITION VERSUS RISK of our work.*

[2] *"In a case of imperfect competition, where there is a strong incentive to collude, we end up with the same outcome as in perfect competition. The equilibrium does not hold with asymmetric cost functions since the firm with the lowest marginal cost would seize the entire market and become a monopoly"- (Policonomics, 2018)*

restructuring was necessary. In this way, a profound reordering process of the current banking structure would be initiated in order to build new bases and achieve a sound level of stability for the future.

The influence of structural adjustment and labor reallocation on the cyclical behavior of employment and productivity has always been a long-standing issue in the economy of a country (Andrew et al, 2008). The performance of the labor market in the early part of the century has not been good, characterized by job losses. One explanation that has been offered for this prolonged weakness in employment during the pre-crisis period is that the unusual amount of economic restructuring relative to that in previous recessions and early recoveries.

When interpreting analysis about restructuring and labor markets one problem emerges and is that the results are typically based on summary statistical measures that are extracted from assumptions related to how the restructuring occurs. For example, some measure the degree of restructuring as a percentage of the industries that experienced either increases in employment both during a recession and early recovery or declines in both periods, whereas others define restructuring as a deviation of changes in employment from "normal" cyclical behavior. The truth is that the results always tend to be sensitive to the way in which the summary statistic is constructed.

3.1. EUROPEAN RESTRUCTURING PROCESS

The more developed countries such as US, United Kingdom (UK) and Germany took immediate action after the outbreak of the global financial crisis, reducing interest rates with expansionary monetary policy, rescuing entities while making cuts on public expending[3]. In order to solve the harmful effects that the global financial crisis caused to their banking system, three different procedures were identified within the European Union: countries like Spain[4] restructured their banking system first and then recapitalized it; countries like Ireland and Portugal inverted the order of the former process; and, finally, countries with sound economies such as Germany and UK only needed to recapitalize the system.

In the specific case of Spain, on the one hand, there were problems associated with rescue costs originated mainly due to the waiting time assumed before beginning the restructuring and recapitalization processes, besides the European conditionality. On the other hand, the orderly planning of the sector, the profound restructuring and the correction of excess capacity managed to stabilize the Spanish banking system in a solid

[3] *Depending on the wealth of the fiscal accounts: some countries had to apply austerity measures along with the corresponding expenditure of the crisis (automatic stabilizers and the rescue of the financial system); some countries could apply the ideal expansionary policy which help them to recover faster from the hit of the financial crisis.*
[4] *3.2* SPANISH RESTRUCTURING PROCESS

manner along with European support. The execution of this processes enabled all these countries to avoid major declines in their respective economies. In the case of countries like Germany and the United UK, this allowed them to have little or no European conditionality due to the avoidance of European financial aids. However, the liabilities (public debt) of these countries were higher and their reduction was more complicated.

On the contrary, Ireland and Portugal underwent a late restructuring and early recapitalization, this type of reforms generated problems on the initial recapitalization since it was insufficient and produced credibility issues, higher rescue costs and European conditionality. In the same way, these countries gradually regained their credibility through European support programs. At the same time, and at a European level, the restructuring of the banking sector was mainly focused on the creation of the European Banking Union. The first key step was the creation of the SSM (Single Supervisory Mechanism) and the SRM (Single Resolution Mechanism)[5].

The SSM (11/2014) consisted of a European system of financial supervision composed by the ECB and the national authorities of each member state. This organism was a key factor for the banking union and was responsible for the evaluation of the quality of banking assets through stress tests in order to know the state of the entities. On the other hand, the SRM (01/2016) represented a great advance in the process of mutualisation of risks of the European entities and had important faculties to decide on the fate of non-viable banks. This mechanism establishes the order of assumption of losses by shareholders and creditors (bail-in) and develops the creation of the Sole Resolution Fund, a fund that will be financed by the financial industry progressively until 2026.Finally, as part of the banking union, a safety net was designed. This net was based mainly on the protection of bank deposits, a key factor in the stabilization of the system.

The development of this measure incurred a great harmonizing effort, which ended in a directive (2009) that unified the minimum level of coverage of the guaranteed deposits in €100,000 and also allowed establishing a calendar of objectives in the maximum payment terms and in financing the funds. The Single European Deposit Insurance Scheme is built gradually over the existing system and established under community regulations, providing the protection of deposits by individuals and not by current accounts in the bank. It is expected to be completely achieved by 2024, the year in which the single European system will finance national systems completely. Additionally, the implementation of strict guarantees of European regulatory compliance is foreseen to avoid problems of moral hazard and inappropriate uses.

[5] *According to "The Five Presidents Report:" In the short term, this risk- sharing can be achieved through integrated financial and capital markets (private risk-sharing) combined with the necessary common backstops, i.e. a last-resort financial safety net, to the Banking Union" (Juncker et al, 2015). Thus, the Banking Union is a vital part of the European ecosystem, formed by three pillars: SSM, SRM and the Deposit Guarantee Schemes (EDIS). Its main goal is reassuring the safeness of the European banking system avoiding futures needs of restructuring process and their government recapitalization among others.*

3.2. SPANISH RESTRUCTURING PROCESS

The Bank of Spain, central bank and supervisor of the banking sector, has established a range of measures since 2007 in order to contribute and increase the resilience of the sector in response to financial crisis occurred around the world. These measures include increasing, provisioning and transparency, promoting mergers between savings banks in poor conditions and setting up organisms which will be defined and explained later.

The restructuring of the Spanish banking system was caused by a global economic crisis originated, in the first place, by the transmission of liquidity into the economy years ago. This injection of liquidity was derived from the economic situation that the US was going through due to the dotcom's technological bubble and the terrorist attacks that took place at that time, this events also dragged the German economy as the main European exporter of products to the US, forcing the FED and the ECB to take economic expansion measures in order to reduce the impact of the recession. Additionally, the entrance of the Spanish economy in the Euro Area led to the convergence of Spanish and foreign interest rates which also help the boost of the entrance of capital flows into the Spanish economy.

Spain, by then, maintained a stable economy[6] and did not find the need for a restructuring process of the banking system. Hence, in an environment of such low interest rates, the Spanish population was endowed with an excess of liquidity, creating considerable macroeconomic imbalances, and an abundance that annulled the incentives to control prices and wages, this situation introduced a level of inflation higher than the cost of financing, inviting the population to get in debt. Spanish companies and families started to finance extraordinary consumption and exceptional investment by appealing to foreign savings. From 2003 to 2009 the external debt tripled, reaching up to 900,000 million Euros. This level of indebtedness and credit created what would be the forerunner of the Spanish crisis: the real estate bubble.

3.2.1.How to recover the lost competitiveness?

As a result of wage bargaining structures and inorganic growth induced by monetary policy in the years prior to the crisis, the country experienced an impressive combination of external indebtedness and loss of competitiveness. When the bubble burst and the financial crisis occurred, the liquidity faded, from abundant amounts of credit it passed to a significant shortage of it. The activity contracted, tax revenues declined and unemployment increased considerably.

[6] *Due to the good international macroeconomic conditions and the big efforts the country did in order to comply with Maastricht criteria (Euro convergence criteria) needed to enter the Economic and Monetary Union (EMU).*

At that time, the current government tried to regularize the situation with public spending, taking advantage of the fact that at that time public debt was still at low levels. These measures taken by the government only delayed the inevitable, damaging the public sector even more. The new problem of the state is how to recover the lost competitiveness. Recover the confidence of the markets and restore credit and growth is impossible without a price adjustment in relation to trading partners, however, lowering prices and nominal wages is a process very slow and with high costs in terms of activity and employment.

Furthermore, gaining competitiveness through lower inflation is a very remote possibility, since the German state would not allow inflation above the 2% target due to the historical risk aversion that characterizes the country. The devaluation of the currency was another alternative discarded because the country is part of a monetary union, so, the way to gain efficiency is through structural reforms, from these restructurings the state will seek to increase productivity and lower the costs of the economy. Also, these reforms should cover not only financial, budgetary and labor issues but also issues related to public administration, health, energy, justice, education, research, etc.

3.2.2. The restructuring process carried out by Spain

By 2009, Spain was already facing an interposed restructuring necessary to comply with regulatory requirements and to reduce excess in capacity and number of operators, given this fact, the government starts with the implementation of reform measures. The reform process carried out was orderly restructuring and late recapitalization, this scheme of resolution of the banking crisis brought with it problems such as the increase in rescue costs due to waiting time and exposure to European conditionality, on the other hand, the fact of carrying out the process through this channel produced advantages such as better planning and management of the sector, support from European countries, substantial restructuring and correction of excess capacity in the sector. This resolution process was characterized by being different from other European countries who applied different restructurings and recapitalizations in a timely manner.

The recapitalization measures applied in Spain reached € 59.7 billion, 5.69% of GDP by 2012, and the measures on asset purchases and guarantees reached € 28.4 billion, representing 2.71% of GDP.It should be noted that due to the addition of state guarantees to recapitalization aids, the resolution costs in Spain are equivalent to those of countries such as Germany or the UK.

	Recapitalization measures		Measures Asset purchases	
Member state	Billion	%PIB (2012)	Billion	%PIB (2012)
France	25.05	1.23%	1.2	0.06%
Germany	64.17	2.43%	79.97	3.02%
Holland	18.86	3.14%	5	0.83%
Ireland	62.78	38.38%	2.6	1.59%
Italy	6.05	0.39%	0	0.00%
Portugal	6.75	4.08%	3.1	1.87%
Spain	59.74	5.69%	28.4	2.71%
UK	82.39	4.33%	40.41	2.13%
Total EU-27	413.2	3.20%	178.71	1.39%

Table 1- Recapitalization Data by Country
Source: EUROSTAT data.

In order to address the core of the Spanish crisis, the real estate bubble, a number of regulatory actions and policy interventions were implemented for banking reorganization and reinforcement of the entity's own resources. Apart from that, other aspects such as the strengthening of the financial system, the creation of aid agencies for financial institutions and the signing of measures and agreements with European authorities were also key elements of the Spanish restructuring process.

In terms of aid agencies creation two main organisms were constitute, FROB[7] (Fund for Orderly Banking Restructuring, RD-Ley 9/2009) and SAREB[8] (Institution for the management of assets from bank restructuring, 2012), which their main object was to enhance the solvency of the banking system. The first one would be in charge of carrying out integration processes and the contribution of funds, while the second would absorb the bad quality assets with the aim of reducing the risk of credit institutions and selling these assets optimizing their value in a term of 15 years.

The institution for the management of assets from bank restructuring received assets worth € 50,781 millions[9], of which 80% were financial and 20% real estate assets. The participation of this entity is constituted by 55% of private capital and the rest by public capital through the FROB.

In the international scenario, Spain signed several agreements with Europe, including MoU (Memorandum of Understanding, 2012), which was based on a complex program

[7] *The FROB is a public law entity with its own legal personality and full public and private capacity for the development of its purposes, which aims to manage the resolution processes of the entities in their execution phase.*
[8] *It is a management society to which the problematic banks transfer their toxic assets. The objective is to reduce the risk level of these financial institutions and liquidate the problematic assets in the best way.*
[9] *Assets coming from: BFA Bankia, Catalunya Ban, NCG Banco- Banco Gallego, Banco de Valencia, BMN, Ceiss, Liberbank, Caja 3 (FROM, 2012)*

of measures aimed at restoring confidence, stabilizing the sector and placing it in a stronger position to the future.

This program consisted of three types of measures:

- The determination of capital needs for each bank through evaluation of the European banking system, this evaluation would be based on the analysis of asset quality and stress tests.
- Recapitalization, restructuring and resolution of weak banks on the basis of plans that address the capital deficits detected.
- Transfer of toxic assets from banks to the SAREB.

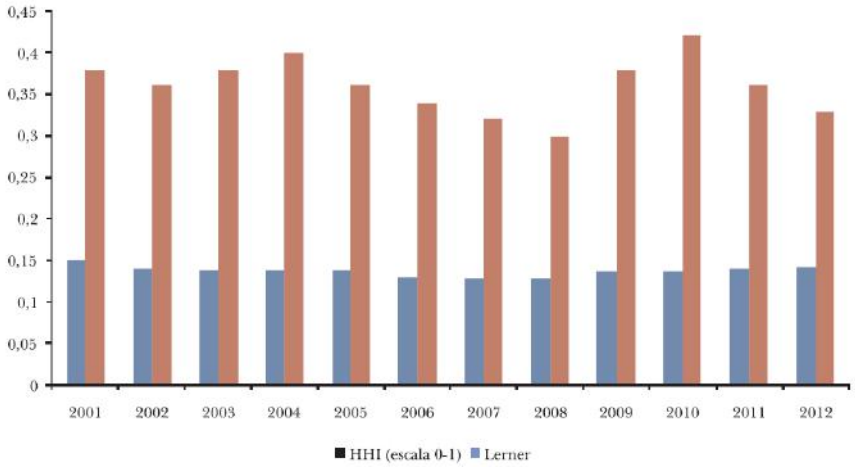
Furthermore, the law referred to saving banks (Ley 26/2013), another pillar of the Spanish crisis, is reformed with the purpose of converting them into banking foundations when they meet certain conditions. The main objective of this enactment is the establishment of a basic legal status for savings banks and banking foundations, likewise, its main activity will be aimed at a social purpose.

This way, it is possible to affirm that one of the main failures that aggravated the crisis of the country was the application timing of the necessary restructuring measures to avoid major falls in the banking system and the economy.

The subsequent effects of all the measures adopted on the market structure of the sector were significant. Between 2009 and 2013, the number of credit institutions decreased from 192 to 160. In the case of savings banks, in 2009 there were 45 and in 2013 they had been reduced to 12 groups. As for the number of bank branches, they went from 44,085 in 2009 to 36,115 in 2013, an accumulated reduction of 13.1%.

Taking into account the controversial relationships between banking concentration, competition and availability of credit, a first relevant issue would be to analyze whether the consolidation of the sector (less competitors with greater market share) has significantly affected banking competition in Spain. For this purpose, Graph 4 takes a long-term perspective and shows the evolution between 2000 and 2013 of the Herfindahl-Hirschman concentration indicator (HHI) and the Lerner index. The HHI is a synthetic measure of concentration that is calculated as the sum of squared market shares of competitors in that market.

As for the Lerner index, it shows effectively how these competitors fix prices with respect to marginal costs in relative terms. That is, its market power as the percentage in which its prices are greater than its marginal costs. The data correspond to the 55 largest deposit institutions in Spain, which represent 94% of the market. The results shown reveal that there is no definite relationship between concentration and market power.



Graph 4- Concentration and market power in the Spanish banking sector. (2000-2012). Source: AEB, Cecabank, Banco de España.

What both indicators do show is that although the concentration (HHI) increased between 2009 and 2012 in parallel to the restructuring of the sector, the market power (Lerner index) has not only not increased but has fallen during those years.

4. COMPETITION VERSUS RISK

Competition in the banking sector and its relationships with the different variables defining the performance and activity of the financial intermediaries has attracted the interest of the financial literature especially during the most recent years, not least because of the recent global financial crisis. Alongside the usual concerns that the traditional literature has identified about competition, this characteristic of banks has additional significance in finance because of its crucial role on non-financial activity. (León, 2014)

Previous researchers have found that the relationship between competition and stability varies across markets with different regulatory frameworks, market structures and levels of institutional developments (Beck et al., 2013). Exploring the variation in the competition-stability relationship across time could be important when we tend to explain the relationship between–and the real effects of- competition and risk.

Under the most traditional economic perspective, competition has the usual efficiency benefits in banking, based on the reduction of allocative and productive deadweight losses as well as fostering innovation. However, there are two channels through which competition may increase instability: (1) exacerbating the coordination problem of depositors/investors on the liability side and fostering runs/panics, and (2) by increasing incentives to take risk on the asset side and raise probabilities of failure.

Runs may happen independently of the level of competition, but more competitive pressure worsens the coordination problem of investors/depositors and increases potential instability, the probability of a crisis, the range of fundamentals for which there is coordination failure of investors and the impact of bad news on fundamentals. This is so because an increase in the intensity of competition raises the strategic complementary of the actions of the investors and depositors in the bank and makes the institution more fragile. However, this does not imply that competitive pressure has to be minimized since the socially optimal probability of a crisis is not zero in general because of its disciplining effect.

With regard to funding and investment policies, once a certain threshold is reached, an increase in the level of competition will tend to increase risk taking incentives and the probability of failure of banks. Banks will have excessive incentives to take risk in the presence of limited liability (for shareholders and managers) and moral hazard (non-observable risk on the asset side). And this is exacerbated by flat deposit insurance and the presence of a social cost of failure[10].

This problem is particularly acute for banks close to insolvency or bankruptcy. Indeed, limited liability is another way to say that banks will take excessive risks on the asset side, unless the bank's risk position can be assessed. For instance, a bank cannot increase its market share and profits by taking more risk since investors will discount it. But considering flat premium deposit insurance (or bailouts), it destroys the market's disciplinary effect market and eliminates investors' concerns about potential bank failure.

Nowadays, it widely exists an important debate about the impact of bank competition on financial stability, in which there is the belief that fiercer competition among banks may lead to a more effective banking system and result in more benefits for society as a whole (such as lower prices and higher quality financial products). Previous financial literature has focused on how markets depart from perfect competition whether because of scale economies, transaction costs, strategic behaviour or other factors. From an empirical point of view, these arguments lead us to questions about how the role of competition could be different across markets and affects the real economy (Einav & Levin, 2010) (Beck et al., 2013). The influence of a competitive banking market on financial stability is not clear yet. There are two main opposing theories on this matter. First, some studies find that intense competition may worsen the excessive risk-taking problem because high profits provide a buffer and increase the "bank's charter value" as well as pressing on banks to operate with a minimum capital buffer (Hellman et al., 2000; Allen and Gale, 2004). In a more dynamic setting, market power enhances the bank's charter value and making it more conservative. With heterogeneous borrowers, tougher competition may lead to a riskier bank portfolio and higher probability of failure. While others defend that crises are less likely to occur in competitive banking environments.

[10] *Flat premium deposit insurance tends to make banks more aggressive, by increasing the elasticity of the residual supply of deposits available to the bank. This is also the result in Matutes and Vives (1996). Furthermore, with risk-insensitive insurance, deposit rates will be too high with intense competition, even when there is no social cost of failure and no discipline on the asset risk taken.*

Those studies that support the competition-stability view state that banks may have higher profit premiums in collusive markets, thus creating a buffer from crises and reducing the banks' incentives to take risks (Hellman et al., 2000). For instance, in a more competitive market, managers may take more risk on behalf of shareholders as competition reduces the gains of both. Another argument in favour of this view claims that a competitive market worsens the adverse selection problem (i.e., in the presence of many banks in the market) (Broecker, 1990; Nakamura, 1993; Shaffer, 1998). Nonetheless, competition tends to push down the rates that firms pay for loans and may, therefore, improve the average quality of loan applicants and/or reduce the need to ration credit. This is a force that tends to align competition and stability. However, competition and stability do not always go hand in hand, as an increasing of competition amongst banks could also threaten the solvency of particular institution and hamper the stability of the banking system at an aggregate level. Tough competition might enforce banks to pursue riskier policies in an attempt to maintain its former profits (Beck et al, 2013).

If there was a monopoly banking regime, then an increase in competition will be probably beneficial because it will increase customer surplus and productive efficiency with small effects on the probability of failure. However, increasing competitive pressure we will reach a point where the benefits at the margin equate to the social cost of failure, and further increases will be socially harmful. The rival view "competition-stability" states that a more collusive banking market increases financial fragility as the higher interest rates banks charge in a less competitive market, may enhance the risk-taking behaviours of borrowers, leading to an increase in the probability of default and consequently, a systemic crisis.

In conclusion, despite the complexity of the relationship between competition and risk taking, it seems plausible to expect that, once a certain threshold is reached, an increase in the level of competition will tend to increase risk-taking incentives and the probability of bank failure. This tendency may be held in check by appropriate regulation and supervision. Therefore, and according to previous evidence, it seems important to take into account the regulatory and supervisory practices implemented in each country in order to explain the relation between competition and risk.

4.1. EVIDENCE

Previous evidence points to the presence of a charter value effect reducing risk-taking liberalization increasing the occurrence of banking crises and a strong institutional environment and adequate regulation mitigating these effects.

In the traditional view, bank competition is seen as detrimental to financial stability. And this view is supported by many theoretical contributions (Smith, 1984; Hellman et al., 2000; Matutes and Vives, 2000) and based on the idea that competition erodes bank profits and thus the banks' franchise value. Other economic theories argue that this trade-off between competition and stability may be explained by higher ability to monitor borrowers when banks earn rents (Boot and Thakor, 1993; Allen and Gale, 2000), greater diversification (Beck, 2008) and better regulators' monitoring in concentrated markets.

Contrary to the "competition-fragility" view, Boyd and De Nicolo (2005) demonstrate that market power increases bank portfolio risks. Low competition increases loan rates, borrowers tend to shift riskier projects TBTF subsidies as a result of implicit or explicit government bailout insurances (Kane, 1989; Acharva et al., 2016) or lack of diversity of diversified bank portfolios. Recent empirical evidence supports this thesis (Boyd et al., 2006; Schaeck et al., 2009; Uhde and Heimeshoff, 2009; Schaeck and Cihák, 2014; Pawlowska, 2015).

There is a third way that reconciles these two strands by theoretically and empirically demonstrating the existence of a U-shaped relationship between competition and risk (Martinez-Miera and Repullo, 2010; Jiménez et al., 2013; Liu et al., 2013).

However, the relationship between concentration and stability is complex. On the one hand, a concentrated banking system with a few large banks may be easier to monitor and banks may be more diversified. On the other hand, large banks may be TBTF, receive larger subsidies and have incentives to take more risk. Indeed, there is evidence that larger banks tend to be better diversified but may also assume more risks.

In addition, large banks tend to be more complex, harder to monitor and more interdependent (increasing systemic risk). The evidence also points to a complex relationship between concentration and stability with a positive association between some measures of bank competition (i.e. low entry barriers, openness to foreign entry) and stability. We have to be aware that aggregate concentration need not be a good proxy for competition. The certain connection is between concentration in relevant markets and competition.

There is a clear proof that higher concentration in relevant deposit and loan markets leads to market power (worse terms for customers) and to cost inefficiency of much larger magnitude than the deadweight loss induced by mispricing.

Taking some lessons from the 2007-2008 financial crisis, we learnt that this crisis affected banks in countries characterized by different concentration levels and market structures. For instance, it points out that concentrated banking systems like those in Australia and Canada may fared better in the crises than concentrated ones, those in the US or Germany.

However, countries with concentrated systems such as Belgium, the Netherlands or the UK (in retail banking), also ran into trouble. Departures from traditional banking have proved to be a source of increased risk and vulnerability.

4.2. COMPETITION AND THE LIMITS OF REGULATION

Banking and financial markets display a whole array of classical market failures: externalities (fragility with coordination problems and contagion), asymmetric information (excessive risk taking with agency problems, moral hazard and adverse selection), and market power. This has led regulation to protect the system and the small investor, and more recently, competition policy to foster market competitiveness. A problem is that facilities to preserve stability like the lender of last resort (LOLR) mechanism, deposit insurance and "too-big-to-fail" policies introduce further distortions and exacerbate the excessive risk-taking problem.

In fact, the main concern of these regulators is the Too-Big-To-Fail (TBTF) banks because of their systemic importance. These banks are likely to incur risks, believing that the authorities will assist them if any problems should occur (simply, a moral hazard problem). Not only does this thinking create instability in the banking market, but TBTF banks are also too costly to save.

The introduction of more competition in the banking industry has been accompanied by policies to control risk taking through capital requirements, encouraging banks to rely on their own internal models to assess and control risk, and including disclosure requirements for financial institutions in order to increase transparency and foster market discipline – the Capital Requirements, Supervision and Market Discipline pillars of the Basel II framework. The rationale for this framework was to make capital requirements risk-sensitive. Supervisors would assess how well banks are matching capital to their risks and banks would disclose information on their capital structure, accounting practices, risk exposures and capital adequacy. In summary, capital requirements plus appropriate supervision and market discipline are seen as the main ingredients for maintaining a sound banking system.

After the last financial crisis which was a testimony to the failure of the three Pillars of the Basel II system, in the present regulatory framework, banks have been insured without paying the appropriate risk premiums thereby encouraging risk taking. Optimal regulation needs a combination of risk-based insurance for deposits (which implies that insurance premiums are contingent on the rates offered by banks and their asset risk position, eliminating or offsetting limited liability) and systemic capital charges that internalize the social cost of failure of banks. Macro-prudential measure should be added to this so as to limit maturity transformation, avoid risk concentration in a sector and control credit in booms to alleviate the collective moral hazard problems. If banks' asset risk position is

not observable, then insurance cannot be contingent on it and banks will be encouraged to take excessive risks on the asset side. This should be controlled by restrictions on the asset side of the balance sheet (e.g. separating banking and proprietary trading/investment banking activities).

In an ideal world, we could regulate away the trade-off between competition and stability by fine tuning regulation to internalize the externalities through sophisticated risk-based insurance mechanisms, credible liquidation and resolution procedures, contingent convertibles and capital requirements[11]. In this context, competition policy should be given the simple mandate to maximize competitive pressures.

Therefore, an adequate banking competition may benefit consumers by reducing costs, lowering prices and improving offered services. While if the competition is too weak it may occur the reverse. But when the competition is too strong, banks may seek greater risks in an effort to replace profits lost by lowering prices more than costs can be reduced. Then, if the level of competition is consistent with a reasonable risk-adjusted return on invested capital and we manage to eliminate market failure arising out of asymmetric information and externalities, it might meet the needs of depositors and borrowers, making it be close to minimum production cost while being ideal and we will be better off with more competition. The problem is that it is doubtful that we will manage to eliminate completely market failures derived from asymmetric information and externalities with regulation.

Although regulation can alleviate the competition-stability trade-off, it does not eliminate it completely. In that case, a certain degree of market power may alleviate the externality problem of a social cost of failure. The design of optimal regulation has to take into account the intensity and rivalry in the environment of the banks, with tighter requirements in more competitive situations. The coordination of prudential regulation and competition policy in banking is necessary.

The trade-off between competition and stability is bound to persist and it does not seem prudent to strive for the complete elimination of market power in banking. However, in the present situation there is room to improve both stability and competition with better regulation. In fact, in a world where behavioural regulation is imperfect, regulation of structure and entry may help in providing environments conducive to a better

[11] *Risk-fencing assets retail activities from investment banking activities in separately capitalized divisions of a bank holding company. (ICB.2011). It is a compromise to alleviate the gambling problem with public insurance while allowing some scope economies within banking activities. This structural measure has the potential to alleviate the competition and stability trade-off but the drawback is that even in the most optimistic scenario, will not eliminate it. One reason is that the definition of the boundary between the divisions will leave an important grey area and generate perverse incentives. Another reason is that the regulatory boundary problem* (Vives, 2011)*persists: risky activities migrate to areas where regulation is lax and reproduce the problems that we have witnessed during the crisis in the shadow banking system. The outcome may be that the investment bank part may need to be rescued if it becomes systemic*

performance of the industry. This dual relationship between competition and stability must not be seen as a discrepancy, but one way for implications of economic policy. There are many indicators which reflect individual risks referred to a partial equilibrium approach and internalized by banks as well as indicators of contribution to systemic risk corresponded to externalized risks.

Many studies show that prudential policies like competition policies should further consider a macroeconomic dimension referring to the impact of market power on risk-taking. All this is likely to lead to a complete change in the results and the implementation of competition policy. Both approaches seem to be complementary and can help to redefine competition policy implementation. Although the market power has a cost of increasing the systemic fragility, it also has a benefit in reducing the individual fragility.

In any case, what is clear is that competition should be limited for institutions close to insolvency. This should be done in a prompt corrective action frame where the supervisor has to intervene as capital is depleted. The uniqueness of banks should be recognized (and not only in crisis) and appropriate lessons drawn for the implementation of competition policy.

5. COMPETITION, CONCENTRATION AND RISK ANALYSIS

5.1. COMPETITION, CONCENTRATION AND RISK RATIOS

5.1.1. Competition

Previous literature has used different proxies to measure the level of competition in the banking industry. However, we will only focus on the Lerner Index and Boone Indicator in order to reflect the relation between concentration and competition. The Lerner Index is also known as price-cost margin and is a popular measure of market power in empirical research. The market power of a firm is identified by the divergence between the firm's price and its marginal cost. The price and marginal cost should be equal in perfect competition but will diverge in less competitive environments. The bigger gap between price and marginal cost is, the greater monopoly power there is.

The theoretical foundation of the Lerner Index is rooted in static oligopoly theory, where the profit maximization problem for firm i is written as:

$$\max_{q_i} [P(Q)q_i - C(q_i, \omega_l)]$$

[1]

Where qi is the quantity produced by firm i, Q is the total quantity and P(Q) the price in the market. $C(q_i, w_i)$ is the total cost of firm i, where wi is the vector of the prices of the factors of production employed by firm i. Lerner (1934) proposes the following measure of market power, known as the Lerner index:

$$L_i = \frac{P(Q) - C'_{q_i}(q_i, \omega_l)}{P(Q)}$$

[2]

Where $C'q_i(q_i, w_l)$ is the marginal cost of firm i. The Lerner index ranges from -1 in situation of perfect competition to the inverse of the price elasticity of demand in situation of monopoly or collusion. Its application is relatively recent due to the difficulty of assessing marginal costs.

Cost function is often assessed using the intermediation approach from a trans-log equation including a single output (total assets) and three inputs (labour, deposit and physical capital). The trans-log function is generally as follows:

$$ln(C_i) = \beta_0 + \beta_1 ln(q_i) + \frac{1}{2}\beta_2 [ln(q_i)]^2 + \sum_{l=1}^{3} b_l [ln(\omega_{l,i})] + \frac{1}{2}\sum_{l=1}^{3} b_{3+l} [ln(\omega_{l,i})]^2 + \sum_{l=1}^{3} \beta_{2+l} [ln(q_i)][ln(\omega_{l,i})] + \sum_{l \neq l'} b_{6+l} [ln(\omega_{l,i})][ln(\omega_{l',i})] + \sum_{k=1}^{K} \kappa_k Z_{k,i} + \varepsilon_i$$

[3]

Where $C_i (= C(q_i, w_l)$ represents total bank costs of bank i, q represents a proxy of bank output (total assets), w_l the price of 1st input, and Z a set of control variables. The marginal cost is merely obtained by taking the first derivative and multiplying by the average cost:

[4]

$$C'_{q_i} = \frac{\partial C_i}{\partial q_i} = \left(\beta_1 + \beta_2 ln(y_i) + \sum_{l=1}^{3} \beta_{2+l} [ln(\omega_{l,i})] \right) \frac{C_i}{q_i}$$

The price of output (P) is computed as the average revenue. This indicator is a good measure of individual market power. It allows researchers to simply quantify the pricing market power of individual bank. The Lerner index has the main advantage to be bank-specific and to vary over time, allowing comparison of market power amongst banks and/or over the period. Furthermore, the value of the Lerner index is monotonically associated to market power. The Lerner Index ranges between 0 and 1 where values close to zero describe highly competitive markets; and values close to 1 indicate monopolistic market behaviour.

Boone is a competition measure based on the idea that efficient firms are more highly rewarded in more competitive markets. This indicator begins from the notion that in more competitive markets, firms are punished more harshly in terms of profits for being inefficient.

Following the efficiency hypothesis (Demsetz, 1973), it says that more efficient firms achieve better performance in terms of higher profits at the expense of the lack of efficiency from its rivals, obtaining a larger market share. This indicator exploits the reallocation effect from inefficient to efficient firms. "In the most extreme case, the reallocation effect is combined with a selection effect insofar as the least efficient firms leave the market" (León, 2014).

Boone (2008) shows that reallocation effect increases with the degree of competition, then an intensification of competition can decrease the output of firms and this decrease will be smaller for more efficient firms. As a result, the market share and profits for those efficient firms will increase while those less efficient firms will shrink. Hence, the relative profit difference is sensitive to the degree of competition.

The intensity of competition is estimated from the following simple profitability equation

$$ln\pi_i = \alpha + \beta lnc_i + \varepsilon_i \qquad [5]$$

Where π_i stands for profit and ci a measure of costs (proxying efficiency). The coefficient β gives the profit elasticity (PE), that is, the percentage drop in profits of bank i as a result of a percentage increase in bank i's costs. This indicator is in theory negative, reflecting the fact that higher marginal costs are associated with lower profits. In addition, its value should be lower the more competitive market conditions are.

5.1.2. Concentration

Some authors have been and still modelling the relation between competition and risk for a long time, and they assert that there is an imperfect correlation due to its U-shaped, measured by the number of banks and the risk of bank failure. For instance, the authors Martínez-Miera and Repullo (2010) consider that the "risk-shifting" effect captures the result that states that more competition leads to lower loan rates, lower firm default probabilities, and improved bank risk measures. However, lower rates should also reduce all firms' interest payments and thus overall bank revenues, which should lead to potentially greater bank risk and bank failures. This effect is known as margin effect.

The fact that competition is not directly observable because of its complex notion, it has resulted in the development of many methods for its assessment. Determining its operational realization is quite difficult by the fact that assessing competition can differ depending on which one of the current measurement metrics is applied.

With the attempt to explain some ambiguous consequences of competition on access to credit, cost and quality of financial services, innovation, the stability of financial systems and thus economic development, it is firstly necessary to come up with reliable measures of intensity of banking competition.

In our attempt to demonstrate if there is relationship between competence and risk and how it has been evolving since before the financial crisis, it is firstly essential to understand the main measures which are used and when is the best time to use one or another.

In the way to assess competition, it has led to two major streams:

The Structure-Conduct-Performance (SCP) paradigm, developed by Mason (1939) and Bain (1956), which is based on the likelihood of collusion increases with market concentration, despite some authors raising doubts about its reliability owing to deficiencies. It seeks to explain aspects of the conduct and performance of banks in terms of the structural characteristics of the markets in which they operate. The structural characteristics of a market cover the number of firms and their absolute and relative size as well as the entry and exit conditions and the extent of product differentiation with the aim to gauge market concentration. This paradigm postulates that where there are fewer and larger firms, the firms are more likely to engage in anticompetitive behaviour and reap large benefits.

As a response to those deficiencies in the structural approach, some non-structural measures have developed with the aim to directly measure and assess the competitive conduct of firms.

"The first generation of Non-Structural Measures is based on oligopoly theory and a static model of competition" (León, 2014) ,where the Lerner Index, the conjectural variation model and the Panzar-Rosse model can all be attached to this conception of competition. The Boone indicator is another non-structural measure which has been recently developed with the objective of capturing the dynamic of the market rather than focusing on static analysis.

Currently, there is no consensus regarding which is the best measure by which to gauge competition as some researchers may prefer one measure over another and vice versa. At the same time, these different indicators of banking market competition do not provide the same inferences about competition (Carbó-Valverde et al., 2009; Liu et al., 2013). Therefore, the choice of a particular indicator influences conclusions regarding the implications of competition.

The SCP paradigm's most important insight is that the more concentrated an industry is, the easier it is for banks to operate in an uncompetitive manner. However, in a concentrated market by itself is not sufficient to demonstrate a lack of competition; it must also be difficult for new firms to enter the industry if there are high entry barriers such as prices are "too high" relative to costs, thereby generating abnormal returns. It also argues that competitive features of industry are inferred from structural characteristics.

And this is the inclusive way that many researchers cannot easily separate concentration and competition. Therefore, competition and concentration must be measured and studied separately and with its interrelations to make assertions.

For instance, the Lerner Index and the H-statistic are helpful in assessing whether price competition is strong or weak and, indirectly, whether entry may be easy or difficult.

A good concentration index should satisfy a number of key criteria:

1. Concentration should be a one-dimensional measure.
2. Concentration in an industry should be independent of the size of that industry.
3. Concentration should increase if the market share of any bank is increased at expense of a smaller firm.
4. If each bank is divided into two firms of equal size, then the concentration index should be reduced by one-half.
5. When an industry is divided into N equal sized firms, a measure of competition should be a decreasing function of N.
6. A concentration measure should have a range of zero to one (this property makes the measure easier to interpret).

There are three widely-used measures of concentration: the number of firms, the concentration ratios (i.e. assets of the three largest banks/total assets) and the Herfindahl-Hirschman Index (HHI). Although, existing measures of concentration do not respect all the criteria listed above. Competition authorities typically rely on the concentration ratios and HHI conditional on information regarding the ease of new firm entry or abuse of market power evident in a "high" Lerner index.

The level of concentration between two countries may differ greatly if one country is dominated by one or few firms, while another country assembles firms with same size. After the last financial crisis and its consequential important restructuring of the banking sector, a few papers and authors assert that the concentration index has spiked dramatically, reducing the competence as a result.

To use the concentration ratio, it requires more information than the number of firms, insofar as researchers need to obtain the market share of leading firms and internal information of banks such as their total amount of assets.The firms concentration ratio measures the volume of assets of the top k firms in the banking industry over the total amount of assets:

$$CR_k = \sum_{i=1}^{K} s_i, \quad \text{with } s_1 \geq \cdots \geq s_K \geq s_N, \quad \forall N \geq K$$

[6]

Where S_i is the market share of the firm being firms ranked in descending order of market share and N is the total number of firms. The three-firm concentration ratio consists of considering the market share of the three largest banking firms in the banking sector, expressed as percentage. Contrary to the three-firm concentration ratio, there is the five-banking asset concentration ratio which calculates the weight of 5 largest banks in the system to total assets of the system.
The concentration ratio is calculated as the sum of the market share percentage held by the largest specified number of firms in an industry.

The concentration ratio ranges from 0 % to 100%. If the index approaches zero for an infinite number of equally sized firms and equals 100 if the firms included in the calculation make up the entire industry. In our case, the determination of the value of K will be 3 and 5. These concentration ratios do not take into account for the size distribution of remaining firms. For instance, a merger between small firms may not be reflected in the concentration ratio, although the market becomes more concentrated.

While there is disagreement about which of the three measures "best" reflect market competition, the expectation is that since they tend to measure the same thing, they are all positively correlated. "Unfortunately, this expectation is not always met. These measures are almost unrelated when compared across European countries over time and can be negatively related within the same country over time. If there was a consensus as to which of the indicators is indeed "best", this inconsistency would be mitigated." (Carbó-Valverde et al., 2009)

In the attempt to test if the concentration in Europe has increased or not after the financial crisis as a consequence of the restructuring processes and what relation it has with competence and risk, we should analyse on how concentration has been performing in the largest economies (Europe, the United States of America, China and Japan) since before the crash until now.

5.1.3.Risk

The evaluation of stability and soundness of the banking sector is a complex task since it involves a significant number of multidimensional criteria. After the multiple restructuring processes it has gone through, it seems that competition and concentration blend with the concept of risk and soundness.

Using a single indicator to construct an index which indicates the level of stability of the banking system is a very difficult task as well as quite ambiguous. In this section, we describe some indicators, which, following previous financial research, will allow us to construct an aggregate stability index, relevant for evaluation of riskiness of the European countries' banking system after the financial crisis considering these indicators which reflect the financial strength of banks and the major risks affecting banks in the banking system.

Asset quality is assessed through indicators related to credit risk of banks. Lack of diversification in loan portfolios and loan concentration in specific economic sectors send important signals of vulnerability of the financial system. Z-SCORE; the ratio Loan to Deposits (LTD) and the level of Provisions over Non-Performing Loans (PNPL) are key traditional indicators to measure the level of credit risk and the capacity of bank capital. They allow to identify problems through loan portfolio quality, whereas capture the value of loans for which banks expect that they will have difficulty to collect.

The Z-SCORE indicator is a measure of bank soundness. The bank risk is measured using the natural logarithm of the Z-SCORE. The Z-SCORE measures the distance from insolvency and is calculated as:

$$Z_{i,t} = \frac{ROA_{i,t} + (E/A)_{i,t}}{\sigma(ROA)_{i,t}}$$

[7]

Where ROA is the return on assets, (E/A) denotes the equity to asset ratio and σ (ROA) is the standard deviation of return on assets.

The Z-SCORE is a multivariate technique that analyses a set of variables to maximise the between-group variance while minimising the within-group variance. This is normally a sequential process in which the analyst includes or excludes variables based on various statistical criteria. The Z-SCORE can be interpreted as the number of standard deviations by which returns would have to fall from the mean to wipe out all equity in the bank. A higher Z-SCORE implies a lower probability of insolvency, providing a more direct measure of soundness than, for example, simple leverage measures.

Moreover, Loan to Deposit ratio (LTD) is a commonly used statistic ratio for assessing a bank's liquidity by dividing the bank's total loans by its total deposits:

$$\frac{Total\ Loans}{Total\ Deposits} = LTD(\%)$$

[8]

The higher the ratio is, the less liquidity the bank had to cover any unforeseen fund requirements, and conversely, the lower the ratio is the lower the bank's earnings are and the further way from its potential profitability. Nevertheless, measuring liquidity is difficult due to dynamism that characterizes the concept.

The LTD is used as a regulation instrument[12] for managing banks' liquidity, by limiting the size of their loans, so credit growth, in relationship with the size of their deposits. The main objective for regulators is to develop a resilient banking sector, by promoting shot-term resilience in the banking sector that can combat sudden shocks.

Finally, the variable Provisions to no performing loans (NPL) aims to show how much reserves the bank has in order to bear potential loses created by the default of the NPL. The ratio is composed of:

$$\frac{Loans - Reserve\ Balance\ (Provisions)}{Total\ Non - Performing\ Loans\ (NPL)} = PNPL(\%) \quad [9]$$

It is a ratio which shows the relation between the expense set aside as an allowance for uncollected loans and loan payments and the volume of loan losses. It is also known as Loan Loss Provision.

This provision is used to cover a number of factors associated with potential loan losses which includes bad loans, customer defaults and renegotiated terms of a loan that has already incurred lower than previously estimated payments. Provisions to NPL are an adjustment to loan loss reserves and can also be known as valuation allowances. This is also a measure of a banks' ability to absorb potential losses from its non-performing loans.

5.1. SAMPLES AND VARIABLES DESCRIPTION

The objective of this work is to analyse how the restructuring processes that took place as a response to the global financial crisis in certain countries have affected the stability of their financial sectors through changes in the level of competition of the banking market. After all, it can be said that the aim of this research is to study the relationship between competition and risk.

It is important to set a period of time during which the data taken can be representative and can go in line with the objective of our research. Therefore, for every country used in the analysis, we will distinguish three different subperiods around the global financial crisis: pre-crisis, crisis and post-crisis. This will allow us to test how bank competition, market concentration, and risk evolve throughout this period.

[12] *However, since the publications of Basel III Accord and the new approach to liquidity risk, this ratio has lost importance against two new liquidity ratios: Net Stable Funding Ratio (NSFR) and Liquidity Coverage Ratio (LCR).*

In order to take as more advantage as possible of the available data, we are will develop our empirical analysis in three parts. Each one of the groups will compare different countries. Each country within each group will be chosen through different criteria so we can be able to obtain different conclusions from each group.

The first group will be composed by three countries that were affected by different and independent regulators and supervisory authorities. Therefore, we can see if regulation is one of the main variables that might have affected directly or indirectly on risk, competition or concentration. The three countries/economic areas and their time frames used under this analysis will be the ones presented in the following table:

Country/Economic Area	*Pre-crisis*	*Crisis*	*Post-crisis*
EEUU[13]	2004-2007	2008-2012	2013-2015
Eurozone	2004-2009	2010-2013	2014-2016
Japan	2004-2009	2010-2013	2014-2016

Table 2-Group 1: Countries and time framework

The second group will be composed by three countries that were affected by different regulators and supervisory authorities that are not independent. The three countries will be members of the European Union. Therefore, the regulation set in the crisis period was always under the supervision and approval of the supranational institutions. However, the three of them were able to attain different restructuring processes due to the different pre-crisis situation of their financial systems. Then we can see if the different restructuring processes and initial situations are one of the main variables that might have affected directly or indirectly on our variables. The three countries/ and their periods used under this analysis will be the following:

Country/Economic Area	*Pre-crisis*	*Crisis*	*Post-crisis*
Germany	2004-2009	2010-2013	2014-2016
Portugal	2004-2009	2010-2013	2014-2016
Spain	2004-2009	2010-2013	2014-2016

Table 3- Group 2: Countries and time framework

Finally, the third group will be composed by two countries that have the same geographical extension. We think that it would be interesting to compare to countries with similar sizes because this will show us if the geographical size determines the size and shape of the financial sector. If it does affect, countries with similar sizes would have similar financial systems and then the crisis and their reaction to it would have been similar. The two countries and the period we have chosen are:

[13] *US has a different time frame because the crash and recovery were earlier, so we will take different time periods in order to make it comparable to other countries.*

Country/Economic Area	*Pre-crisis*	*Crisis*	*Post-crisis*
France	2004-2009	2010-2013	2014-2016
Spain	2004-2009	2010-2013	2014-2016

Table 4-Group 3: Countries and time framework

5.2. DESCRIPTIVE ANALYSIS

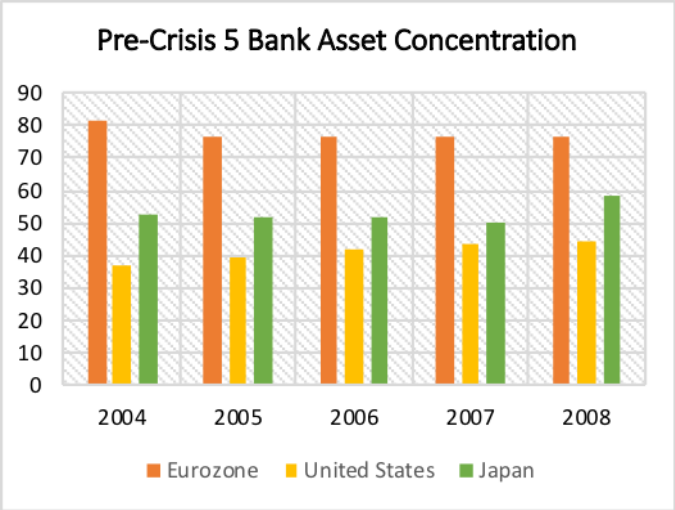
5.2.1. US, Japan and the Eurozone

Pre-crisis: US, Japan and Eurozone

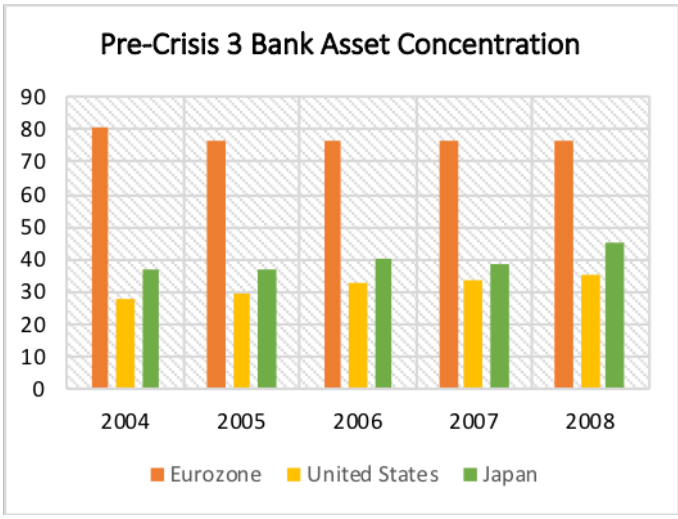
In the pre-crisis period we can identify three different bank market profiles according to their concentration measure. First, we can observe that the Euro zone had the highest level of concentration among the group. Additionally, three banks within the economic area hold between 70% to 80% of the overall assets.

Japan and the US are the two countries with lower levels of concentration within the period. On one hand, Japan had its half total assets hold by the five most important banks. On the other hand, the US had the lowest level of concentration, which did not exceed the 50% in any of the ratios.

It is true that US has a very strong policy regarding concentration, and this may be one of the reasons why they had the lower levels of concentration. However, there might be other such as the size of the market or the weight of the financial system and the banking in the economy.



Graph 5- Pre-Crisis 5 Bank Asset Concentration ratio, Own elaboration (Data from the World Bank Data)

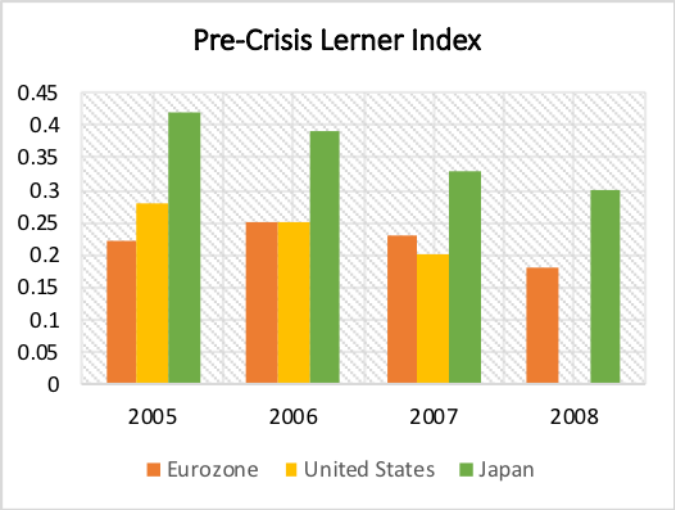


Graph 6- Pre-Crisis 3 Bank Asset Concentration ratio, Own elaboration (Data from the World Bank Data)

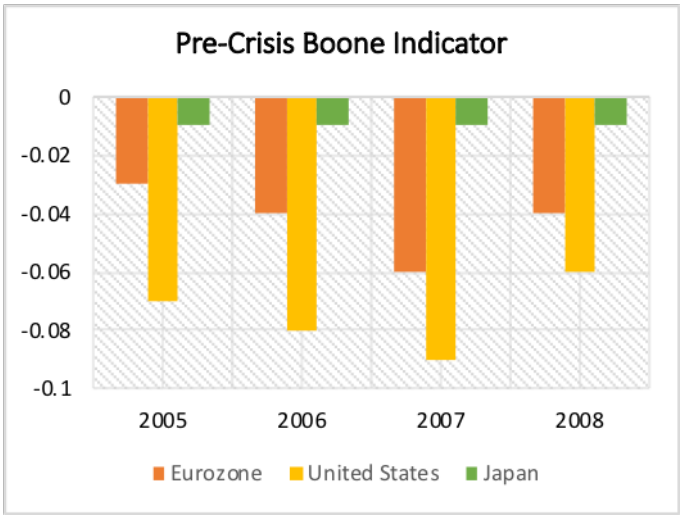
Regarding competition, we can conclude several things. In the first place, both indicators, Lerner and Boone, show that Japan had the lowest levels of competition out of the three countries. Which could mean that medium levels of concentration might be affecting competition.

Secondly, according to the direct measure of bank market power, the Lerner index, we can observe that the higher levels of competition for the Euro zone and the US banking systems, than for the Japanese banking market[14]. However, the observed trend of the Lerner index in Japan is negative across the pre-crisis years. Nevertheless, the Boone indicator shows the banking sector of the United States as a far more competitive sector. This conclusion matches the fact that this country had the lowest levels of concentration out of the three economies.

Finally, the Euro zone could be shown as a good example of the Bertrand Paradox in the banking market. Even though it had significant levels of concentration, the competition indicators have shown more competitive markets.



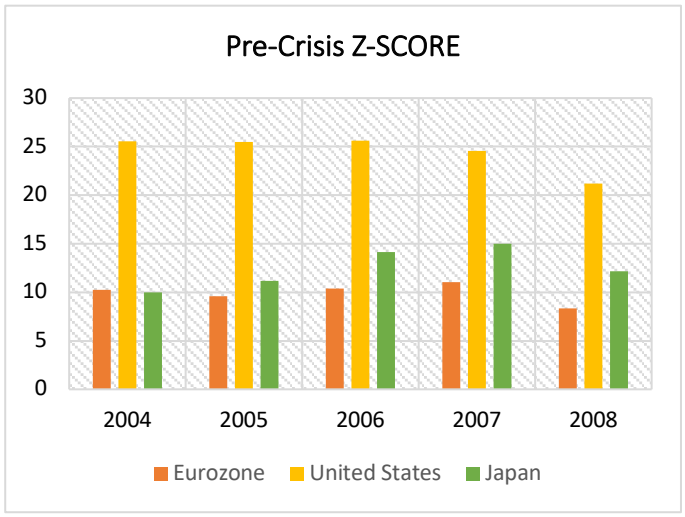
Graph 7- Pre-Crisis Lerner Index.
Own elaboration (Data from the World Bank Data)



Graph 8- Pre-Crisis Boone Indicator.
Own elaboration (Data from the World Bank Data)

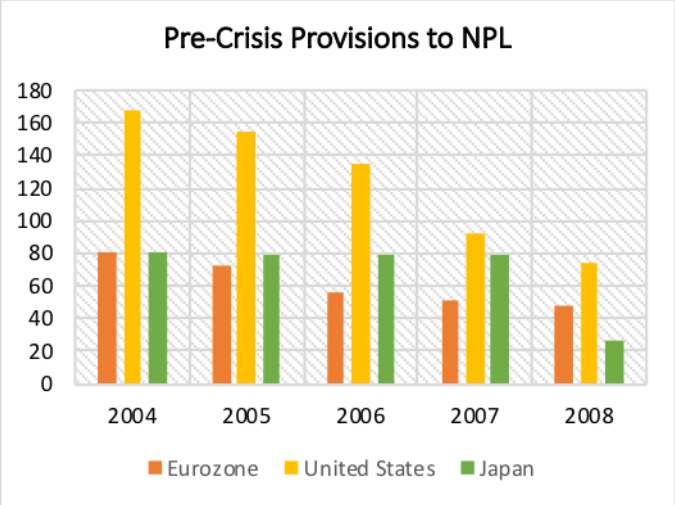
[14] *The 2008 value of the Lerner index in the US is not available in the World Bank Database.*

If we analyze the soundness of the three countries we can reach the following conclusion: according to the Z-SCORE index, in the pre-crisis period, the United States was the soundest country out of the three, as the level of the Z-SCORE index is always higher for the US market. The reason for its fall down in 2008 was the beginning of the financial crisis.
Additionally, the Euro zone had the less secure financial system. It is true that it had a trend of improvement during this time frame, however. It had, then, a similar behavior that the Japanese but with lower levels of the Z-SCORE index.

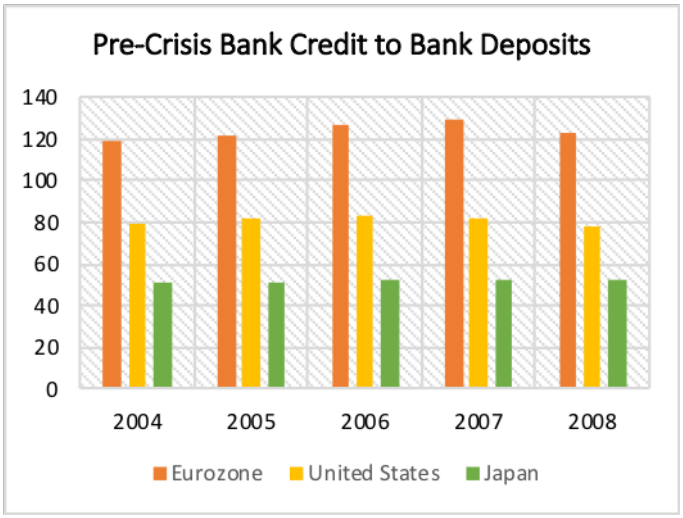


Graph 9- Pre-Crisis Z-SCORE.
Own elaboration (Data from the World Bank Data)

Given these previous results about the soundness of the banking sector of each country, we could be interesting on testing the main determinants of the soundness of each country. In this work we identify two main factors: the level of loans given out compared to their deposits and the amount of provisions compared to the potential future losses.



Graph 11- Pre-Crisis Provisions to NPL ratio.
Own elaboration (Data from the World Bank Data)



Graph 10- Pre-Crisis Bank Credit to Bank Deposits ratio.
Own elaboration (Data from the World Bank Data)

On one hand, the Z-SCORE for the Euro zone is proven right when we observe that the economic area had given more credit than the money they had in deposits, meaning that the growth of credit was higher than the growth of savings, which gives the banks problems of liquidity. Moreover, the Euro zone had little provisions to cover the potential loses of those credits and the possible lack of liquidity. This is what made it the lowest secure area.

In contrast, the US had significant levels of provisions, in fact in 2004 the number of provisions in reserves was half higher than the total value of NPL. This, added to the fact that the credit given out was not over the deposits, made it a secure country.

In the case of Japan, the reasons for it to be a less secure country that the US will have to rely, according to our data availability on the provisions to NPL, among other factors.

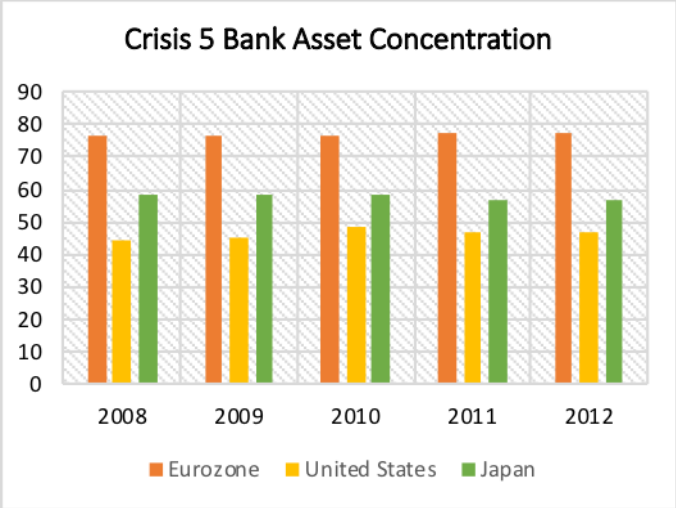
Crisis: US, Japan and Euro zone

After the multiple restructuring processes that took place as a response of the financial distress episode, we should expect increases in the levels of concentration for the three countries. In the case of the Euro zone this increase is not so significant, and the variables proxying for bank market structure remain on their average levels. On the other hand, US and Japan's concentration highly increases during the crisis period. For both countries the concentration increases around a 10%.

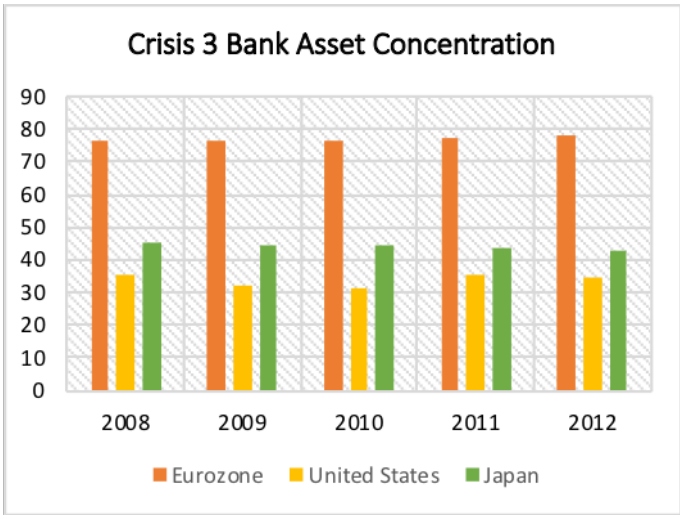
Searching for a potential explanation about these different results, it can be said that the Euro zone takes into concentration levels of 19 countries. Within those countries not all of them accomplished a restructuring process (or not in the same way) or had failing banks. Then concentration remained quite stable when taking the data of the Euro zone as a single area, in fact the steadiness was caused by the capitalization measures that substituted the restructuring processes.

In contradiction, for example, the US, who triggered the crisis with the fall of Leman Brothers, suffered an increase in concentration caused by the insolvency and further bankruptcy of some of its most important banks. Nevertheless, this country also saw acquisitions of their most significant banks such as: J.P Morgan acquiring Bear Stearns or Bank of America acquiring Merrill Lynch. Moreover, the Japanese economy also embodied a strong restructuring process that ended up affecting the concentration of the whole economy.[15]

[15] *The EU an US post crisis measures were different due to their differences in their safety net and supervision. For example, the US has a Federal supervision mechanism and safety net whereas in the EU these two remained as national competences in pre-crisis period. Moreover, the Federal safety net developed before the cross border banking which made the US banking system a more robust one. During the crisis the decision making in the US was centralized while in the EU was decentralized, and this is why we have many different restructuring and measures applied within countries in the EU.* (Nieto & D.Wall, 2015)



Graph 12- Crisis 5 Bank Asset Concentration ratio. Own elaboration (Data from the World Bank Data)

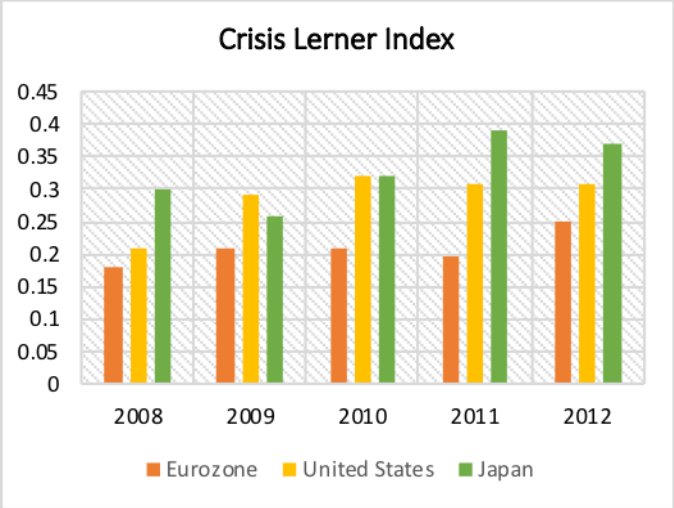


Graph 13- Crisis 3 Bank Asset Concentration ratio. Own elaboration (Data from the World Bank Data)

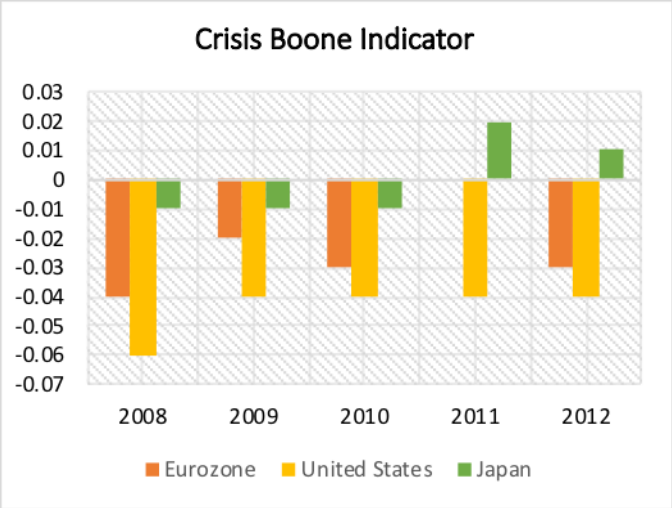
How did changes in the concentration affect the competition indexes? First of all, it is vital to observe how Japan reached positive numbers in the Boone index for the last two years, which coincide with the conclusions of the Lerner index that show the highest numbers of the Lerner Index. As a first conclusion we can say that the restructuring process in Japan highly affect competition. Japan competition had been decreasing since the beginning of the pre-crisis period, probably because of the new entrance of new competitors that saw the financial sector as a very profitable one. When the crisis triggered, those institutions were absorbed or disappeared bringing competition to former high levels.

The same happens for the US. Before the crisis the indicators showed an increase in competition until 2008. When the bubble burst competition reduced yearly until 2010, the last two years of the crisis it stabilized. This supports the argument that this change was mainly caused by the failure and acquisitions taken in the first years of the crisis, because ones the healing process of the sector stopped, competition remained constant.

Finally, the Euro zone showed the same trend of decreasing competition. The main difference with the other two countries is concentration. We have seen that concentration in the Euro zone was not as significant in relative terms, but competition changes are comparable. This can be caused by: the different measures taken to overcome the crisis between the different crisis, and the different ways of attaining the restructuring process. For example, in Spain the main number of M&A's were done by small-medium saving banks, thus the concentration in the volume of the market share and assets of the 3-5 biggest banks may have remained constant or with very low variations but the number of competitors in the market was lower.



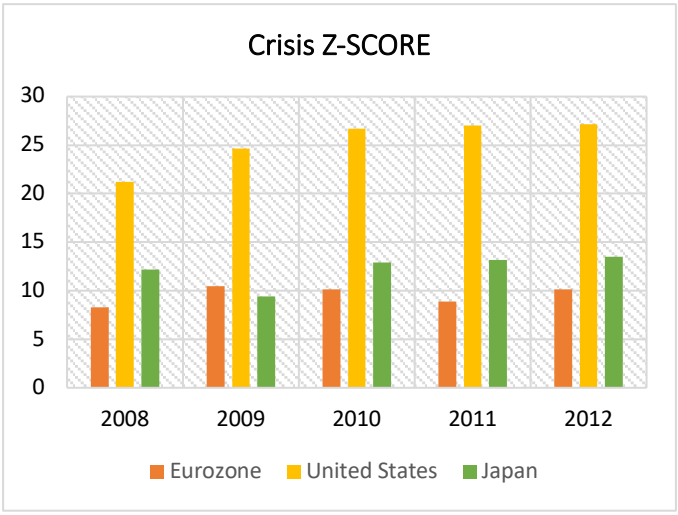
Graph 14- Crisis Lerner Index.
Own elaboration (Data from the World Bank Data)



Graph 15- Crisis Boone Indicator.
Own elaboration (Data from the World Bank Data)

For the crisis period we can still identify the US the most secure country out of the three, i.e. the country with a lower risk. In fact after the worse part of their crisis, they reached higher levels of the Z-SCORE than in the pre-crisis period (over 25 on 2010 onwards).

In this period the soundness of the Euro zone seemed to remain constant excluding 2011, which was right after the sovereign debt crisis, in which banks resulted very harm. Japanese soundness was also harmed by the financial crisis (shown by the Z-SCORE of 2009) but recover on 2010 and onwards, although without reaching pre-crisis levels.



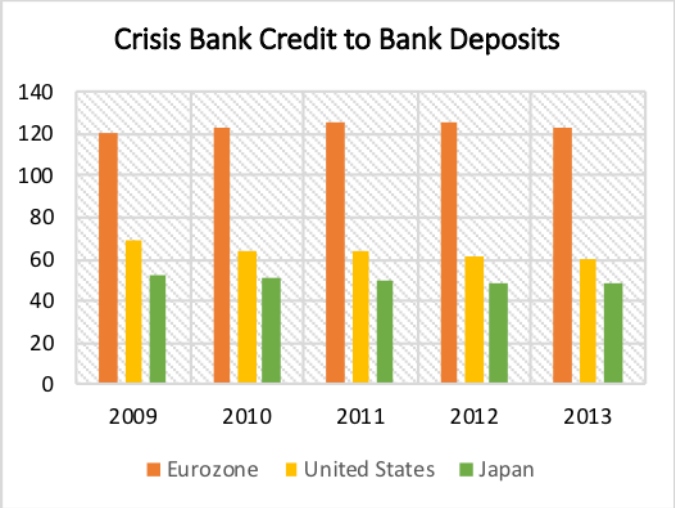
Graph 16- Crisis Z-SCORE.
Own elaboration (Data from the World Bank Data)

In this period the soundness of the Euro zone seemed to remain constant excluding 2011, which was right after the sovereign debt crisis, in which banks resulted very harmed. In the case of the Japanese banking sector, its soundness was also harmed by the financial crisis, as it can be seen in terms of the Z-SCORE in 2009. However, it recovered on 2010 and onwards, although without reaching its pre-crisis levels.

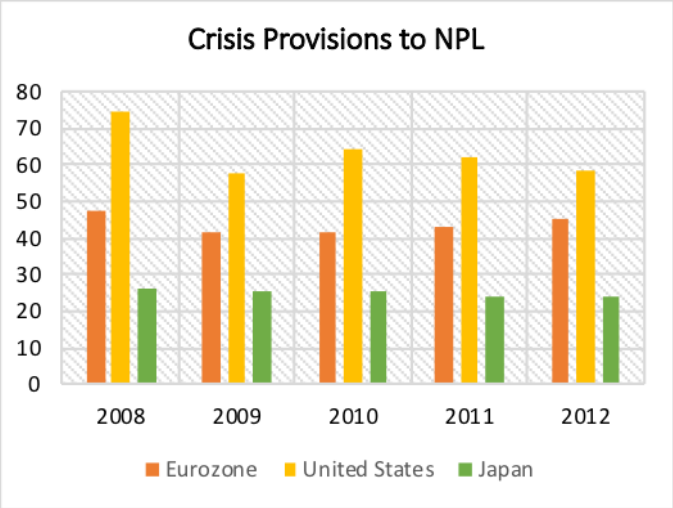
Again, even in the crisis period, the US banking market presented a low level of credits compared to deposits if we take into account their provisions. However, now provisions

were lower than before because of the relevant increase in the amount of declared NPL, which is a process that happens over the years[16].

The other two countries remain being the less secure countries. Japan and the Euro zone remained with similar levels of the credit-to-deposits ratio, since most of the loans given out before the crisis were mortgages, thus since it is a long-time investment, it is hard to reduce quickly this ratio.



Graph 17- Crisis Bank Credit to Bank Deposits ratio. Own elaboration (Data from the World Bank Data)



Graph 18- Crisis Provisions to NPL ratio. Own elaboration (Data from the World Bank Data)

It is worth mentioning that the decreasing trend of the pre-crisis provisions to NPL is caused by the increase of NPL over the years, specially the years the crisis triggered for each county. The US banking sector comes near the relative levels of provisions of the other two countries on 2017 because they suffered the effects of the crisis earlier.

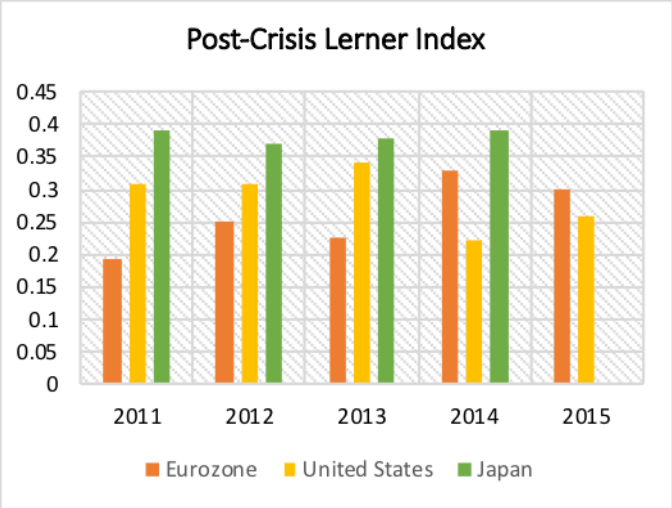
Post-crisis: US, Japan and Euro zone

In this section, we will mainly see the effects of the measures taken during the crisis and how did that affect every different indicator. At the end concentration in the Euro zone, US, and Japan remain in the same levels as in the pre-crisis situation. But again, for the Euro zone, this index is not very representative due to the fact that we are looking at the overall effect within the area and not every country, individually considered.

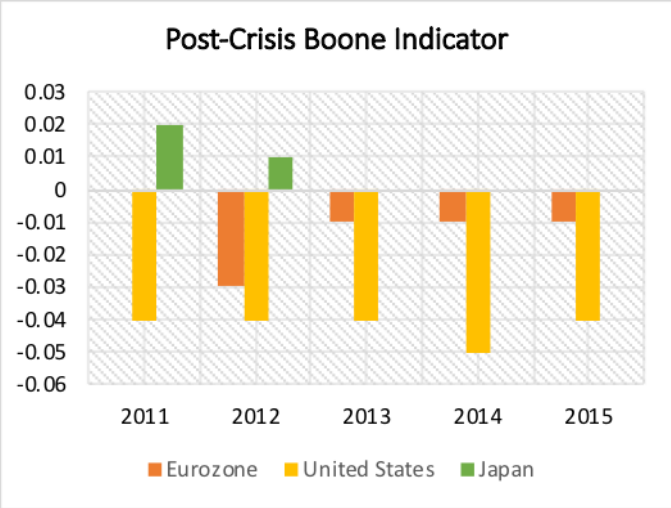
Regarding competition, we see that any country reached its pre-crisis' levels. The trend of competition from 2008 to 2015 has been certainly negative. As we have mentioned several times in this work, this is due to the effect the financial crisis had on the banking

[16] *The accumulation of unpayment installments which determines the status of the mortgage will depend on the economic situation of the borrower. For example, most of the increases of the NPL at the beginning of the crisis were subprime loan, i.e. loans given out to the ninjas.*

system and the different resolution policies applied in order to mitigate the most negative effects of the distress period.

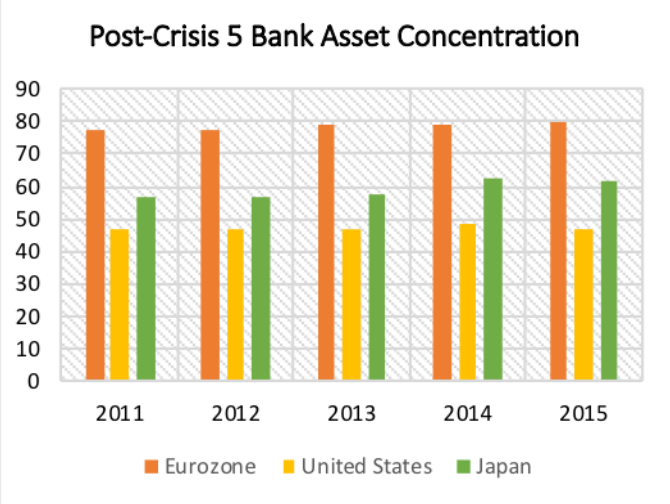


Graph 19- Post-Crisis Lerner Index.
Own elaboration (Data from the World Bank Data)

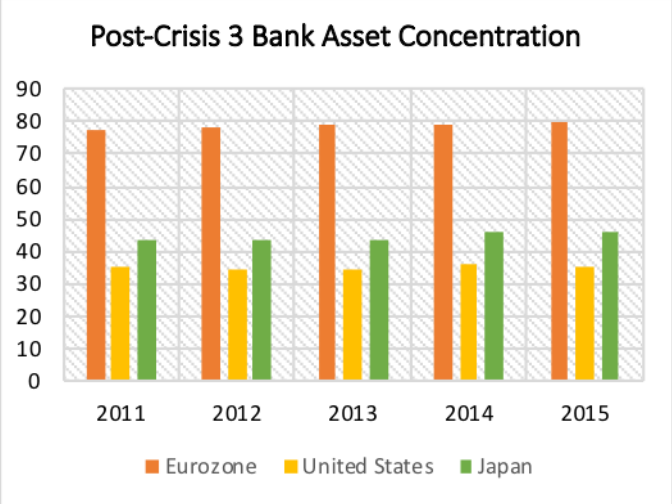


Graph 20- Post-Crisis Boone Indicator.
Own elaboration (Data from the World Bank Data)

Now, at the end of all the processes of restructuration and measures taken we obtain the following conclusions: some countries, such as Japan or the Euro zone, have the same levels of risk than in the periods before the crisis. Only the US exceeds more than one year the Z-SCORE from the pre-crisis levels, meaning that the measures taken did improve indeed the soundness of the US banking sector.



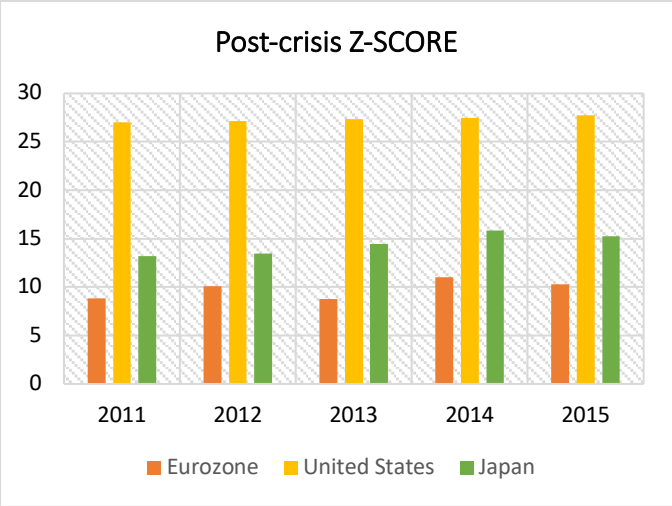
Graph 21- Post-Crisis 5 Bank Asset Concentration ratio.
Own elaboration (Data from the World Bank Data)



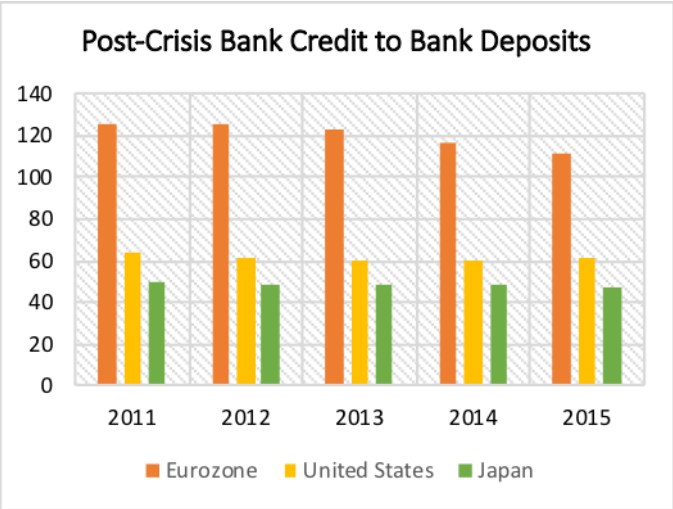
Graph 22- Post-Crisis 3 Bank Asset Concentration ratio.
Own elaboration (Data from the World Bank Data)

We also see a big improvement in the Credit to NPL, for every country. This improvement has been helped by the restructuring process. The measures taken by the official authorities of the different countries have helped banks to take out of their balance sheet NPL that were highly affecting the liquidity of banks and, thus leading with insolvency problems.

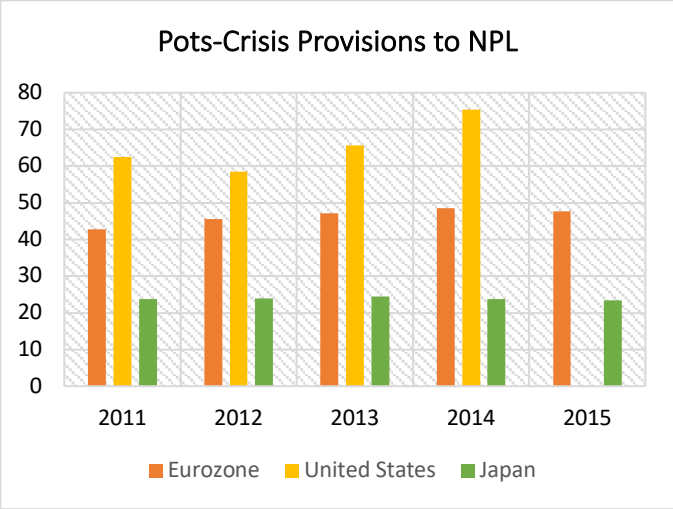
Moreover, provisions to non-performing loans in the US and the Euro zone seem to have improved significantly. The main reason is found in the regulatory bodies, which have been very strict with the implementation of the guidelines set in Basel III. The new implementation of these guideless insist a lot on the need of having liquidity buffers to out front possible new crisis like the one in 2007/2008.



Graph 23- Post-crisis Z-SCORE.
Own elaboration (Data from the World Bank Data)



Graph 25- Post-Crisis Bank Credit to Bank Deposits ratio.
Own elaboration (Data from the World Bank Data)



Graph 24- Post-Crisis Provisions to NPL ratio.
Own elaboration (Data from the World Bank Data)

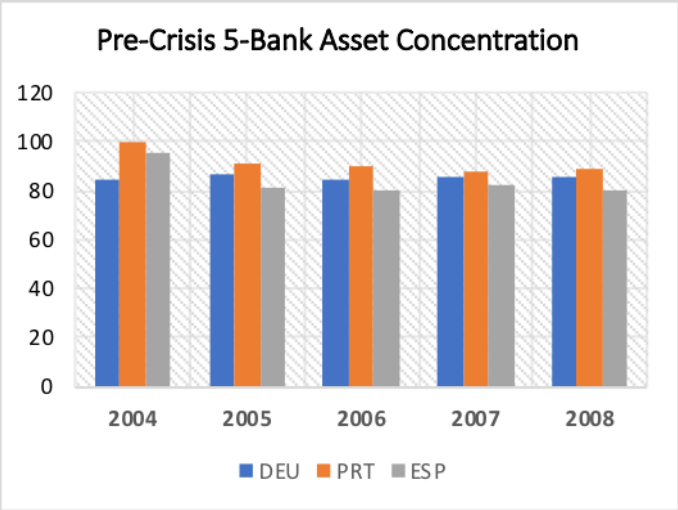
5.2.2. Portugal, Germany and Spain

Pre-crisis: Portugal, Germany and Spain

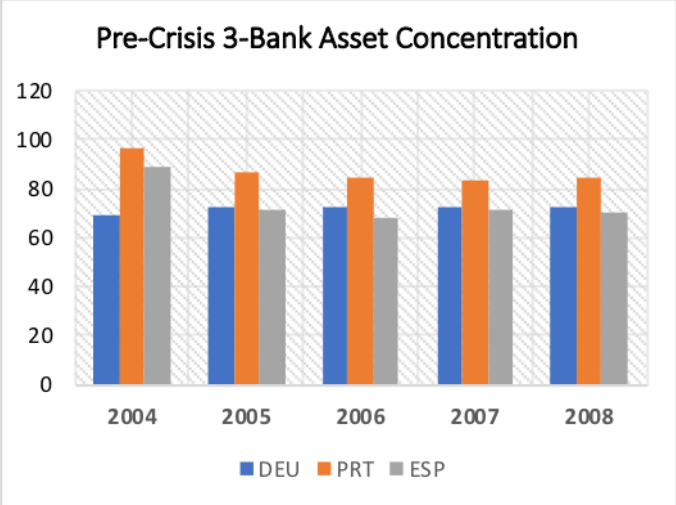
During the years previous to the crisis, the Euro zone's financial system stayed in an economic-boom period, where market concentration of the largest banks was very high. In some countries, more than others, like Portugal, the five largest banks almost occupied

the whole financial market. Germany and Spain did not fall far behind Portugal; indeed their concentration level tended to even while the great financial crisis was closer.

However, if we went to see how the financial market was shared amongst the three largest banks, we could clearly observe that they occupied around the 75%, even if in Portugal it was quite higher.

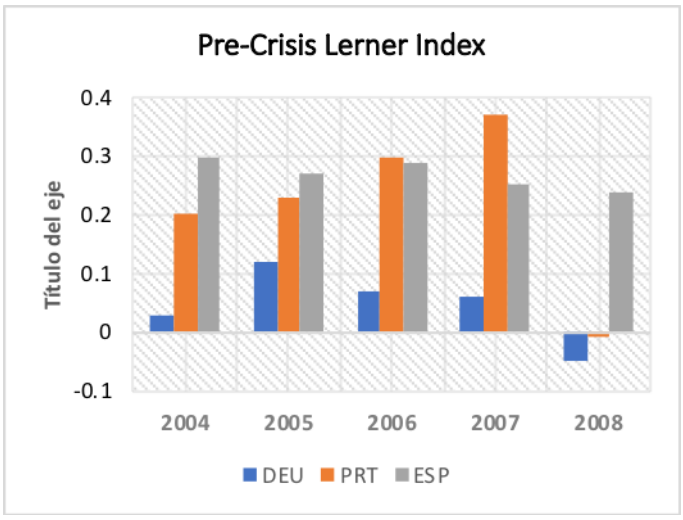


Graph 27- Pre-Crisis 5 Bank Asset Concentration ratio. Own elaboration (Data from the World Bank Database)

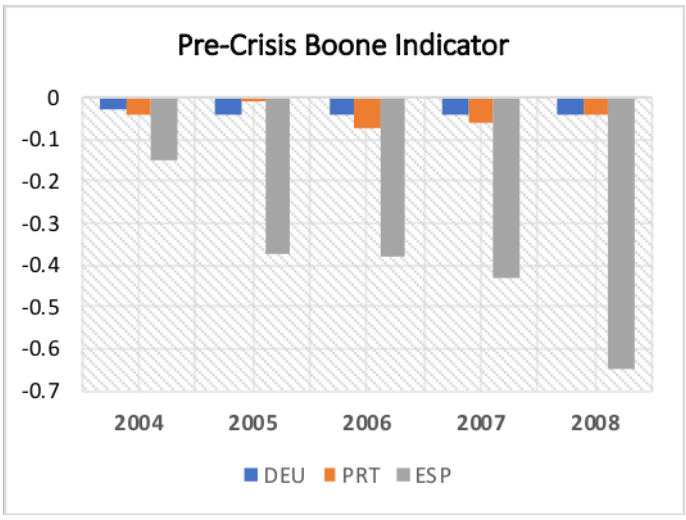


Graph 26- Pre-Crisis 3-Bank Asset Concentration ratio. Own elaboration (Data from the World Bank Database)

Competition has also played an important role in the financial systems of these countries. During this last decade, competition took very diverse values which they may strike everyone.
At the beginning, there was a huge difference of competition in the Spanish and Portuguese financial markets with respect to Germany. It might be said that the competition was highly intense in Spain and Portugal. Many financial institutions were fighting for selling more and more products without paying too much attention to its costs and risks.



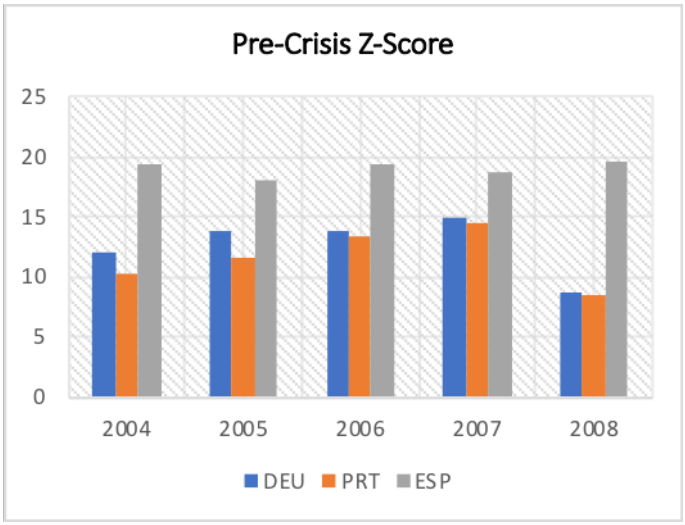
Graph 29- Pre-Crisis Lerner Index. Own elaboration (Data from the World Bank Data)



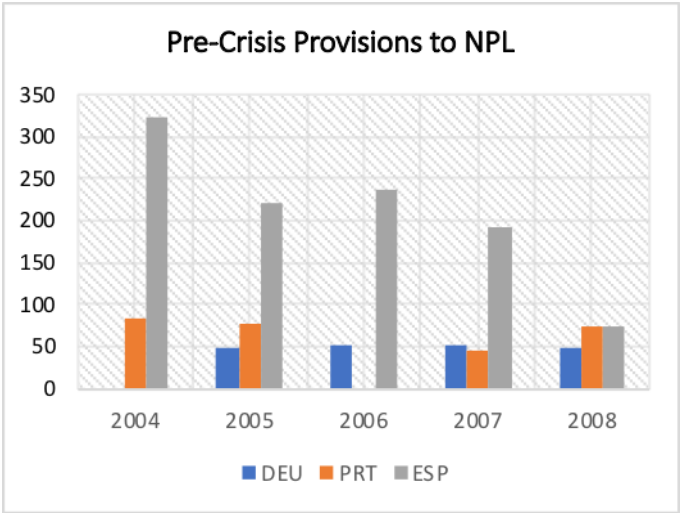
Graph 28- Pre-Crisis Boone Indicator. Own elaboration (Data from the World Bank Data)

This high level of concentration and competition went hand in hand with risk. The years of the economic boom were characterised by a raised risk, where banks had a reduced non-performing loan rate if we compare to the volume of loans they issued. Observing how different the situation of Portugal and Spain was from Germany's, which indeed had a very particular situation, it was not enough to avoid the impact of this hard plight.

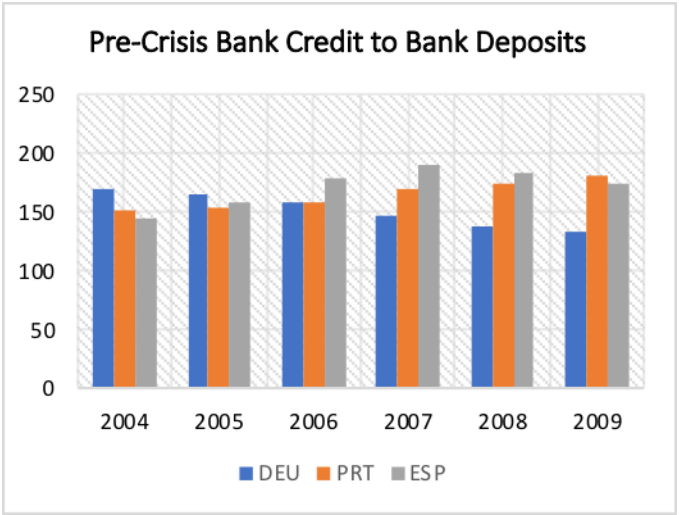
Although, in general, banks met with the regulatory levels of capital, even having similar levels of risk in the three countries, it was not enough to guarantee or cover what it came. The enforcement of applying different restructuring process saved their broke financial systems.



Graph 30- Pre-Crisis Z-SCORE.
Own elaboration (Data from the World Bank Data)



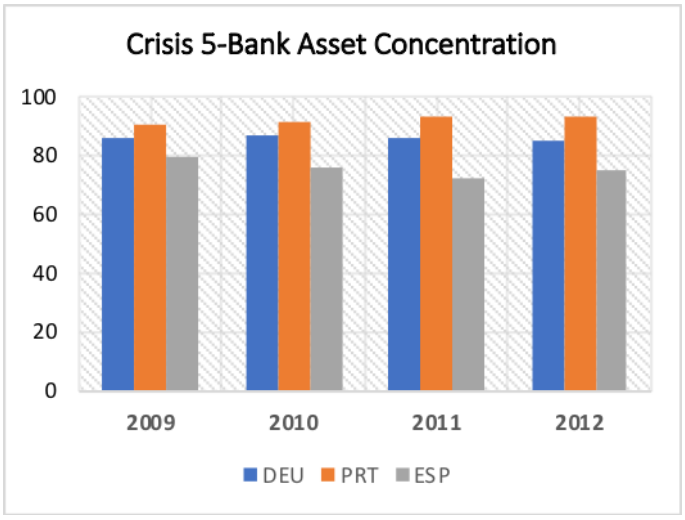
Graph 31- Pre-Crisis Provisions to NPL ratio.
Own elaboration (Data from the World Bank Database)



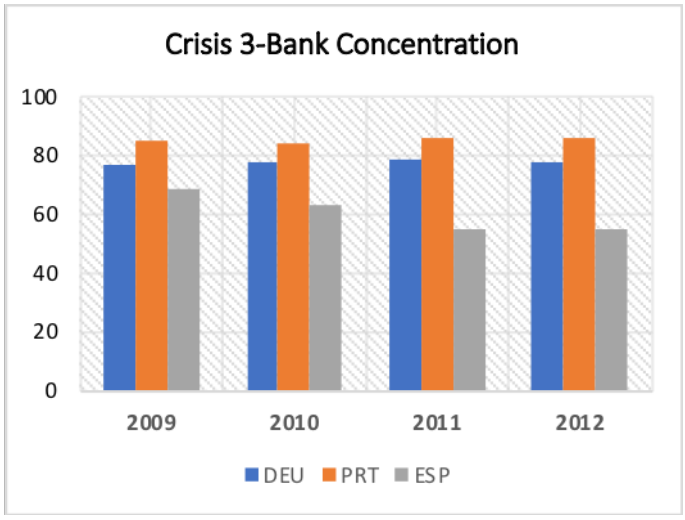
Graph 32- Pre-Crisis Bank Credit to Bank Deposits ratio.
Own elaboration (Data from the World Bank Database)

Crisis: Portugal, Germany and Spain

The financial crisis did not improve the situation. In fact, it drove small banks and financial institutions to default, distributing the rest amongst the largest ones. During the first years, when the crisis was hitting the financial system severely, the concentration level lagged. However, it finally came back to its initial pre-crisis values.

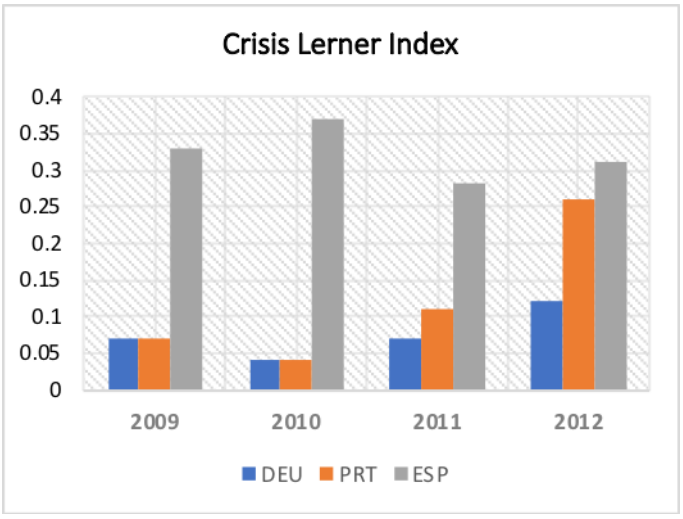


Graph 33- Crisis 5-Bank Asset Concentration ratio.
Own elaboration (Data from the World Bank Database)

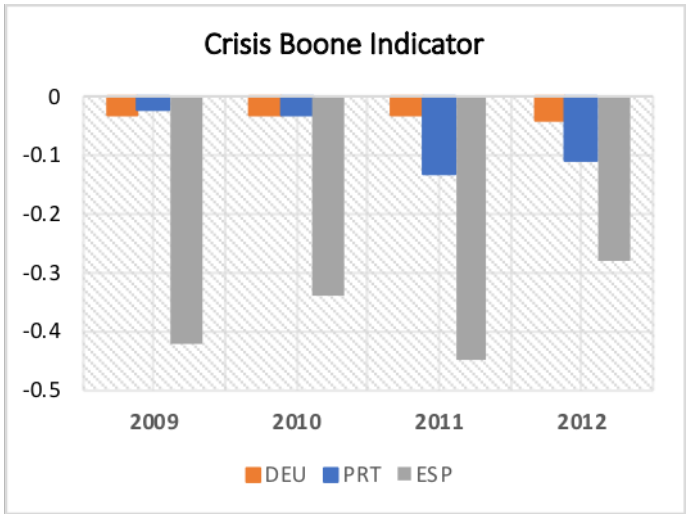


Graph 34- Crisis 3-Banks Concentration ratio.
Own elaboration (Data from the World Bank Database)

On the other hand, the crisis and the restructuring process intensified the competition level in the case of Spain, while in Portugal, it suffered a sharp fall.
While the recovery of the financial system in the Euro zone was closer, competition seemed to pretend as though anything happened. It again had the same intense competition as the previous years of the crisis.

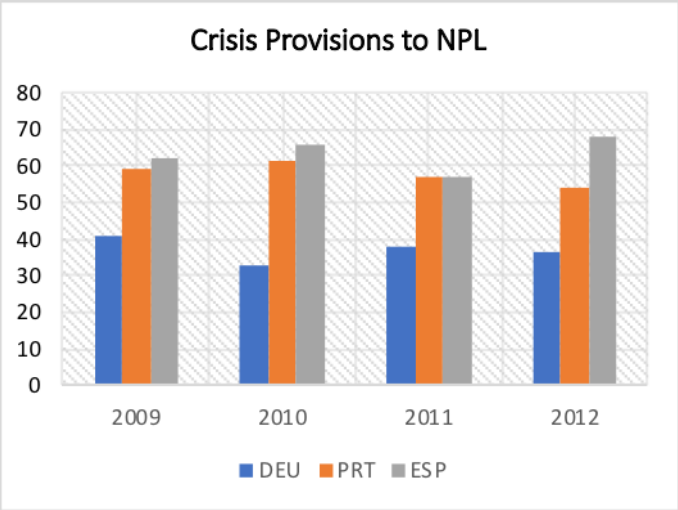


Graph 36- Crisis Lerner Index.
Own elaboration (Data from the World Bank Database)

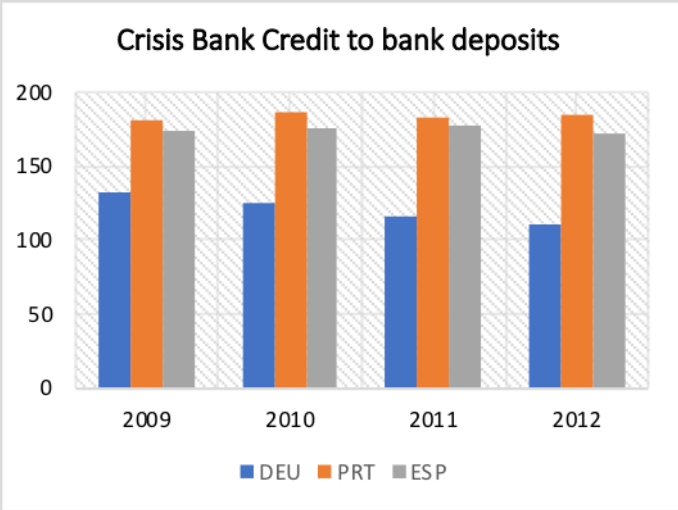


Graph 35- Crisis Boone Indicator.
Own elaboration (Data from the World Bank Database)

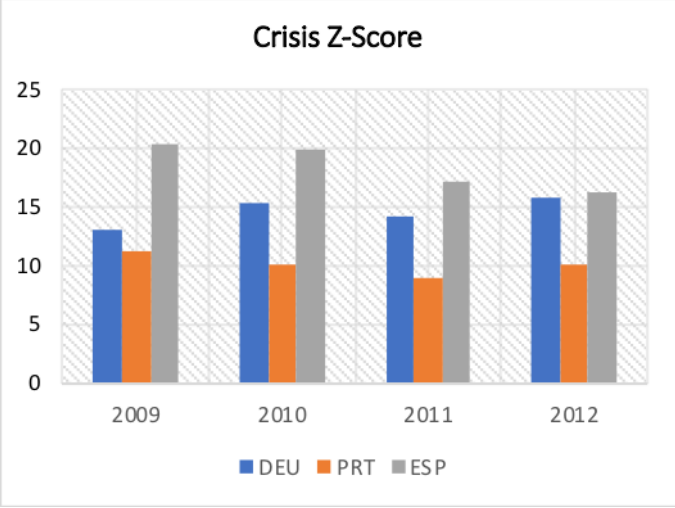
The risk was also a variable which was little constant along that period. It changed while the crisis hit and the restructuring processes were implemented. Crisis hit financial institutions badly that risk varied too much. Non-performing loans were sharply raising, provisions were insufficient to cover their positions, especially in the case of Spain and Portugal. The German financial system also had an important level of risk but not as much exposed as the other two countries.



Graph 37- Crisis Provisions to NPL ratio.
Own elaboration (Data from the World Bank Database)



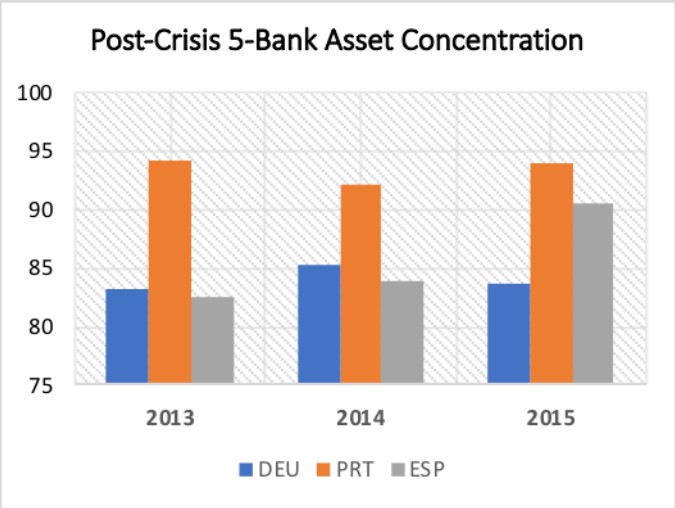
Graph 38- Crisis Bank Credit to Bank Deposits ratio.
Own elaboration (Data from the World Bank Database)



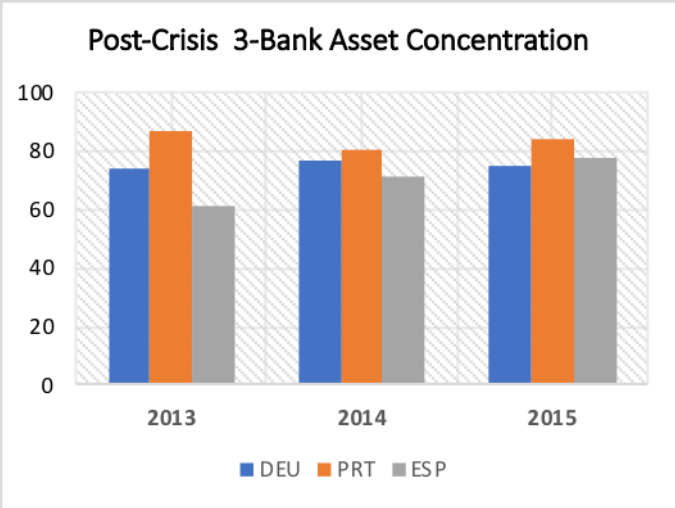
Graph 39- Crisis Z-SCORE.
Own elaboration (Data from the World Bank Database)

Post-crisis: Portugal, Germany and Spain

Once the crisis was over and after the application of the different restructuring processes in each country according to its situation, it seems that now the market is dominated by the three largest banks. It seems that in Portugal the situation has not changed too much if we compare it with Germany and Spain. In Germany and Spain, the concentration has become harder to sustain by the largest ones, although it conveys the impression that in this last one the situation is reverting to its beginnings.

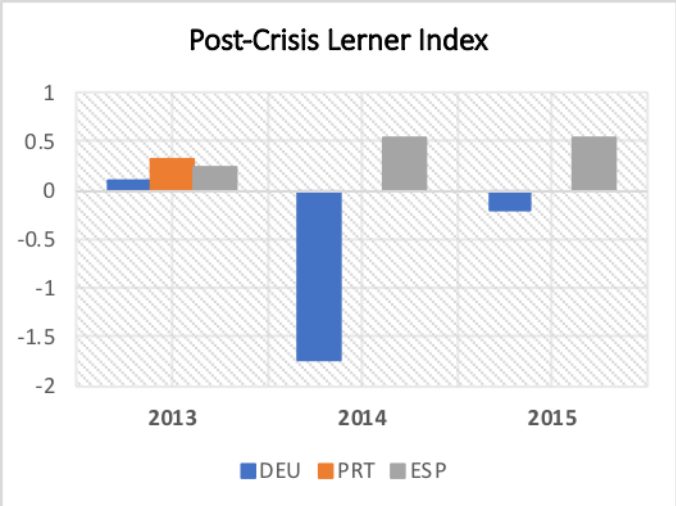


Graph 40- Post-Crisis 5-Bank Asset Concentration ratio.
Own elaboration (Data from the World Bank Database)

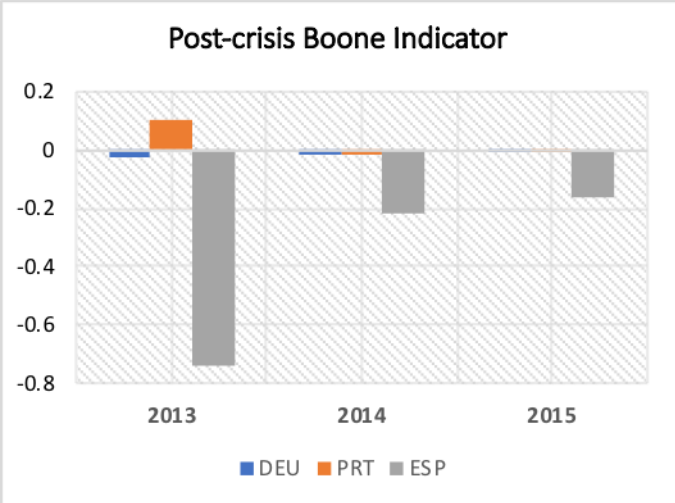


Graph 41- Post-Crisis 3-Bank Asset Concentration ratio.
Own elaboration (Data from the World Bank Database)

Competition has ended with larger values than when all started. Despite having now a healthy financial system, Spain is by far on top the list in terms of higher bank market power, having a large difference to Germany.



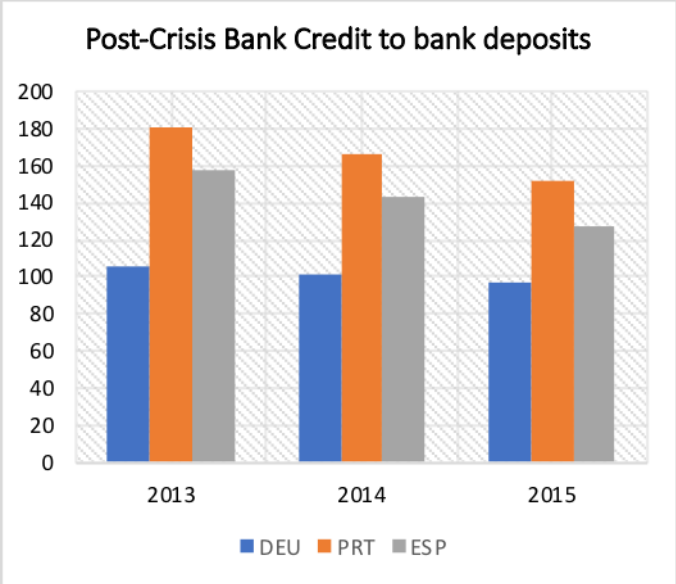
Graph 42- Post-Crisis Lerner Index.
Own elaboration (Data from the World Bank Database)



Graph 43- Post-Crisis Boone Indicator.
Own elaboration (Data from the World Bank Database)

The necessary measures which were applied to save the Euro zone's financial system, trying to make it sounder and stable made the risk did not change from the pre-crisis levels. Some countries' risks were more mitigated than others thanks to these restructuring processes as it is the case of Portugal, even though with time its risk level has come back to the square one.

At the end, all seem that competition, concentration and risk levels did change but not as much as it was expected after the implementation of these measures. It is true that along these last 10 years, these countries and their financial systems have experienced different regulation processes, financial disasters, encompassing bankruptcies, bailouts, government aids, many mergers and acquisitions by large financial institutions that they might have driven to a lack of diversification and that is way it may be one of the consequences of the crisis but at the same time, one reason which explains these results analysed previously.



Graph 44-Post-Crisis Bank Credit to Bank Deposits ratio. Own elaboration (Data from the World Bank Database)

5.2.3.France and Spain

Pre-crisis: France and Spain

Within the European Union, not all countries were affected in the same way, nor did they have the same restructuring process. France, like many countries, was affected by the financial crisis. However, during the worst part of it (2008-2010), the country did better than other industrialized countries in the EU. As an example, the Euro zone's overall GDP decreased by 4%, while France's GDP only decreased by 2.2%.

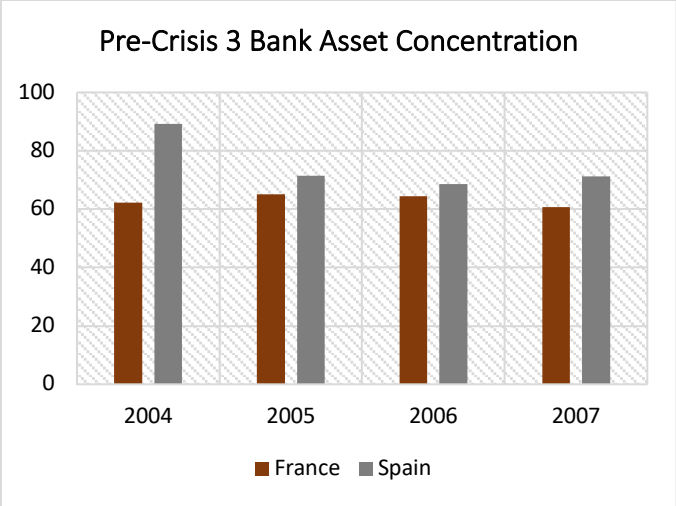
This resilience is linked to France's social protection system, which provides France with strong economic stabilizers. However, these stabilizers weigh inversely on recovery. Starting in 2012, many countries experienced economic recoveries, where the analysis of the indicators of economic activity in France does not show a clear recovery or rather do not show an increased growth during this time.

In the particular case of France the restructuring was scarce and the recapitalization was lower than countries like Spain and Ireland, being less than half the amount needed for the last two. In terms of GDP, the recapitalization represented 1.23% of the GDP of the nation by 2012. Likewise, the measures for the purchase of assets and guarantees on assets

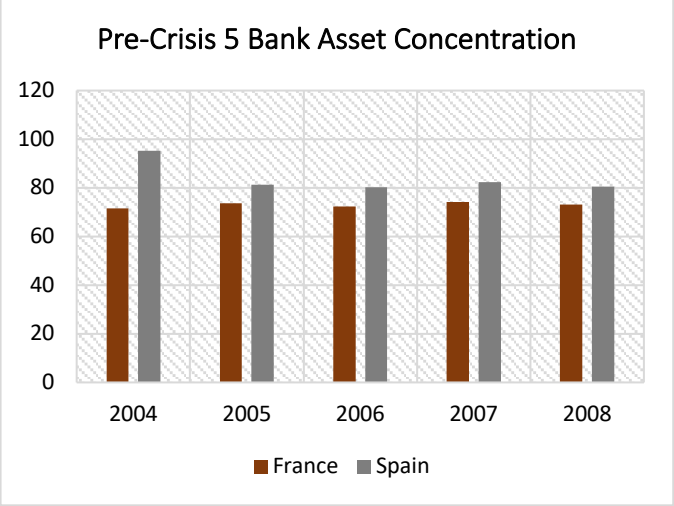
stayed at 1.2 billion (€) or 0.06% of GDP by 2012, the second lowest in the EU only above Italy.

The concentration of the banking system was very similar for these two countries, being slightly bigger in the case of Spain. It remains steady and stabilized for the last years before the onset of the global financial crisis.

Nonetheless, it is remarkable to highlight the large levels of concentration that both countries already had during the pre-crisis periods, reaching up to 70% bank concentration in Spain and roughly the 60% in France. These high levels of concentration can be reflected in the market share of the 5 largest banks of the countries at that time, which exceed 50%.

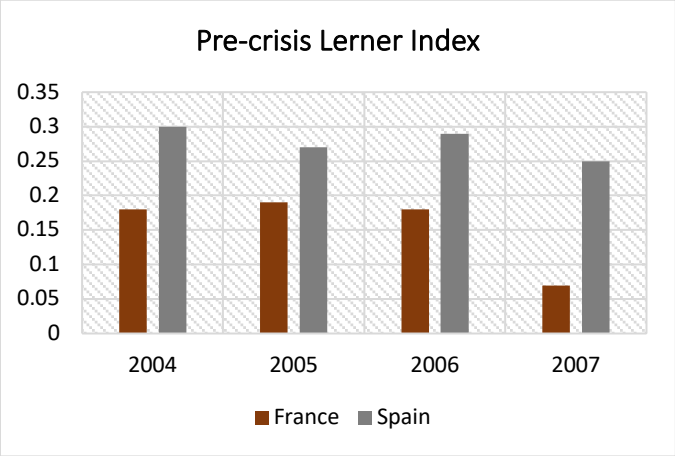


Graph 45- Pre-Crisis 5 Bank Asset Concentration ratio. Own elaboration (Data from the World Bank Database)

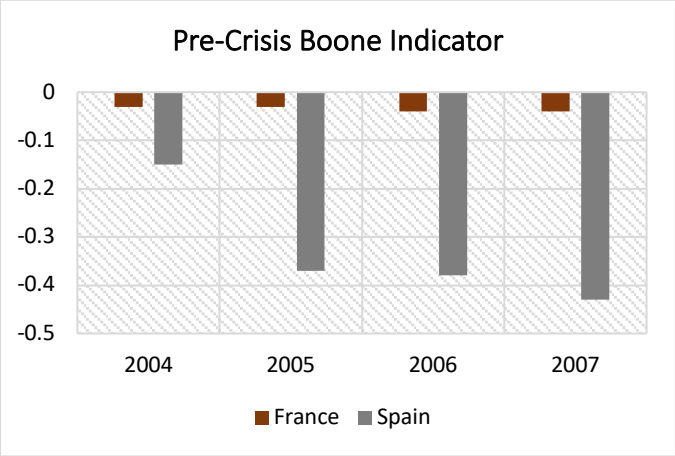


Graph 46- Pre-Crisis 5 Bank Asset Concentration ratio. Own elaboration (Data from the World Bank Database)

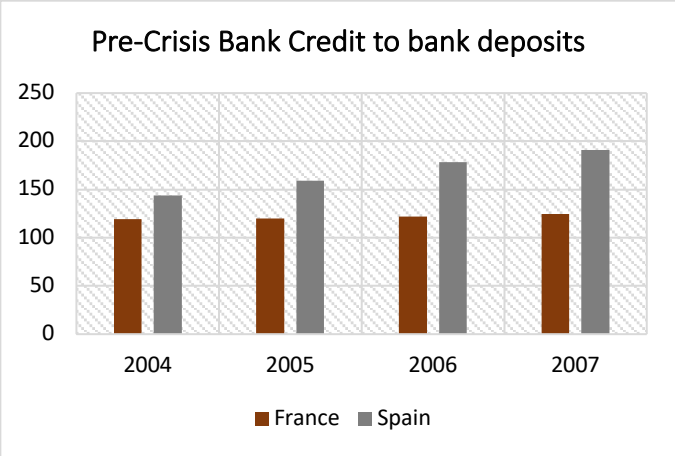
In terms of competition, the Lerner and Boone indicators (Graphs 47-48) show us that the levels of competition in Spain were greater than those in France. This fact represents a major competitiveness based on profit-efficiency in the Spanish banking market; in the particular case of the Boone Indicator, more negative values suggest higher the degree of competition because the effect of reallocation is stronger.
These differences in competition levels can be related to the concentration levels in terms of what Spain presents a more concentrate banking sector and, therefore, higher power market between the top banks.



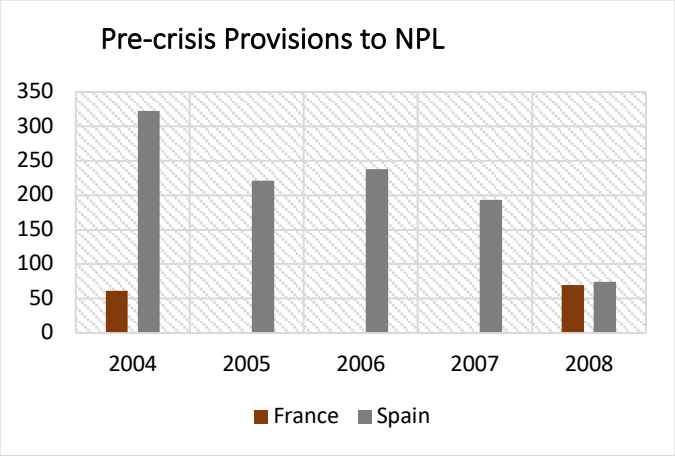
Graph 48- Pre-Crisis Bank Credit to Bank Deposits ratio. Own elaboration (Data from the World Bank Database)



Graph 47- Pre-Crisis Boone Indicator. Own elaboration (Data from the World Bank Database)



Graph 49- Pre-Crisis Lerner Index. Own elaboration (Data from the World Bank Database)

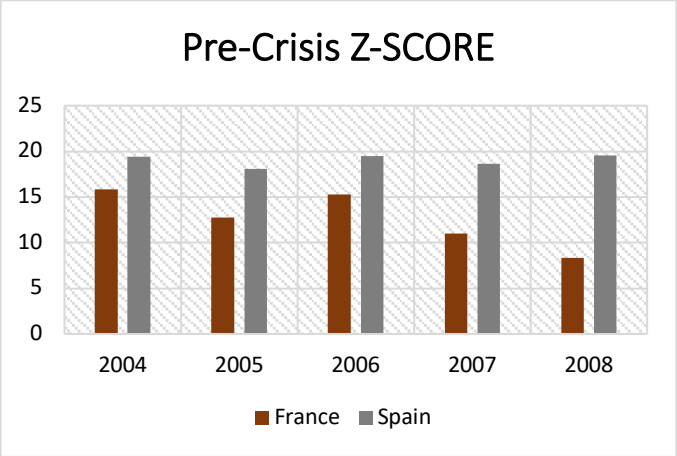


Graph 50- Pre-Crisis Provisions to NPL ratio. Own elaboration (Data from the World Bank Database)

The banking sector of these two European countries had a latent risk despite the size and recognition of their banks. As we mention before, the market power was in a few entities and the possibility of falling into a crisis or recession if any of them got affected by a credit default was high.

Taking graphs 49 and 50 and as reference, we can observe that the Spanish banks have a higher value of the ratio credit-to-deposits than French banks (despite the lack of information in France between 2005 and 2007). It can be appreciated how provision made for Non-Performing Loans were significantly bigger in 2004 than in 2008 for Spain and how the differences between 2004 and 2008 in France remained at similar levels, making the differences decrease between one and other. This fact could be considered an important source for what will come later in terms of coverage and losses from bad credit.

In addition to this, the probability of insolvency in France increases significantly, almost doubling the chances according to the data. In the case of Spain, this probability remains without significant variations. These features would have to do with the respective characteristics of each country in terms of regulation; while Spain keeps it a much-regulated sector, France is characterized by having liberalized its financial sector many years ago.



Graph 51- Pre-Crisis Z-SCORE.
Own elaboration (Data from the World Bank Database

Crisis: France and Spain

From 2008 until 2012 the worldwide banking system saw how decisions made during the previous years led to big losses and to put on the table the debate about how the permanence of financial entities in the industry was endangered. Hence, big banks from France and Spain were not the exception, although is safe to say that Spain suffered more since not only the concentration levels but also the reduction of provision for bad credit and the increment on the credit-to-deposits ratio impacted on the Spanish banking system significantly.

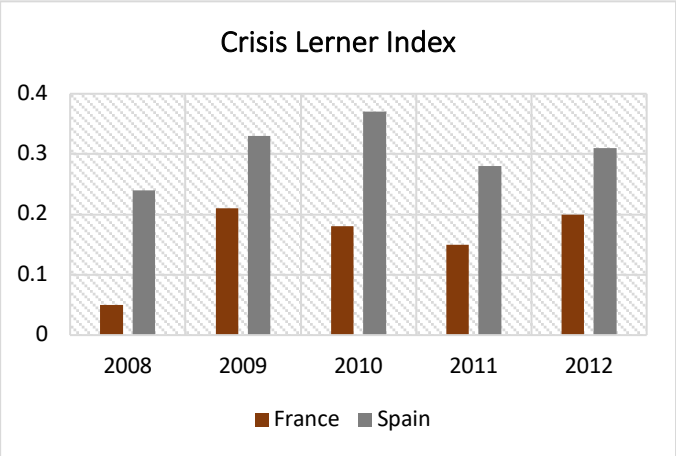
In the end, the scale of the contraction in 2008 and 2009 did not differ greatly from that in the main European countries. At the trough of the cycle, France loss was 3.5% of their pre-crisis level output, a significant smaller figure compared to the 6.0% seen in other European countries like Germany or the UK. In terms of this comparison, Spain stood out as the country that underwent the sharpest fall in its domestic demand, more than double that recorded in other economies like Germany, Italy, and the aforementioned France.

In France, although the impact was not as deep as in Spain the big banks did notice an important fall in their activities and their annual accounts due to their presence in many countries around the world that had more exposure to the financial crisis.

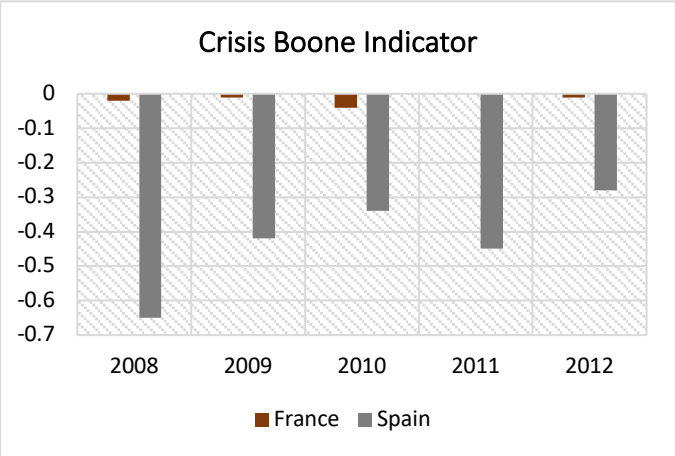
The duration of the contraction in Spain was six quarters, if the growth in GDP is used as the main measurement variable, and around the same period for most variables (private consumption, investment in capital goods, exports and imports). But the fall in terms of the investment in construction and its value added continues, after 15 consecutive quarters of decline, as it does in terms of employment.

Consequently, some smaller banks (saving banks in the case of Spain) started to get in default and the competition began to emerge, as we can see in graph 52 below the competition levels soar in 2009 and reach maximum levels in 2010, in this way, the big banks begun to collect market share as smaller banks started to get into default.

In addition to this, it is notable how the concentration levels have grown symmetrically in both countries, with the only distinction of the dramatic increase in France by 2009, Moreover, the Boone Indicator suggests that the effects caused by savings and loan banks on competition. This made necessary the development of a prompt restructuring plan in Spain.



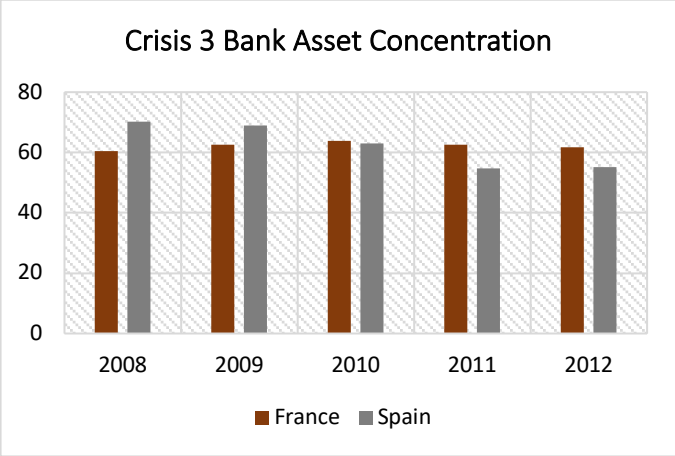
Graph 52- Crisis Lerner Index.
Own elaboration (Data from the World Bank Database)



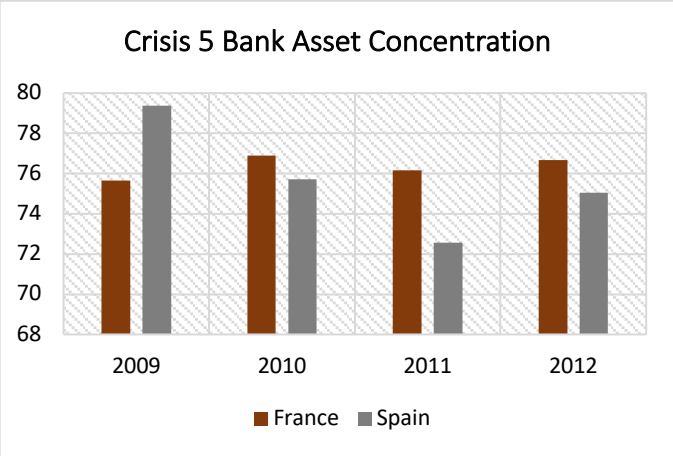
Graph 53- Crisis Boone Indicator.
Own elaboration (Data from the World Bank Database)

In terms of concentration, the number of small Spanish banks (mainly saving banks) was significantly reduced through mergers, which made a way to new medium-sized banks, and acquisitions processes by larger entities. This new scenario diminished the competition, as its observable in the graphs below, the market share remains the same for the top banks in the country. On the other hand, France did not experience any relevant case of bank restructuring or legal obligation to intervene a credit entity.

This disparity established a solid statement on how countries with similar features but different approaches in terms of the functioning of the banking industry are not able to face adverse market and financial conditions with the same easiness.



Graph 54- Crisis 3 Bank Asset Concentration ratio.
Own elaboration (Data from the World Bank Database)

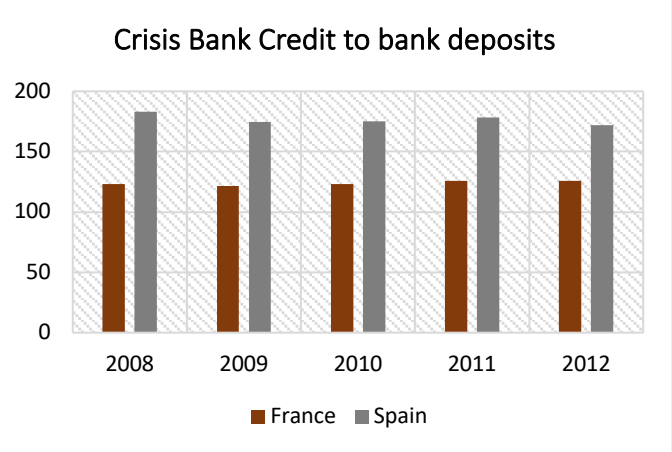


Graph 55- Crisis 5 Bank Asset Concentration ratio.
Own elaboration (Data from the World Bank Database)

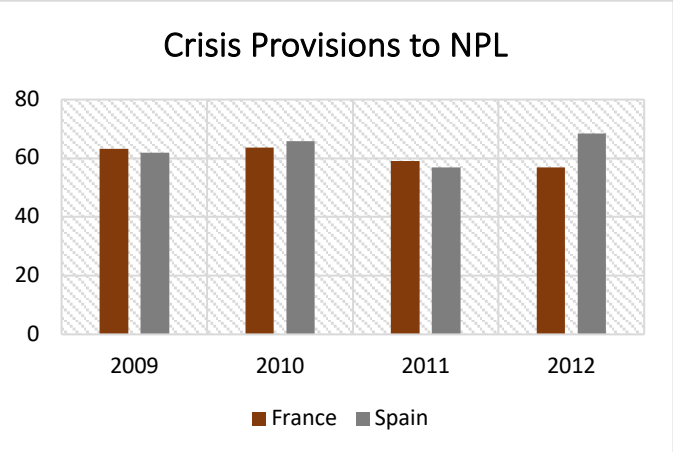
Effects on Risk

When financial instability began to spread to EU countries, the banking conditions were not completely accurate to face this negative scenario. As it can be seen in the graphs below, the ratio bank's credit-to-deposits was higher in France and even more in Spain. In the same way, the provisions made for NPL were significantly lower in Spain; while France, anticipating an upcoming eventuality maintained its provision levels, even setting them above pre-crisis levels.

As a result, the measures and processes implemented from 2008 and the following years were very different between these two banking systems. Spain falls into a mandatory process of restructuring and recapitulation, while France manages to minimize the effects and consequences of the crisis after the troubles it went through in the first years.

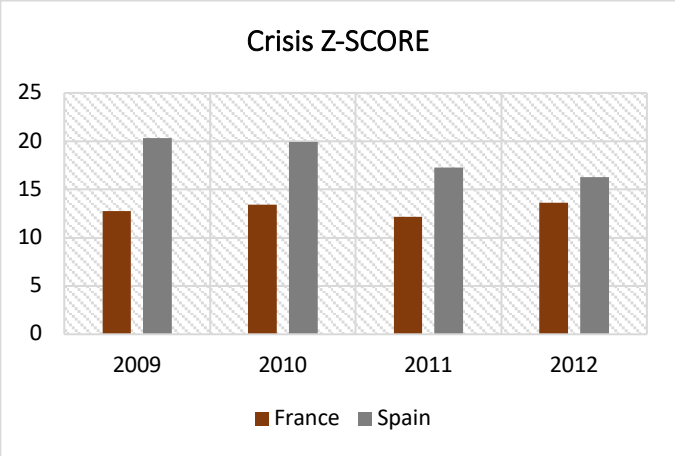


Graph 56- Crisis Bank Credit to Bank deposits ratio.
Own elaboration (Data from the World Bank Database)



Graph 57- Crisis Provisions to NPL ratio.
Own elaboration (Data from the World Bank Database)

Another relevant fact is how the probability of bankruptcy kept very low, even lower than in France in spite of the exposure to the housing market, the low coverage ratios and the bursting of the credit bubble. The main reasoning behind this fact could be understood in terms of the regulated character of the Spanish banking system.

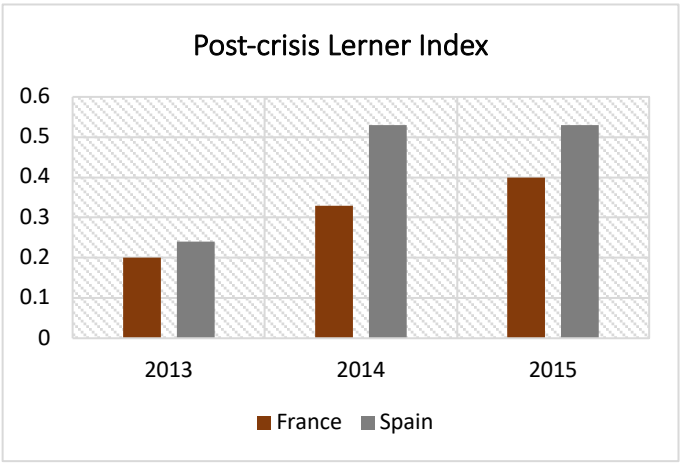


Graph 58- Crisis 3 Z-SCORE.
Own elaboration (Data from the World Bank Database)

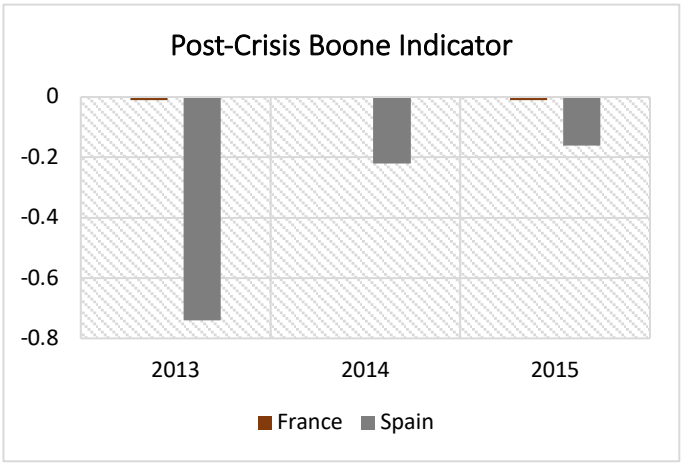
Post-crisis: France and Spain

After five years of deep recession and the implementation of unconventional monetary policies by the ECB, slight signs of recovery have begun to surface.

In the aftermath of the financial crisis, data reflect an increase in terms of the levels of competition among banks (despite the small downward deviation in 2013 for Spain). This can be explained from the absorption of small and medium banks by the large ones, turning them more competitive between one and other. Moreover, the Boone Indicator shows that Spanish banks have gotten solid efficiency levels allowing them to get higher profits and bigger market share.



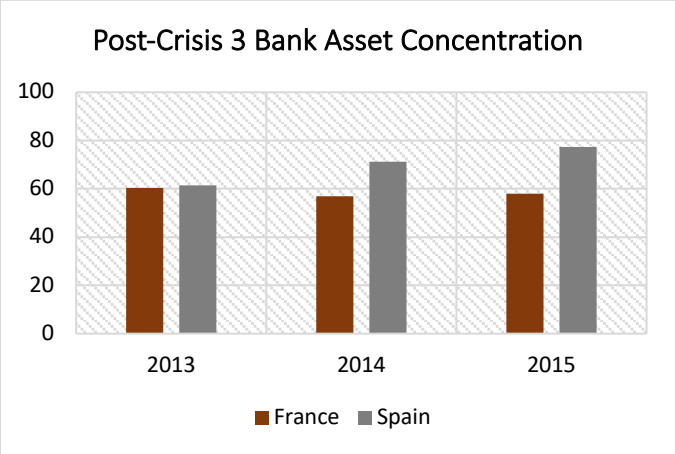
Graph 59- Post-crisis Lerner Index.
Own elaboration (Data from the World Bank Database)



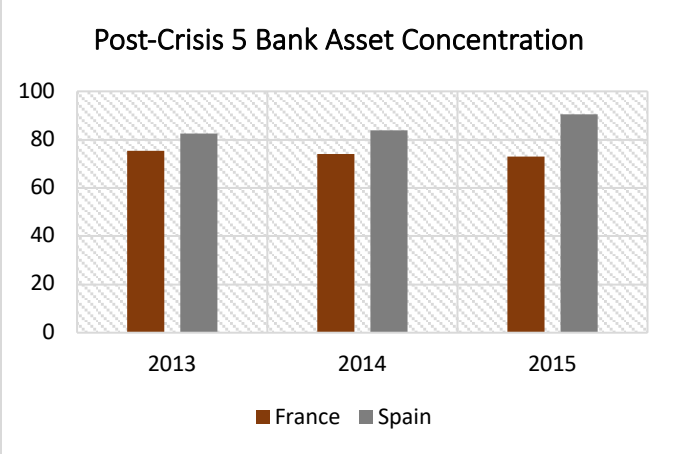
Graph 60- Post-crisis Boone Indicator.
Own elaboration (Data from the World Bank Database)

Likewise, the market concentration in the sector is higher in the Spanish case than in France. In Spain, saving banks were gathered and turned into medium-sized institutions, while others were absorbed by big banks, resulting in fewer entities and bigger concentration ratios. This was not the case in France. The conditions set before the crisis and the measures applied just by the time the international exposure began to alter the stability of banking sector helped to avoid the default and bankruptcy of its banks.

According to data from the World Bank Financial Development Database, another relevant difference between both countries related to concentration was the variation rates in the number of bank offices during the restructuring process. While in Spain the downward was about 17%, in France it was only of 3%, avoiding the distressing position in which many people lost their jobs, driving the unemployment to rates even higher.

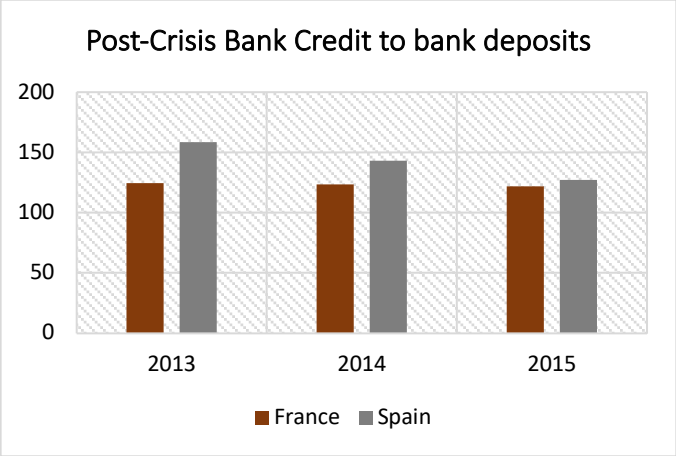


Graph 61- Post-crisis 3 Bank Asset Concentration ratio. Own elaboration (Data from the World Bank Database)

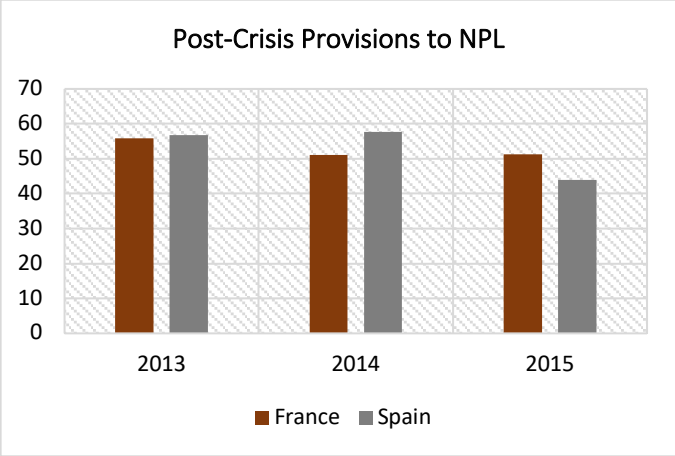


Graph 62- Post-crisis 5 Bank Asset Concentration ratio. Own elaboration (Data from the World Bank Database)

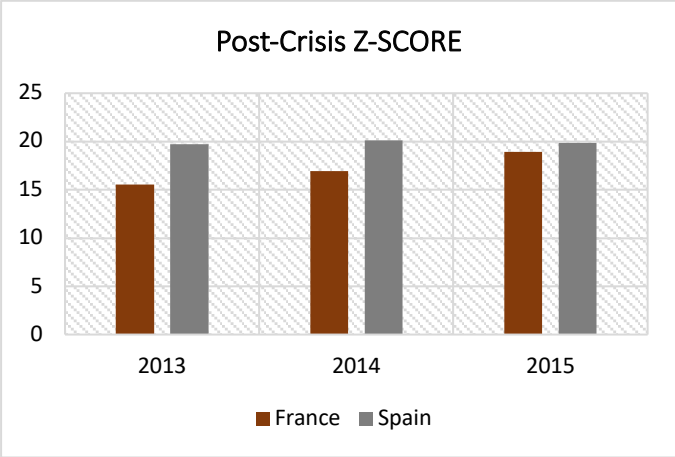
At this stage, the levels of risk were stabilized, driving liquidity and solvency ratios to safe levels. In the specific case of Spain, this was possible mainly because of the banking bailout and the orderly restructuring process carried out. France, however, did not need big reforms due to its financial innovation, policies, and early resolution mechanisms.



Graph 64- Post-crisis Bank Credit to Bank Deposits ratio. Own elaboration (Data from the World Bank Database)



Graph 63- Post-crisis Provisions to NPL ratio. Own elaboration (Data from the World Bank Database)



Graph 65- Post-crisis Z-SCORE. Own elaboration (Data from the World Bank Database)

When referring to the post-crisis values of the bank Z-SCORE, it can be said that the probabilities of default decrease in both the Spanish and French banking market, although it seems that in the case of Spain, the increase of the bank Z-SCORE is even more relevant than in the case of France.

In conclusion, despite the similitude in terms of size and structure of both countries and the far-reaching liberalization of the French banking system over the past twenty years, French banks suffered far less during the international financial crisis (2007–2012) than banks in Spain and other EU countries, like Germany and the UK. Nonetheless, the French system also suffered far more at the beginning of the crisis than the banking systems of Southern Europe, due to highly exposition to international markets movements and loss in competitiveness, mainly.

Hence, the limited impact of the crisis was owed to the specifications of French "market-based banking". The state action years before the crisis created a specific sort of banking system and encouraged forms of financial innovation that made possible to avoid the big exposure to credit and securitization that caused must of the damage during the financial crisis.

6. ECONOMETRIC ANALYSIS

In this following section we are going to present the results of our analysis. We have conducted several linear regressions (Ordinary Least Squares – OLS methodology) in order to test the basic objective of our work, this is, to examine the impact of the global financial crisis on banking market concentration, competition and risk. Since we have been talking about concentration, competition, and risk, again defining them as dependent variables and explaining their behavior will be the main goal of this empirical analysis.

The analysis has been performed in the following way. There are four different tables, (Table 5-8) which represent two different sections. The first section, composed by the first two tables, will show concentration and competition as the dependent variables. The second section, composed by the last two tables, will show risk as the dependent variable.

The independent variables used in the analysis to explain the changes in concentration, competition, and risk are: the ratio Bank Deposits-to-GDP; Net Interest Margin; and a dummy variable regarding the POSTCRISIS period, which will allow us to certify what has been the effect of the crisis episode on the variables of interest and if the relationship between dependent and independent variables has changed after the restructuring processes. Moreover, and in order to control for potential misspecification of the empirical models, if for example we are explaining concentration or competition risk variables will be taken into account as independent variables in the regression and vice versa. However, and following previous literature, when explaining competition we will not use concentration because of the high level of correlation between them. This also applies to the use of concentration as dependent variable.

All the explanatory variables are lagged by one period in order to control for potential endogeneity problems between the explanatory variables and the dependent variables. Moreover, in all estimations we include a set of country-level dummy variables, and a set of country-year dummy variables in order to better define the econometric model.

We also thought that it would be interesting to observe if these regressions were different when only taking into account the so called PIIGS countries: Portugal, Italy, Ireland, Greece and Spain. During the debt crisis these countries were a huge target for financial instability. All of them are considered by the financial markets to have weak financial systems, and this was shown when the contagion effect, started by Greece on 2010, spread throughout the other countries by highly increasing the premiums on their public debt.

6.1. GLOBAL FINANCIAL CRISIS, BANK CONCENTRATION AND MARKET POWER: ALL THE COUNTRIES

In this section we examine the effect of the global financial crisis on bank market structure (concentration) and competition. Results are shown in Table 5.

Within each panel of Table 5 we can observe two columns, one is the regression that includes the BANK DEPOSITS as a variable of risk and the other one uses NPL for the same purpose. Additionally, as it is shown in the table, Net Interest Margin does not affect, neither positively or negatively, competition and concentration. Starting from that point it will be interesting if we analyze each dependent variable individually in order to draw conclusions:

Banking Market Concentration (3 Banks) – Panel A

- By using BANK DEPOSITS: The significant variables are: POSTCRISIS, Z-SCORE and BANK DEPOSITS. These three variables are significant with, at least, a 95% level of confidence. Having POSTCRISIS as a significant variable means that after the restructuring process the level of bank market concentration has systematically increased on 2.2356 (fixed amount in the regression when considering periods over 2011-2012) . Thus, we can now state that the restructuring process under this OLS analysis has had a positive and statistically significant effect on bank concentration. Additionally, the fact that the beta for the Z-SCORE of (t-1) is negative means that when there are higher levels of financial stability concentration will tend to reduce in 0.1914.
- By using NPL: The significant variables are: NPL and BANK DEPOSITS. The two variables are significant with a 99% level of confidence. According to this OLS regression, when the level of NPL from the year before increases, current concentration increases as well on 0.264. This could be explained by the fact that some banks might have disappeared or reduce their market share due to the increase of NPL.

For both regressions, the higher the significance of the banking sector is in the country, the lower the concentration is. However, this beta for the Z-SCORE regression, is not big enough to establish a direct relationship, which means that the increase of the financial system can be cause for an increase in competition but also an increase of the size of the 3 biggest banks.

Banking Market Concentration (5 Banks)-Panel B

- By using Z-SCORE: The significant variables are: POSTCRISIS and Z-SCORE. These two variables are significant with, at least, a 95% level of confidence. The first variable shows, that the restructuring process has affected not only concentration in the 3 largest banks but also in the 5 largest ones. Again, this regression shows that the higher the stability of the economy the lower the concentration level in the

banking market. However, if we compare the betas for the Z-SCORE of (t-1) we can see how an increase in financial stability of last year will affect 0.0729 (0.01914-0.1185) times more the 3 largest banks than the 5 ones.

- By using NPL: The significant variables are: POSTCRISIS, NPL and BANK DEPOSITS. These three variables are significant with, at least, a 90% level of confidence. Again, it is demonstrated that the restructuring process has shown itself to have an impact on the concentration level of the 5 largest banks. Moreover, the increase in non-performing loans will also increase concentration, the same as a reduction of the significance of the banking system over the GDP.

It is important to observe than when we consider the 5 largest banks in the country's economy in comparison to the 3 biggest one, every beta decrease. This means that if we increase the number of banks considered in the analysis the effects of the restructuring process and the changes in the independent variables tend to be less significant.

Lerner Index, Competition- Panel C

- By using Z-SCORE or NPL the only variable that turned out to be significant has been the dummy variable identifying the post-crisis episode (POSTCRISIS) with a 90% level of confidence.[17] The restructuring process has had the highest impact of competition, by reducing it. It is stated by the OLS methodology that competition has decreased after the crisis between 9.16-10.47, which are very significant numbers, because the Lerner index has increased.

The results of this first analysis allow us to state that, globally considered, the global financial crisis and the restructuring processes that took place during the years after the onset of the crisis period, increased the level of concentration in the banking industry and also transmitted in terms of higher levels of market power of the surviving entities.

[17] *These results were surprising, because we expected the NET INTEREST MARGIN to be the most significant one, as we know the index is based on banks margins.*

This table presents the results examining the effect of the GFC on bank market concentration and on the Lerner index. POSTCRISIS is a dummy variable that takes value 1 during the post-crisis years, and 0 otherwise. The post-crisis period is defined as 2011-2015 in the case of US and United Kingdom and 2012-2015 for the rest of the countries. Panel A, B, and, C present the results using the ratio assets from the three largest banks-to-total assets in the banking industry, the assets of the five largest banks-to-total assets of the banking sector, and the Lerner index as dependent variables, respectively. ZSCORE is the natural logarithm of the Z-SCORE. Z-SCORE is the return on assets plus the capital asset ratio divided by the standard deviation of asset returns. NPL is the ratio of nonperforming loans-to-total loans. BANK DEPOSITS is measured as the ratio bank deposits-to-GDP. NET INTEREST MARGIN is the bank net interest margin. The explanatory variables are lagged 1 period in order to avoid potential endogeneity concerns. All the variables are provided by the World Bank Financial Development Database. ***; ** and * indicate statistical significance at 1, 5, and 10 percent, respectively.

	PANEL A: Bank Concentration (3 banks)		**PANEL B: Bank Concentration (5 banks)**		**PANEL C: Lerner Index**	
	(1)	**(2)**	**(4)**	**(5)**	**(6)**	**(7)**
POSTCRISIS	2.2356**	0.5168	3.1211***	1.9686***	9.1623*	10.4738*
	(2.38)	(0.50)	(4.73)	(2.69)	(1.84)	(1.89)
Z-SCORE$_{t-1}$	-0.1914**		-0.1185**		-0.4697	
	(-2.43)		(-2.14)		(-1.13)	
NPL$_{t-1}$		0.2641***		0.1810***		-0.4450
		(2.74)		(2.68)		(-0.87)
BANK DEPOSITS$_{t-1}$	-0.0970***	-0.1029***	-0.0353	-0.0397*	-0.1823	-0.1470
	(-2.94)	(-3.11)	(-1.52)	(-1.71)	(-1.04)	(-0.83)
NET INTEREST MARGIN$_{t-1}$	3.78e-13	8.76e-13	3.22e-12	3.56e-12	-1.12e-08	-2.21e-08
	(0.04)	(0.10)	(0.50)	(0.56)	(-0.02)	(-0.05)
Country dummies	YES	YES	YES	YES	YES	YES
Country-Year dummy	YES	YES	YES	YES	YES	YES
R^2	0.8722	0.8731	0.9192	0.9202	0.6391	0.5544
# Observations	242	242	242	242	242	242
# Countries	22	22	22	22	22	22

Table 5-Global Financial Crisis, Bank Concentration and Market Power: All the Countries

6.2. GLOBAL FINANCIAL CRISIS, BANK CONCENTRATION AND MARKET POWER: TYPES OF COUNTRIES

In this section we check the effect of the global financial crisis on market concentration and competition by splitting the sample of countries into PIIGS and non-PIIGS countries. The objective is to check if the global financial crisis had a homogenous impact on the characteristics of the banking sector across countries or not. The results are shown in Table 6.

Within each panel of Table 6 we can observe two columns, one is the regression that has used all the data only from the PIIGS countries and the other one has excluded the data from the PIIGS countries.

Banking Market Concentration (3 Banks)-Panel A

- PIIGS: The significant variable is POSTCRISIS, with a 99% level of confidence. It is interesting to see how the restructuring process has affected only the PIIGS when considering the three largest banks. This is shown by the fact that for the NO PIIGS POSTCRISIS variable is not significant. Also, we can outline the relevant number of the beta for this dummy variable, which is 5.6232.

- NO PIIGS: The significant variable is BANK DEPOSITS, with a 99% level of confidence. This result means that the importance of the banking system is terms of the GDP of these countries the lower the concentration levels are found. The fact that this variable was not significant in the PIIGS may have been a matter of data, due to the low amount of observations (55).

Bank Concentration (5 Banks)- Panel B

- PIIGS: The significant variables are POSTCRISIS, Z-SCORE and NET INTEREST MARGIN. The confidence level for the three variables is, at least, 90%. The table shows how the restructuring process has highly affected the PIIGS, but when using the bank market concentration of the 5 largest banks the NO PIIGS countries have also shown to be affected by the resolution mechanisms taken during the crisis. However, it is worth mentioning that for the PIIGS the changes undertook have affected concentration 4.6975 times more. Again, increases in financial stability decrease the level of concentration. NET INTEREST MARGIN from (t-1) only appears in the regression as significant, with a level of confidence of 10%. The interpretations of the results state that when there is an increase in the NET INTEREST MARGIN there is a decrease of 1.5424 in the concentration of the 5 biggest banks. This result could be explained by the fact that banks with higher levels of margins, maybe have less important incentives to invest on higher levels of assets and, therefore, to increase market share.
- NO PIIGS: The two significant variables are: POSTCRISIS and BANK DEPOSITS. For the two variables the confidence level reaches, at least, 95%. As in the regression of the concentration of the 3 biggest banks BANK DEPOSITS variable seems to be significant again. Changes are found in the POSTCRISIS variable, which have already been commented.

Lerner Index- Panel C

As it was also shown in the previous table, for both groups of countries, the only significant variable with at least 95% of confidence level is the POSTCRISIS dummy variable. Like in Table 5the variable has the exclusive power of change the Lerner Index. The only thing to comment is how in the PIIGS competition is more affected and with a higher level of confidence than in the NO PIIGS countries.

In sum, it can be stated that, although the global financial crisis has affected the entire sample of countries in terms of concentration and competition levels, it seems that in the PIIGS countries, its effect has been stronger than in the NO PIIGS countries. This result is consistent with the fact that PIIGS countries are the ones mostly affected by the crisis episode and in which the resolution and intervention policies have been more important in order to overcome the worst consequences of the crisis.

This table presents the results examining the effect of the GFC on bank market concentration and on the Lerner index distinguishing between PIIGS and non PIIGS countries. POSTCRISIS is a dummy variable that takes value 1 during the post-crisis years, and 0 otherwise. The post-crisis period is defined as 2011-2015 in the case of US and United Kingdom and 2012-2015 for the rest of the countries. Panel A, B, and, C present the results using the ratio assets from the three largest banks-to-total assets in the banking industry, the assets of the five largest banks-to-total assets of the banking sector, and the Lerner index as dependent variables, respectively. ZSCORE is the natural logarithm of the Z-SCORE. Z-SCORE is the return on assets plus the capital asset ratio divided by the standard deviation of asset returns. NPL is the ratio of nonperforming loans-to-total loans. BANK DEPOSITS is measured as the ratio bank deposits-to-GDP. NET INTEREST MARGIN is the bank net interest margin. The explanatory variables are lagged 1 period in order to avoid potential endogeneity concerns. All the variables are provided by the World Bank Financial Development Database. ***; ** and * indicate statistical significance at 1, 5, and 10 percent, respectively.

	PANEL A: Bank Concentration (3 banks)		**PANEL B: Bank Concentration (5 banks)**		**PANEL C: Lerner Index**	
	PIIGS	**NO PIIGS**	**PIIGS**	**NO PIIGS**	**PIIGS**	**NO PIIGS**
POSTCRISIS	5.6232*** (2.78)	0.6238 (0.60)	6.2885*** (4.28)	1.5591** (2.31)	29.0693** (2.53)	11.8772* (1.84)
Z-SCORE$_{t-1}$	-0.4833 (-1.40)	-0.1272 (-1.61)	-0.5138** (-2.04)	-0.0506 (-0.98)	0.7103 (0.36)	-0.5454 (-1.11)
BANK DEPOSITS$_{t-1}$	0.0508 (0.38)	-0.1211*** (-3.65)	0.0884 (0.91)	-0.0585*** (-2.70)	0.7651 (1.01)	-0.1889 (-1.11)
NET INTEREST MARGIN$_{t-1}$	-1.4404 (-1.18)	4.66e-13 (0.05)	-1.5424* (-1.74)	3.30e-012 (0.57)	-4.6980 (-0.68)	-1.38e-08 (-0.03)
Country dummies	YES	YES	YES	YES	YES	YES
Country-Year dummy	YES	YES	YES	YES	YES	YES
R^2	0.7357	0.8985	0.8488	0.9730	0.3990	0.6490
# Observations	55	187	55	187	55	187
# Countries	5	17	5	17	5	17

Table 6-Global Financial Crisis, Bank Concentration, and Market Power: Types of Countries

6.3. GLOBAL FINANCIAL CRISIS AND BANK RISK: ALL THE COUNTRIES

We now test the impact of the global financial crisis on bank risk, taking into account the changes in terms of banking market concentration and competition as potential explanatory variables of the observed change in risk-levels. Results for this empirical test are shown in Table 7.

Within each panel of Table 7 we can observe two columns: one shows the regression that includes the level of each variable in previous years, in order to see if current levels of risk are affected by past levels of risk, and another column that does not include it. Additionally, we have included the Lerner Index as a variable that would represent competition on the year 2015 (LERNER2015). The idea of including LERNER2015 is that the new level of competition in the banking market as a result of the crisis episode could be on the origin for understanding the impact of the crisis on the levels of bank risk. We did not include concentration variables because of the problems they would have caused in the regressions due to its high correlations with competition (not independent variables). Additionally, we can observe that NET INTEREST MARGIN is not significant to any of the variables. Starting from that point it will be interesting if we analyze each dependent variable individually in order to draw conclusions:

Z-SCORE-Panel A

- With Z-SCORE (t-1) and without it: The significant variables are POSTCRISIS and LERNER2015. Certainly, the restructuring processes and recapitalization measures have affected the level of stability by increasing it (by almost the same amount). The significant coefficient for the POSTCRISIS dummy variable indicates that the post-crisis years positively affected the ZSCORE variable and, therefore, the stability of the banking market.
  The significance of the LERNER2015, however, shows how the decrease of competition on 2015 could have increased the risk of the banking sector. This result is consistent with the argument that the higher level of bank market power that we observe after the resolution and intervention policies in the banking market are negatively related to bank stability. In other words, the reduction in competition levels occurred in the years after the crisis help to reduce the level of risks in the banking sector.

NPL- Panel B

- Without NPL (t-1): the significant variables are POSTCRISIS and BANK DEPOSITS. These two variables are significant with a level of confidence of 99%. The table shows how after the crisis the level of risk, measured by NPL has increased in 4.4489.
- With NPL (t-1): the significant variables in this case are again NPL (t-1) and BANK DEPOSITS. These two variables are significant with a level of confidence of, at least, 95%. In the OLS presented in column (4) the NPL POSTCRISIS variable is not significant, however it shows by the significance of NPL (t-1) how previous levels of risk related to previous percentage of NPL affect the current level of risk. This relationship is positive, and this would mean that the trend of risk across time will be positive, which can present problems and threats for the stability of the financial system.

Both regressions consider BANK DEPOSITS as a significant variable. Non-Performing loans ratio is dependent on the total number of deposits in the economy. Therefore, it could be expected that the increase in this variable will increase risk-level in terms of NPL, as this variable would be a good proxy for credit risk.

On one hand, an overall result, we can conclude that the restructuring process has increased the level of stability. However, it has also reduced competition, which at the same time reduces the Z-SCORE or, again financial stability. Thus, we can state that the restructuring process, seen from a global perspective has: increase stability but has created market conditions that could be very significant for future negative shocks in the economy.

This table presents the results examining the effect of the GFC on bank risk. POSTCRISIS is a dummy variable that takes value 1 during the post-crisis years, and 0 otherwise. The post-crisis period is defined as 2011-2015 in the case of US and United Kingdom and 2012-2015 for the rest of the countries. Panel A and B present the results using the ZSCORE and the NPL as dependent variables, respectively. ZSCORE is the natural logarithm of the Z-SCORE. Z-SCORE is the return on assets plus the capital asset ratio divided by the standard deviation of asset returns. NPL is the ratio of nonperforming loans-to-total loans. LERNER2015 is the level of bank market power of each country in 2015 (resulting from the crisis episode). BANK DEPOSITS is measured as the ratio bank deposits-to-GDP. NET INTEREST MARGIN is the bank net interest margin. The explanatory variables are lagged 1 period in order to avoid potential endogeneity concerns. All the variables are provided by the World Bank Financial Development Database. ***; ** and * indicate statistical significance at 1, 5, and 10 percent, respectively.

	PANEL A: Z-SCORE		**PANEL B: NPL**	
	(1)	**(2)**	**(3)**	**(4)**
POSTCRISIS	2.6899***	2.6157***	4.4489***	-0.3232
	(3.53)	(3.37)	(6.03)	(-0.69)
$Z\text{-}SCORE_{t-1}$		0.0354		
		(0.52)		
NPL_{t-1}				0.9410***
				(21.57)
$LERNER_{2015}$	-0.0002***	-0.0002***	-2.10e-0.7	4.82e-08
	(-4.96)	(-4.59)	(-0.49)	(0.20)
$BANK\ DEPOSITS_{t-1}$	-0.0405	-0.0386	0.0713***	0.0313**
	(-1.47)	(-1.39)	(2.67)	(2.07)
$NET\ INTEREST\ MARGIN_{t-1}$	1.56e-12	1.55e-12	-2.47e-12	-4.72e-13
	(0.21)	(0.21)	(-0.34)	(-0.12)
Country dummies	YES	YES	YES	YES
Country-Year dummy	YES	YES	YES	YES
R^2	0.6758	0.6762	0.4943	0.8397
# Observations	242	242	242	242
# Countries	22	22	22	22

Table 7-Global Financial Crisis and Bank Risk: All the Countries

6.4. GLOBAL FINANCIAL CRISIS AND BANK RISK: TYPES OF COUNTRIES

Finally, in this section we present the results of the analysis about the effect of the global financial crisis on bank risk taking into account different subsamples of countries. In particular, we now test if the results are the same than those above presented when we consider potential differences between PIIGS and NO PIIGS countries. The results of this empirical test are shown in Table 8.

Following a similar pattern than in the previous tables, within each panel in Table 8 we can observe two columns: one presents the results of the regression that includes the level of each variable in previous years, in order to see if current levels of risk are affected by past levels of risk, and another column that does not include it. Moreover, again we are going to consider the division between PIIGS countries and NO PIIGS countries in order to assess how risk has changed and how it is affected by other variables.

PIIGS Countries

- Z-SCORE-Panel A

  In this case, the results obtained provide us with no statistically significant coefficients for any of the variables considered in this regression.

- NPL- Panel B

  - Without NPL (t-1): The two significant variables are POSTCRISIS and BANK DEPOSITS. The level of confidence of both variables is 99%. Comparing the POSTCRISIS betas of the PIIGS and NO PIIGS countries, we can see how the risk has increased after the financial crisis more in the PIIGS than in the no PIIGS countries. Only, in the case of the PIIGS countries the BANK DEPOSITS of the previous year affect today's risk. This can be related to the confidence levels of the market in these countries. Moreover, if we take into account that this variable is not significant for the NO PIIGS countries. For example, when the markets started not trusting the PIIGS, the interest rate asked to the banks of these countries increased to unaffordable level, decreasing NET INTEREST MARGINS and increases the risk within the countries.
  - With NPL (t-1): The three significant variables are: NPL (t-1), BANK DEPOSITS and NET INTEREST MARGIN. With a level of confidence of, at least, 90%.

BANK DEPOSIT is a variable affecting NPL with or without considering the risk of the previous years. In both when deposits increase also does the risk measured by NPL.

NO PIIGS Countries

- Z-SCORE-Panel A

  - Without Z-SCORE (t-1) and with Z-SCORE (t-1): The two significant variables are: POSTCRISIS and LERNER2015. The fact that the risk of the NO PIIGS countries can be represented by a regression and the risk of PIIGS countries might be because of the size of the regression. Moreover, this shows how measures during the crisis did affect the risk of these countries in terms of the Z-SCORE and that a decrease of competition reduces risk.

- NPL- Panel B

  - Without NPL (t-1): in this case the significant variables are POSTCRISIS and BANK DEPOSITS. These two variables have a level of confidence of, at least 90%. Regarding PIIGS countries they coincide with both variables, but both betas are smaller. Moreover, BANK DEPOSITS have a lower level of significance.

- With NPL (t-1): The only significant variable is NPL of the previous year. The level of confidence for this variable is 99% with a positive correlation. In this regression NET INTEREST MARGIN has a no statistically significant coefficient. We think that the basic argument for this has to do with the market confidence these countries may have one with another.

This table presents the results examining the effect of the GFC on bank risk distinguishing between PIIGS and non PIIGS countries. POSTCRISIS is a dummy variable that takes value 1 during the post-crisis years, and 0 otherwise. The post-crisis period is defined as 2011-2015 in the case of US and United Kingdom and 2012-2015 for the rest of the countries. Panel A and B present the results using the ZSCORE and the NPL as dependent variables, respectively. ZSCORE is the natural logarithm of the Z-SCORE. Z-SCORE is the return on assets plus the capital asset ratio divided by the standard deviation of asset returns. NPL is the ratio of nonperforming loans-to-total loans. LERNER2015 is the level of bank market power of each country in 2015 (resulting from the crisis episode). BANK DEPOSITS is measured as the ratio bank deposits-to-GDP. NET INTEREST MARGIN is the bank net interest margin. The explanatory variables are lagged 1 period in order to avoid potential endogeneity concerns. All the variables are provided by the World Bank Financial Development Database. ***; ** and * indicate statistical significance at 1, 5, and 10 percent, respectively.

SECTION 1: PIIGS COUNTRIES

	PANEL A: Z-SCORE		**PANEL B: NPL**	
	(1)	**(2)**	**(3)**	**(4)**
POSTCRISIS	0.1724	0.1786	8.5574***	0.0036
	(0.20)	(0.20)	(5.59)	(0.00)
$Z\text{-}SCORE_{t-1}$		0.0260		
		(0.17)		
NPL_{t-1}				0.8053***
				(6.64)
$LERNER_{2015}$	0.0877	0.0837	-0.0631	-0.0141
	(1.53)	(1.34)	(-0.63)	(-0.19)
$BANK\ DEPOSITS_{t-1}$	-0.0589	-0.0556	0.2655***	0.1291*
	(-1.07)	(-0.95)	(2.77)	(1.79)
$NET\ INTEREST\ MARGIN_{t-1}$	0.1644	0.1640	-1.4027	-1.5818**
	(0.31)	(0.31)	(-1.52)	(-2.37)
Country dummies	YES	YES	YES	YES
Country-Year dummy	YES	YES	YES	YES
R^2	0.8171	0.8172	0.7032	0.8484
# Observations	55	55	55	55
# Countries	5	5	5	5

SECTION 2: NO PIIGS COUNTRIES

	PANEL A: Z-SCORE		**PANEL B: NPL**	
	(1)	**(2)**	**(3)**	**(4)**
POSTCRISIS	3.4625***	3.4161***	2.8230***	-0.3519
	(3.67)	(3.51)	(3.61)	(-0.78)
$Z\text{-}SCORE_{t-1}$		0.0161		
		(0.21)		
NPL_{t-1}				0.9582***
				(20.29)
$LERNER_{2015}$	-0.0002***	-0.0002***	-0.0002	1.55e-08
	(-4.49)	(-4.22)	(-0.71)	(0.07)
$BANK\ DEPOSITS_{t-1}$	-0.0363	-0.0356	0.0438*	0.0174
	(-1.15)	(-1.12)	(1.68)	(1.24)
$NET\ INTEREST\ MARGIN_{t-1}$	1.48e-12	1.48e-12	-2.35e-12	-4.70e-13
	(0.18)	(0.18)	(-0.35)	(-0.13)
Country dummies	YES	YES	YES	YES
Country-Year dummy	YES	YES	YES	YES
R^2	0.6624	0.6625	0.4173	0.8325
# Observations	187	187	187	187
# Countries	17	17	17	17

Table 9-Global Financial Crisis and Bank Risk: Types of Countries

In comparison, according to these OLS regressions, the NO PIIGS were able, with the measures taken, to increase stability according to the Z-SCORE. However, again risk for both regions has increased, which can be related with the decrease of competition/concentration in the banking sector.

Once we have empirically tested the relationships between banking market concentration, competition and risk in the whole sample of countries and how these relationships could be differently found depending on the type of country that we refer to, the overall conclusions.

Firstly, by consensus of mostly all regression we can state that the restructuring process, in a global perspective "has increased stability but has created market conditions that could be very significant for future negative shocks in the economy." Moreover, there are clear differences between the countries classified as PIIGS and the other countries. Both, in terms of risk and competition, and concentration the PIIGS were more affected by the crisis than other European countries. The NO PIIGS see to have been more able to increase financial stability without decreasing the levels of competition as much as the NO PIIGS, although competition has decreased in every area.

Secondly, it is worth mentioning the reason why Z-SCORE and NPL variables yield different results, even though both variables indicate levels of risk. On one hand, the Z-SCORE measures the level of risk of the current period and depends on the bank's assets. On the other hand, NPL measure the risk regarding those loans who have been recalled unpaid, thus their effects last longer.

In the third place, the results obtained for the dummy variable that identifies the post-crisis years (POSTCRISIS) suggest that the restructuring processes and other measures and resolution policies that were carried out during and after the global financial crisis have affected the three variables of interest (not in every regression, but they have in every variable). In particular, our results show that:

- After the crisis market concentration has increased mainly due to the restructuring processes and resolution mechanisms applied during those years. This result is particularly more relevant in the case of those countries that were strongly affected by the crisis episode (PIIGS countries).
- We not only observe an increase in the ratios measuring banking market concentration, but also in terms of the increase of the Lerner index it can be stated that the competition levels have been decreased during these years. Again, the basic argument for this relies on the public interventions and resolution policies applied to overcome the crisis consequences.
- In terms of risk, our results show that during the years after the crisis, the global level of bank Z-SCORE is higher than in previous years. This result is consistent with a higher level of banking stability. However, in terms of the amount of nonperforming loans, the results obtained show that this variable

has also increased after the onset of the crisis. It makes sense to think that although the general stability of the banking sector has increased, the huge amount of bad loans granted before the crisis episode are now resulting in a higher level of nonperforming loans. Moreover, this can also be affected by the fact that competition has reduced, and concentration has increased. Loans are gathered in a lower number of banks which make them more significant for the country. There are bigger "Too Big to Fail" banks.

- Finally, the results obtained also suggest that when taking into account the resulting level of competition in 2015 (LERNER2015) there is a negative relationship with the Z-SCORE variable. This result indicates that higher levels of bank market power (lower levels of competition) are negatively associated with banking stability.

We have seen how concentration has increased, while competition and risk have decreased. Then the policies applied during the financial crisis have been helpful to overcome the problems shown by bringing a higher level of financial stability. Nevertheless, the role of the governments should not finish here. According to our analysis the global economy still has the problem that low levels of competition carries. However, we have also seen along our work that very high levels of competition can carry out big problems due to the incentives to take more risk than what it bearable. The challenge then will be to find an intermediate level of competition which would increase financial stability.

7. OVERALL CONCLUSIONS

The objective of this final work has been to examine the relationships between the bank market structure (concentration), competition and risk across the European banking sector over the last 15 years. As a consequence of the financial crisis the banking sectors all around the globe have been evolving and experiencing different financial/economic instability periods promoting several reactions from regulators and supervisors.

Many of the intervention and resolution policies rely on different kinds of restructurings processes as their situations were quite unique, due to the particularities and the structure of the banking system within the European environment. For instance, in the Euro zone, we can distinguish three different types of reshuffles owing to the variety of problems each individual country's banking sector faced. These restructurings mechanisms may provoke different results in terms of market concentration, competition, and risk.

Therefore the goal of this project has been to analyse if the banking industry is more (less) concentrated and competitive and riskier (or less risky) than before the crisis period. This empirical study has been built in two main pillars: (1) a descriptive analysis, which describes a comparison in a triple perspective: among the European banking sector, US and Japan, different types of restructuring processes across Europe and, finally, France and Spain; (2) and an econometrical analysis in which we explain the variations in terms of concentration, competition and risk by applying an OLS methodology. We have run this analysis over both a sample of 22 countries (US, Japan and Euro zone countries) and,

particularly, over the European countries that were mostly affected by the crisis (PIIGS countries).

The findings of this paper suggest that the restructuring process, has increased stability, in general terms, but has created market conditions that should be taken into account in order to avoid potential future negative shocks in the financial sector. From our study, it could be stated that there exist relevant differences between the countries classified as PIIGS and the other countries, mostly in terms of the restructuring process and their results. The PIIGS were more affected by the crisis than other European countries, probably caused by the lower levels of market confidence mainly due to the debt crisis (2010-2012). The NO PIIGS countries seem to have been more able to increase financial stability without decreasing the levels of competition as much as the No PIIGS, although competition has decreased in every area.

Overall, given the results of our empirical tests we can highlight that the policies applied during and recently after the distress episode have been helpful, in general terms, to overcome the problems shown by bringing a higher level of financial stability. Nevertheless, the role of the public authorities should be continued. According to our analysis the economies analyzed still have the problem that low levels of competition carries, for instance the increase in incentive to take too much risk in order to compensate lower bank margins. This results would suggest that there might exist an optimal level of competition to balance the pros and cons of the different degrees of market structures. So, a potential economic policy recommendation would be to search for this the search and strategies guiding to reach it.

To sum up regarding potential future fields of study we identify three main aspects. Firstly, given the positive and negative effects that bank competition may have on banking stability, it would be interesting trying to find the optimal level of competition in the banking industry. This would give regulators and supervisors the necessary tools to apply those policies and mechanisms that are mainly needed according to the level of bank market power. Secondly, one of our key finding was the fact that even with an increase of the Z-SCORE in general terms, the increase in the NPL variable showed a possible higher instability in some markets. Thus, trying to find faster ways to reduce the level of NPL could also be another missing piece of this work in which we could continue studying in order to improve market stability and take most advantage of the restructuring processes applied. Finally, we could not finish this work by mentioning this last conclusion: the harmonization of the banking system in the Euro zone needs to be achieved. Our work provided evidence on how the crisis of confidence and the lack of harmonization in supranational institutions, in charge of supervision and resolution strategies, might have created additional difficulties for Southern European countries in order to overcome the last financial crisis. Consequently, with the basic objective of avoiding future potential financial crisis, not only competition needs to be improved but, every European country will have to play under the same rules.

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