LISBON SCHOOL OF ECONOMICS & MANAGEMENT
UNIVERSIDADE DE LISBOA

MASTER

MONETARY AND FINANCIAL ECONOMICS

MASTER'S FINAL WORK

DISSERTATION

BANK COMPETITION AND STABILITY IN PORTUGAL

CATARINA GOMES DIAS

NOVEMBER - 2020

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SUPERVISION:

PROFESSOR DOUTOR ANTÓNIO AFONSO

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Abstract

This dissertation studies the impact of bank competition on their stability. It does so by analysing the Portuguese banking sector in the period between 2006 and 2018. We used several measures of competition to assess this relationship (Boone, HHI and Lerner), and, our results indicate that competition has a positive effect on bank's stability. Therefore, our results support the competition-stability hypothesis. In addition, using a unique measure of competition to address this issue is not enough to take assertive conclusions on the role of competition on bank stability in Portugal. Hence, this study accounts for the robustness of results taking into account the period of crisis, bank size, liquidity and capitalization.

KEYWORDS: Bank Stability; Bank Competition; Boone Indicator; Lerner Index; Bank Characteristics.

JEL: C33; G21; G32; L11.

BANK COMPETITION AND STABILITY IN PORTUGAL

Resumo

O presente trabalho final de mestrado estudo o impacto da competição entre bancos na sua estabilidade. Fá-lo através da análise do sistema bancário português entre 2006 e 2008 Usamos várias medidas de competição para avaliar esta relação (Boone, HHI e Lerner), os nossos resultados indicam que a competição tem um efeito positivo na estabilidade de um banco, como tal suportam a hipótese de competição-estabilidade. O estudo confirma que utilizar uma única medida de competição para estudar este tópico não é suficiente para tirar conclusões assertivas sobre o papel da competição na estabilidade de um banco em Portugal. O estudo inclui análises de robustez tendo em conta o período de crise, o tamanho dos bancos, liquidez e capitalização.

PALAVRAS-CHAVE: Estabilidade dos Bancos; Competição entre Bancos; Indicador de Boone; Índice de Lerner; Características dos Bancos.

JEL: C33; G21; G32; L11.

Acknowledgements

I am grateful to my supervisor, Professor Doutor António Afonso, for the support, guidance and availability making possible to present this dissertation.

First of all, I would like to thank to all professors and friends that accompanied me during my bachelor's degree at ISCTE. They were essential giving me all the tools that I needed to thrive in the master's course and in life. I would also like to thank to all ISEG professors, although it was a short journey it was a very enriching experience. A special word to the friends that I made here, thanks for supporting me all the way.

To my co-workers at Inov4you (and other companies) thank you for being not only great co-workers but more importantly being great friends.

To my friends I would like to thank for being present in my life. Fabio a special acknowledgment to you, for all the encouragement, hours spent in the library and more importantly for never stop believing.

I am grateful to my parents for all the sacrifices that they done so that I could pursue my dreams, without them none of this would have been possible.

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Glossary

CIS - Commonwealth of Independent States

ECB – European Central Bank

FE – Fixed Effect

FRED - Federal Reserve Economic Data

GDP – Gross Domestic Product

HHI - Herfindahl-Hirschman Index

K – Equity to Assets Ratio

MC – Marginal Cost

MS – Market Share

NPL – Non-Performing Loans

ROA – Return on Assets

RWA - Risk-Weighted Assets

UK – United Kingdom

US – United States of America

1. INTRODUCTION

Financial stability is defined by the European Central Bank (2019) as a condition in which the financial system is capable of withstanding shocks and the unravelling of financial imbalances. Although the financial system comprises several financial intermediaries, in Portugal, banks continue to be the most important player in the market, therefore it is very important to study the functioning of banking system as a central factor of financial stability. One of the main drivers of the global financial crisis of 2008 was the high level of risk existing in banks' balance sheets. Because of this financial crisis, Portuguese financial system faced a particular difficult situation imposing the need to enforce rules to ensure its stability. One relevant question in this debate and that has implications in regulator's policy is whether competition among banks affect positively or negatively their stability.

More competition in a market means that the supply curve moves to the right so it may have an effect reducing the price, in this case, the interest rate. Van Leuvensteijn et al. (2011) stress out that competition may affect the way changes in the policy rates of the European Central Bank (ECB) are passed on to the interest rates that banks offer their customers.

About this topic, we have two strings of theory, "Competition-Fragility" and "Competition-Stability". The competition fragility view states that increasing competition decreases the degree of market power consequently reduces bank's profit margins and franchise values Carletti and Hartmann (2002). Thus, to increase their returns banks are encouraged to take on more risks, deteriorating the quality of their loan portfolios. Franchise value reflects intangible capital that banks will only realise if they do not go bankrupt, the larger the value, the more unwilling banks become to increase risk de-Ramon et al. (2018). The competition-stability view emphasizes the idea that a higher level of competition in credit markets lead to a fall in loan rates, thus borrowing firms' probability of default declines, which improves banks' profitability and helps build capital buffers thus raising bank stability overall Boyd and De Nicoló (2005).

Existing empirical evidence is mixed, since we have several studies that support both theories. When considering studies that analysed a single country banking system, we can point Jiménez et al. (2010), Kasman and Kasman (2015) and Marsh and Sengupta (2017) to support "Competition-Fragility", for Spain, Turkey and USA, respectively. Supporting "Competition-Stability" we have Schaeck and Cihák (2008), Liu et al. (2012), Clark et al. (2018), all of them cross-countries studies. As pointed out by Beck (2008) this theory is more supported by cross-country studies.

Prices and costs of banking products are not available thus, we do not have direct measures of competition and must construct indirect measures. The construction of the several measures of competition affect the results that are obtained and consequently the results of the implication of competition on stability. This question was addressed using 3 different measures of competition, Boone indicator, Lerner index and Herfindahl-Hirschman index (HHI), first and second measuring competition and the latter concentration. Stability was proxied by different measures typically used to access individual risk, as Z-Score and its components and Non-Performing Loans.

The aim of this dissertation is to continue the debate, as in all articles existing suggest that further research is needed to investigate in more detail the nature of this relationship. I wanted to provide an insightful perspective of the Portuguese case. Although Portugal was part of the sample of some studies, as in Beck et al. (2006) along with 68 other countries or in Bikker and Haaf (2002) with 22 to the best of my knowledge, it is the first that clearly studies this relationship solely for Portugal. Moody's Bank Focus is the only database that includes the information needed for this study, but by adding information of 8 years to the existing (2013-2017) I was able to perform a much richer analysis.

This dissertation is organized as follows. Chapter 2 summarizes the theoretical background about the "Competition-Fragility" and "Competition-Stability" views as well as results of research that supports each theory. Chapter 3 presents the methodology applied to perform this analysis, including the baseline model and all variables that were used. Data definition, sources and descriptive statistics are presented in Chapter 4. In Chapter 5, Empirical Analysis, we have 2 different sections, baseline model and several robustness tests results. Finally, in chapter 6 we have the main findings summarized as well as recommendations for future research on this topic.

2. LITERATURE REVIEW

Whether more competition improves or worsens bank stability is an important issue that continues to spark debate in academic, policymaking and regulatory circles. The existing literature about this relationship can be divided in 2 categories, the "Competition-Fragility" and "Competition-Stability" views. This section gives a brief description of each hypothesis.

2.1 "Competition-Fragility" view

The first main hypothesis, the "Competition-Fragility" view posits that a higher level of competition reduces the market power that each bank has, thus it puts more pressure on profits and leads them to take excessive risks. This results in higher fragility of the banking system. With an influential study Keeley (1990) shows that the liberalization of laws governing branching, multibank holding company expansion, and interstate entry in the 1980's increased competition in the American banking industry. Associated with higher competition is a decrease in the bank's charter value (monopoly rent). The author concluded that banks with lower market power, proxied by a lower market-to-book asset ratio, hold less capital relative to assets and have higher default risk (reflected on higher risk premiums on large and uninsured certificates of deposits). Beck (2008) reinforces that, according to this view the deregulation that occurred in the U.S as well in many emerging markets in 1970's and 1980's, would lead to more fragility.

Besanko and Tackor (1993) focus on the relationship between the bank and its customers and the acquisition by the bank of private borrower-specific information that generates informational rents. Banks have incentives to limit their exposure to risk as long as they take advantage of this relationship by absorbing part of the informational rent. Greater competition has a direct effect on asymmetric information between the two parties eroding the informational value of such relationship. Smaller informational advantage in dealing repeatedly with the same borrowers constitute an incentive to hold a portfolio with greater level of risk, especially when deposits are backed by a risk insensitive insurance scheme.

The link between competition in the deposit market and risk-taking incentives, in the presence of limited liability and a social cost of failure is explored in Matutes and Vives (2000). The authors reached several conclusions, first when deposit insurance does not exist, competition is intense, and the social cost of failure is high banks tend to set excessive deposit rates, therefore bank asset risk is high; The second result happens when deposits are insured through a flat rate scheme, this situation makes banks more aggressive competitors. Excessive competition leads to high deposit rates (even without failure costs), maximal asset risk position undertaken by banks and to an excess supply of deposits. In this case, deposit (rate) regulation and direct asset restrictions will be examples of policies that can eliminate the negative effects of excessive competition. Finally, when it is introduced a deposit premium that is risk-based, it decreases incentives to take risk on the deposit side making deposit rates lower than in the first situation. These results stress the importance that regulation can have in the level of risk of a given portfolio and its effects on welfare.

In a dynamic model Hellmann et al. (2000) describe in a straightforward way how competition undermines prudent bank behaviour. An increase in competition is a result of financial market liberalization, consequently profits suffer a reduction, which implies lower franchise values, described as capitalized value of expected future profits. If expected future profits are going to be lower banks have fewer incentives for making good loans. Banks can invest either in a prudent or in a gambling asset, if markets are competitive bank earns little with the prudent investment, nonetheless it can always capture a rent from gambling. Hence, increased competition promotes gambling in the banking sector.

Along the years several empirical studies were conducted and found evidence that support this theory, Yeyati and Micco (2007) with all commercial banks in 8 Latin American countries; Turk Ariss (2010) examined data from 821 banks across 60 developing countries over the period from 1999 to 2005; Jiménez et al. (2010) reached similar results analyzing the Spanish banking sector from 1988-2003; Kasman and Kasman (2015) used information on 28 Turkish commercial banks from 2002 to 2012; Marsh and Sengupta (2017) tested with U.S. banking data from 1990 to 2005; Leroy and Lucotte (2017) reached the conclusion with a sample of 97 listed banks in Europe covering the period 2004-2013.

2.2 "Competition-Stability" view

A recent trend of both theoretical and empirical models emerged in support of "Competition-Stability" view and refute the traditional one. These models advocate that the intensification of competition in credit markets will cause a fall in loan rates therefore the probability of default of borrowing companies falls as well. This, in turn will improve bank's profits and helps building capital buffers that helps raising bank stability de-Ramon et al. (2018).

Mishkin (1999) suggests that banks that operate in a market with few participants usually get public guarantees and other "to-big-to-fail" subsidies, it is an indication that policymakers are more concerned with bank failures when there is low competition. The existence of a government safety net that protects depositors is in the origin of a moral hazard problem. Depositors that are protected do not have incentives to monitor the bank and withdraw their savings if the bank is taking too much risk, therefore banks have incentives to take a higher level of risk that the one they would take if the protection did not exist.

Caminal and Matutes (2002) constructed a model in which borrowers face a moral hazard problem and consequently banks choose between costly monitoring and credit rationing. The aforementioned authors show that for intermediate monitoring costs only a monopoly bank will incur in those costs and does not have the need to credit ration loan applicants. As a result, this bank is willing to originate risky loan portfolios. The lower the competition is the bigger are the incentives to solve agency problems that translate into more incentives to take aggregate risk.

The typical argument that higher market power has a positive effect on bank's profits and therefore can increase its stability misses an important fact, the impact that this market power has on firm's behaviour (Boyd and De Nicoló, 2005). Bank has no direct control over the riskiness of borrower's projects, instead it is the entrepreneur who choose the risk of their investment projects that are being financed with bank loans. Boyd and De Nicoló (2005) claim that less competition will have two effects, on the one hand it results in lower deposit rates, which allows banks to increase their profits and intentionally seek less risky future investments; on the other hand, it means higher loan rates, it impacts

negatively borrower's profits making them seek for more risk. They show that the loan market effect dominates the deposit market effect, meaning that increasing competition results in lower bank risk.

There are quite a few examples in the empirical literature that found a positive relationship between competition and stability. Covering the period of 1995-2005 with a dataset that include banks from 10 European countries plus US banks Schaeck and Cihák (2008) suggest that competition enhances bank soundness. In addition, Liu et al. (2012) with a sample of banks that operate in South East Asia (Indonesia, Malaysia, Philippines and Vietnam) between 1998 and 2008; Clark et al. (2018) uses data for the commercial banks of Commonwealth of Independent States (CIS) for the period between 2005 and 2013; de-Ramon et al. (2018) focused on banks operating in UK spanning the period 1989 to 2013 obtained similar results.

Apparently, the two streams of the literature predict opposing results regarding the impact of competition on stability, however Berger et al. (2009) introduce the idea that this is not necessarily true. The reasoning is the following, higher market power in loan market may be an encouragement for riskier loan portfolios, but it does not imply an increase of the overall risks of the bank. If because of higher market power, the bank's franchise value increases, they will try to protect it with risk mitigating techniques such as increase in equity capital, reduction of interest rate risk, sales of loans or credit derivatives or a smaller loan portfolio. Using data from 8,235 banks in 23 developed nations their empirical results suggest that banks with a higher degree of market power also have less overall risk exposure, consistent with "Competition-Fragility" view, but it also increases loan portfolio risk, giving some support some support to the "Competition-Stability" view. Taking into account that higher loan rates increases bank's revenues from performing loans Martinez-Miera and Repullo (2010) show that a U-shaped relationship between competition and fragility is obtained. The same non-linear relationship was found by Tabak et al. (2012) when testing for 10 Latin American countries.

Overall, the existing theoretical models obtain ambiguous results regarding the relationship between the degree of competition and stability in the banking sector. According to Beck (2008) empirical analysis that use data of a single country give the

ambiguous results as well, while cross-country studies point more to a positive relationship between them.

3. METHODOLOGY

In order to perform our analysis on the relationship between bank stability and competition in Portugal the following regression was estimated:

(1) $$Stability_{i,t} = \alpha_0 + \alpha_1 Competition_t + \alpha_3 X_{i,t} + \alpha_4 Y_t + e_{i,t}.$$

where $Stability$ is a measure of stability, the subscript *i* refers to a bank, and the subscript *t* to the year. The variables that will be used as proxies for stability are: Non-Performing Loans ratio, Z-Score, Return on Assets, Equity-to-Assets, Standard Deviation of Return on Assets, Risk-adjusted Return on Assets and Risk-adjusted Capital Ratio. The main dependent variables are the NPL ratio and the Z-Score, but because the different components of Z-Score embody different aspects of a bank´s stability, it is useful to study the effects of competition on each one of the aspects; this is easily done by putting each of these variables as dependent on the regression.

For $Competition_t$ 3 proxies will be used namely Boone indicator, Lerner index and Herfindahl-Hirschman index (HHI) for assets. HHI and Lerner index are both measures of market power. HHI is a common measure used in studies about concentration in a given sector, so it will be useful to do comparisons to conclusions reached in the same studies, HHI will be calculated for Portuguese assets of deposit takers. Lerner index is able to measure the mark-up that a firm is able to charge over its marginal cost. Boone indicator measures competition from an efficiency perspective, calculated as the elasticity of market share to marginal costs. Behind this measure is the idea that banks that are more efficient achieve higher market shares or profits, therefore the more negative the indicator is, higher degree of competition exists.

Other factors that also affect bank stability must be considered, according to the existence literature Fu et al. (2014), Lee et al. (2014), Kasman and Kasnam (2015) the following bank-level controls are used: bank size (log of total assets), provisions to assets ratio (%), total loans to assets ratio (%), wholesale (non-retail deposits) to total deposits

ratio (%) and non-interest revenue to total revenue (%). Vectors of bank-level controls are represented by $X_{i,t}$.

Y_t is the variable that accounts for macroeconomic controls that will be used, namely Portuguese rate of inflation, unemployment and real GDP growth. The last variable will also be accounted for the Euro Area. Y_t also includes financial controls such as short and long interest rate for the Euro Area and average of ratings of Portuguese banks. These controls are important because the used timespan includes periods of turmoil in banking sector.

This model or simple variations of it has already been used by several authors to study the same relationship for a single country setting or in cross-county analysis. Examples research articles that use it are de-Ramon et al. (2018) for the English market and Brei et al. (2018) using 33 Sub-Saharan countries.

3.1 Dependent Variables

As mentioned in the previous section I am going to use several indicators as dependent variables to proxy for stability: Non-Performing Loans ratio, Z-Score, Return on Assets ($ROA_{i,t}$), Equity-to-assets ($k_{i,t}$), Standard Deviation of Return on Assets (${\sigma_{i,t}}^{ROA}$), Risk-adjusted Return on Assets ($ROA_{i,t}/{\sigma_{i,t}}^{ROA}$), and Risk-adjusted Capital Ratio ($k_{i,t}/{\sigma_{i,t}}^{ROA}$).

The first main dependent, the NPL ratio, is used in this study as a measure of bank credit risk-taking behaviour. Kasman & Kasman (2015) argue that credit risk is the main source of banking risk, explaining its importance as a dependent variable. Banks that have high levels of NPL ratio face balance sheet, profitability and capital constraints, leading to a negative impact on their lending ability ECB (2017). Banking failures may arise due to uncontrolled high levels of NPL.

Z-Score is a widely used measure for bank stability in the related literature such as Boyd and Runkle (1993) and De Nicoló et al. (2003). The indicator is computed in the following way:

(2) $$Z - Score = \frac{ROA_{i,t} + k_{i,t}}{\sigma_{i,t}^{ROA}}.$$

It is a measure that combines indicators of profitability, leverage, and return volatility. I used a 3-year rolling window to calculate ROA's standard deviation for two reasons, one is to allow for time variation in the denominator and the other is because banks do not divulge the information needed at a more granular level. This variable will give the number of standard deviations a bank's return on assets has to decline to deplete its equity. The higher (lower) the Z-index is the lower (higher) is the default probability of banks, meaning that this indicator is inversely related to the probability of insolvency.

Bank stability is a complex concept therefore it is not possible to assess it using a single measure therefore stability is also going to be checked with risk adjusted measures of return. Higher values of risk-adjusted return on assets and risk-adjusted capital ratio indicate higher bank stability.

3.2 Independent Variables

Two measures of banking market competition (Boone indicator and Lerner index) and one measure of concentration (HHI) are used in this study.

3.2.1 Boone Indicator

As a starting point in assessing competition among banks, I used Boone indicator. The main idea is that in a more competitive environment firms are punished for being inefficient Boone (2008). This concept applies to all industries, so banking is no exception. At the expense of the inefficient banks, banks that are more efficient will increase their market share and profits Saif-Alyousfi et al. (2018). The Boone indicator in is the simplest form is presented by many authors as:

$$\pi_{i,t} = \alpha_t + \beta_t \ln(c_{i,t}) + \Theta X_{i,t} + \eta_{i,t}, \quad (3)$$

where π represents the variable profits of bank *i* at time *t*, variable costs are the difference between revenue (sum of interest revenue and fees and commissions received) and variable costs (labour costs, administrative costs and interest paid on deposits) scaled by total assets. The β indicates the Boone indicator, which is estimated for each period *t*. Average variable costs are represented by $c_{i,t}$, obtained dividing variable costs by variable

revenue. $X_{i,t}$ represents a group of control variables, which include provisions, loans to assets, proportion of retail funding (proportion of client deposits on total deposits) and balance sheet size. $\eta_{i,t}$ is the error term. de-Ramon et al. (2018) uses the group of control variables, a similar approach is used by Khan et al. (2016) without taking into consideration any control variable.

Following some researchers that transformed the formula of Boone Indicator by replacing the value of bank profit with a bank market share and instead of average marginal costs, we obtain:

(4) $$\ln MS_{i,t} = \alpha_t + \beta_t \ln(MC_{i,t}) + \Theta X_{i,t} + \eta_{i,t},$$

where $MS_{i,t}$ is the market share, measured in terms of loans, of the i-th bank at time *t*. The formula behind MC (Marginal Cost) is explained in section 3.2.2.

Larger market share is expected to be attained by banks with lower marginal costs. A high absolute value of β means that there is a high level of competition in the market, so we have a reallocation of market share from less efficient banks to more efficient.

The Boone indicator is suitable for this study because, according to Van Leuvensteijn et al. (2011) authors of the first study applying the Boone indicator to banking markets, it requires relatively small data, allows estimation using data with annual frequency and has a strong technical basis.

3.2.2 Lerner Index

This study employs the conventional approach of Lerner index, a non-structural indicator to measure the degree of competition. It is widely used in bank research (Fernández de Guevara et al. (2005), Berger et al. (2009), Soedarmono et al. (2013), Tan (2016)). The convention index is defined in the following way:

(5) $$Lerner_{i,t} = \frac{P_{i,t} - MC_{i,t}}{P_{i,t}}.$$

It is the difference between price (P) and marginal costs (MC) expressed as a percentage of price hence it captures the capacity of price power of each bank under analysis. This index will range from less than 0 to 1, where 0 means perfect competition, 1 the existence of a pure monopoly and values lower than zero imply a non-optimal state because the marginal cost is higher than the price that is being charged. The higher the index is, the higher is the ability to charge over the marginal cost.

The price of total assets $P_{i,t}$ is proxied by the ratio of interest and non-interest revenue to total assets for bank *i* at time *t*. We can calculate price in this way under the assumption that the flow of services produced by banks is proportional to the totality of its assets as pointed out by Turk Ariss (2010). More difficult to calculate is the marginal cost $MC_{i,t}$ since it is not directly observed for any bank. To obtain MC first the following translog cost function is going to be estimated:

$$(6)\quad \ln(c_{i,t}) = \alpha_0 + \alpha_1 lnQ_{i,t} + \frac{1}{2}\alpha_2 (lnQ_{i,t})^2 + \sum_{j=1}^{3} \beta_j \ln(w_{j,i,t}) + \frac{1}{2}\sum_{k=1}^{3}\sum_{j=1}^{3} \alpha_{k,j} \ln(w_{k,i,t}) \ln(w_{j,i,t}) + \sum_{j=1}^{3} \delta_j \ln(w_{j,i,t}) lnQ_{i,t} + \lambda_1 E_{i,t} + \frac{1}{2}\lambda_2 (E_{i,t})^2 + \theta_1 T + \theta_2 T^2 + \sum_{j=1}^{3} \lambda_j T \ln(w_{j,i,t}) + \varepsilon_{i,t}.$$

where *c* is bank's total costs, including financial and operational costs. Output (*Q*) is proxied by total assets. $W_{j,it}$ represents three input prices, namely, the prices of labor, capital and funding. Prices of production factors are defined as $W_{1,it}$ – ratio of personnel expenses to total assets, I used personnel expenses instead of the number of employees because of availability of data on Bankfocus; $W_{2,it}$ – ratio of operating costs such as buildings and administrative costs to total assets; $W_{3,it}$ – ratio of interest expenses (interest paid on deposits) to total deposits. $E_{i,t}$ denotes equity capital. To account for technical change *T* (Trend) is included. For banks that do not accept deposits from clients and therefore do not have interest expenses, such as Credibom, marginal cost was obtained without considering W_3.

Marginal cost was computed as the derivative of total cost with respect to output, as shown in equation 6:

(6) $MC_{i,t} = \frac{\partial c_{i,t}}{\partial Q_{i,t}} = (\alpha_1 + \alpha_2 lnQ_{i,t} + \sum_{j=1}^{3} \delta_j \ln w_{j,i,t}) \frac{c_{i,t}}{Q_{i,t}}$.

This index is not a perfect measure since it does not capture risk premia in the prices of banks' product and services Berget et al. (2009) but it is the only measure of competition that is possible to use at an individual level.

3.2.3 Herfindahl-Hirschman Index (HHI)

HHI is defined as the sum of the squares of the market shares, represented by s_i, of all companies of a given sector. We observe the maximum value, 1, when there is a single company controlling the entire supply of a given sector. The other extreme value, the minimum is obtained when we have *n* companies with equal market shares, therefore their market share is 1/*n* the same value of HHI.

(7) $HHI = \sum_{i=1}^{N} s^2$.

European Union made a classification of the levels of concentration in a given industry, for this institution if HHI is lower than 0.1 the industry is unconcentrated, between 0.1 and 0.2 is moderately concentrated and highly concentrated when we are in the presence of an index higher than 0.2 European Union (2004).

In banking industry, we can calculate the index with shares considering total assets, total deposits or loans, it is a relatively easy variable to obtain. Other variable that it is commonly used in the literature as in Bikker & Haaf (2002), Beck et al. (2006) or Zhang et al. (2013) is the Concentration Ratio. It only takes into account a certain number of the largest banks in a country, I don't think this is a good measure for the Portuguese market because we have a considerable number of small banks and banks that have origin after 2006, the first year considered in this study, which will not be considered in this index. HHI includes these two features making it a widely used measure.

3.3 Control Variables

When we are studying the effect of competition on bank stability it is important to control for factors that might affect market structures, financial stability or both Uhde & Heimeshoff (2009). To account for the business cycle conditions annual growth rate of GDP is included, both Portuguese and European rate. On the one hand, banks' investment opportunities may be correlated with business cycles Laeven and Majoni (2003), on the other hand, bank's asset quality is improved due to the increase of borrowers' solvency. Interest rates are also important and have impact on bank's asset quality. The other macroeconomic controls are unemployment and inflation rate, because the timespan includes a period of noteworthy financial turmoil in banking sector.

Unlike other articles about this subject besides macroeconomic controls, I included financial controls by incorporating bank's ratings. Ratings used are provided from Moody's, which typically assigns two ratings to a bank, bank deposit ratings and bank financial strength ratings. A bank that is rated has superior intrinsic financial strength, strong financial fundamentals and predictable and stable operating environment Moody's (2018). We transformed the qualitative rating scale into a quantitative rating scale. The scale used by Moody's varies between C (default) and Aaa (highest quality), each grade was transformed into a linear scale, where C corresponds to zero and 1 to Aaa as depicted in Table 1. From 2016 onwards Moody's gives rating to only 5 Portuguese banks, Banco BPI, Banco Comercial Português, Banco Santander Totta, Caixa Geral de Depósitos and Novo Banco. We calculated the arithmetic average of ratings attributed to these banks to obtain the rating for each year.

Table I
Linear Transformation of Moody's Rating

	Moody's Rating Scale	**Linear Transformation**
Investment grade	Aaa	1
	Aa1	0,95
	Aa2	0,9
	Aa3	0,85
	A1	0,8
	A2	0,75
	A3	0,7
	Baa1	0,65
	Baa2	0,6
	Baa3	0,55
	Ba1	0,5
	Ba2	0,45
	Ba3	0,4
Speculative grade	B1	0,35
	B2	0,3
	B3	0,25
	Caa1	0,2
	Caa2	0,15
	Caa3	0,1
	Ca	0,05
	C	0

4. DATA

4.1 Data

Bank of Portugal defined the relevant banking market of this study taking into account the authorized institutions. By choosing only banks, I am not considering the so-called Mutual Agricultural Credit Banks or Savings Banks, the reason for not including the first one is that it is composed by 86 local level institutions, each one with a financial report. These institutions cannot perform the exact same services that banks can, so for a correct comparison all individuals are banks. Panel dataset includes annual information for 29 banks. All the variables that were used and their sources are described in Table 2.

Information regarding the period 2013-2017 was retrieved from Moody's Analytics BankFocus. These are the years available for Portuguese banks in the database. To have more observations the remaining information, meaning 2006-2012 and 2018 I collected from the annual reports from each individual bank. This study spans the period 2006-2018, which covers the period of Portuguese financial crisis (2010-2014). Although it would be beneficial to have a larger spanning period, it is not possible to retrieve prior information neither from individual nor from Bank of Portugal's website.

The panel is unbalanced because we do not have the same periods available for each cross-sectional unit. This happened due to three reasons, one is because some banks of our sample were created after 2006 meaning that they only have observations for a smaller period. The other reason is that one bank, namely Banco Efisa, S.A, did not release its 2018 annual report until July of 2019, like the other banks. The third and last reason is related to a specific variable, Tier 1 Capital. Some banks opt to inform on their Tier 1 Capital ratio, which is calculated by dividing the bank's tier 1 capital by its total risk-weighted assets (RWA). In the case that information on the value of RWA is not given it is not possible to know the value of Tier 1 Capital. Keeping in mind the reasons behind the unbalanced panel data we can conclude that in this case attrition is not based on factors that are related to the response variables.

Table II
Variables definition and source

Variable	Definition	Source
Measures of stability:		
Z-score	(Return on assets+ equity to assets)/standard deviation of ROA	Bank Focus, author's calculations
Return on assets	After tax net income / total assets	Bank Focus, author's calculations
Equity to assets ratio	Total equity / total assets	Bank Focus, author's calculations
Standard deviation of return on assets	Standard deviation of ROA using 3 year rolling window	Bank Focus, author's calculations
Risk-adjusted return on assets	Return in assets/ standard deviation of ROA	Bank Focus, author's calculations
Risk-adjusted equity to assets ratio	Equity to assets/ standard deviation of ROA	Bank Focus, author's calculations
NPL ratio	Non-performing loans/ total loans	Bank Focus, author's calculations
Measures of competition:		
Boone Indicator	Elasticity of market share to marginal costs	Bank Focus, author's calculations
HHI (assets)	Sum of squares of market shares in assets	Bank Focus, author's calculations
Lerner Index	Price-cost markup	Bank Focus, author's calculations
Bank level controls:		
Bank Size	Log of total assets	Bank Focus, author's calculations
Provisions to assets ratio (%)	Loan loss reserve/ total assets	Bank Focus, author's calculations
Total loans to assets ratio (%)	Loans/ total assets	Bank Focus, author's calculations
Wholesale to total deposits ratio (%)	Customer deposits / total deposits	Bank Focus, author's calculations
Non-interest to total revenue (%)	Fees and commissions revenue/ total revenue	Bank Focus, author's calculations
Macroeconomic and financial controls:		
PT GDP growth	Annual rate of real GDP growth	World Bank
EA GDP growth	Annual rate of real GDP growth	IMF
PT Inflation rate	Annual rate of inflation	World Bank
PT Unemployment rate	Unemployment rate	World Bank
EU Short run interest rate	Annual short run interest rate	OECD
EU Long run interest rate	Annual long run interest rate	OECD
PT banks ratings	Average banks ratings of BCA in a numerical scale	Moody's

4.2 Descriptive Statistics

Table 3 presents the descriptive statistics for each variable of interest. The analysis consists of 289 bank-year observations for 29 Portuguese banks over the 11-year sample. Initially existed 347 observations of which the observations of 2006 and 2007 for all variables were loss due to the use of a 3-year rolling window in the calculation of standard deviation. The calculation of Lerner Index is lacking one observation because Montepio Investimento Bank did not provide its labour costs for the year of 2018.

The average NPL ratio is 6.344% with a large degree of dispersion across banks, ranging from -4906.27% to above 2776.9%. The minimum value is negative because one bank had negative values for loans in two consecutive years, in absolute value it was small compared to the value of NPL.

The mean values of competition measures provide an image of the structure of Portuguese banking market. Boone Indicator has on average a small absolute value (0.14), it means that according to this variable Portuguese banking market has a low level of competition. The HHI for assets has an average of 0.207, the value is higher than 0.2, so according to the values defined by the European Union the market is highly concentrated. Lerner Index average is positive, 0.245 since it is closer to 0 than to 1, and this market leans towards perfect competition. Banco Haitong obtains the minimum value of Lerner Index, 15.182 in 2013, meaning that the price charged was lower that the marginal cost. If we had considered the two first years for all banks, the average of the Lerner Index would have been -0.557. The former measure indicates that on average we are in the presence of a competitive market while the latter points out that we have low levels of competition. Different results provided by the indicators stress that is difficult to arrive at a consistent interpretation of the competition in this specific market.

The timespan used in this study includes a period of financial crisis that affected Portugal in a more severe way than it affected the Euro Area, on average the two grew 0.234 and 0.829, respectively. Unemployment rate fluctuated between 2006 and 2018, the highest value (16.18%) was registered in 2013 while the lowest (7%) in the last year of analysis.

Table III

Descriptive Statistics

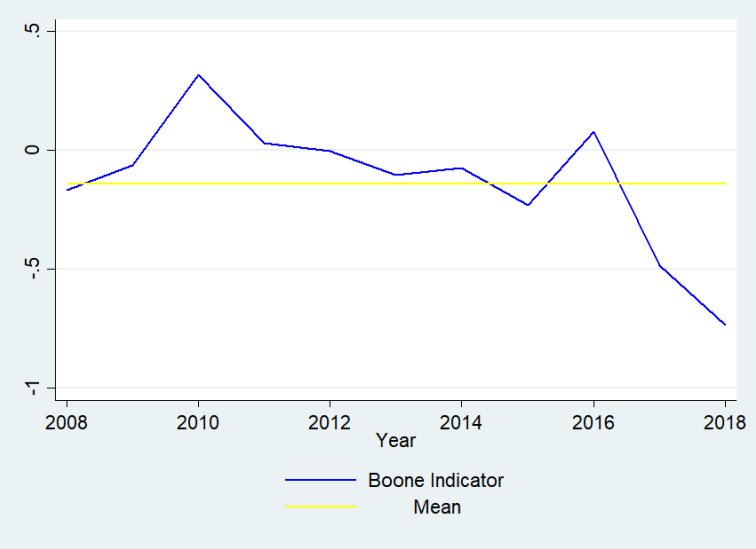
Variables	Obs	Mean	Std.Dev.	Min	Max
Z-score	289	30.986	53.863	-8.584	459.605
ROA	289	.321	7.753	-29.56	100
K	289	15.061	20.09	-42.78	100
Standard deviation of ROA	289	2.31	7.347	.023	57.963
Risk adjusted ROA	289	1.291	3.374	-9.005	20.788
Risk adjusted K	289	29.694	52.248	-7.073	458.043
NPL	289	6.344	345.07	-4906.27	2776.9
Boone	289	-.14	.278	-.736	.32
HHI	289	.207	.029	.17	.242
Lerner	288	.245	1.262	-15.182	.982
Bank Size	289	14.302	1.892	10.616	18.542
Provisions to Assets	289	4.832	10.618	0	99.654
Loans to Assets	289	45.589	40.927	-.59	522.16
Wholesale to total deposits	289	48.621	38.406	0	158.852
Non interest to total revenue	289	22.813	20.348	0	95.574
GDP_PT	289	.234	2.208	-4.03	2.8
GDP_EA	289	.829	1.895	-4.5	2.4
Inflation	289	1.172	1.28	-.84	3.65
Unemployment	289	11.41	2.918	7	16.18
IR_Short_EU	289	.665	1.3	-.33	4.63
IR_Long_EU	289	2.604	1.289	.93	4.36
Ratings_PT	289	.43	.178	.23	.73

Figure 1 shows how Boone Indicator evolved over the sample period, we can observe that it follows a downward path. An increase in the indicator, as seen in 2010 and 2016, implies worsening of the competitive conduct of financial intermediaries. According to FRED between 2006 and 2015 the average of the Boone Indicator for the Euro Area was -0.025 whereas for the same period for Portugal it was -0.14. We can conclude that in this period Portugal had a higher degree of competition when compared to the Euro Area.

The evolution on HHI for assets is displayed in Figure 2, during the first six years of analysis it was relatively constant at around 0.23. From 2011 onwards, it has a downward trajectory reaching its lowest level in 2018. Typically, banking systems in smaller euro area countries tend to be more concentrated and Portugal is included in this group. By looking at the results presented in the Report on Financial Structures of 2017 Portugal was in line with the trajectory of Euro Area, the peak of the group was achieved

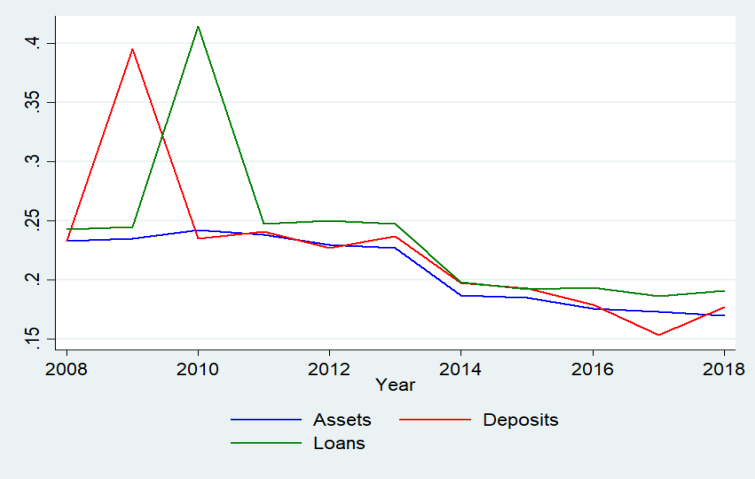
in 2014 while in Portugal it was in 2011. HHI for loans and deposits have a similar path except for 2009 and 2010, were they achieved their respective peaks.

Figure 1
Boone Indicator 2008-2018



Source: Bank Focus and author's calculations.

Figure 2
HHI for total assets, deposits and loans 2008-2018



Source: Bank Focus and author's calculations.

Table IV
Means of Competition and Stability measures, by year

Year	Z-score	NPL	Lerner	Boone	HHI
2008	27.355	2.181	.504	-.017	.233
2009	40.852	4.018	-.400	-.061	.235
2010	19.340	3.708	.209	.320	.242
2011	17.702	6.080	.447	.029	.238
2012	18.775	8.389	-.987	-.002	.230
2013	22.992	111.320	-.346	-.102	.227
2014	23.596	-164.854	.149	-.072	.187
2015	22.543	-12.799	-6.272	-.231	.185
2016	19.694	57.054	-.805	.080	.176
2017	46.868	32.495	-.040	-.485	.173
2018	77.059	21.779	.101	-.736	.170

Table 4 presents the mean values of the main variables of competition and stability of this study and their evolution in time. In the columns of Boone and HHI are the indicators itself and not mean values. The trend for the NPL is ascending between 2010 and 2013, suffering a high decrease in the following year. NPL ratio is still at a high level but its evolution shows banks' efforts to reduce it. The other variable that we have to measure stability, Z-score, also has an ascending trajectory with a lag of one year, so it begins in 2011 and ends in 2014. The highest value of this measure is obtained in 2018.

The correlation coefficients between the parameters of this study are displayed in Table 4. As shown in this table the correlation between the independent variables is lower than 0.90, suggesting the absence of the problem of multicollinearity, we only have one exception that is the correlation between Z-Score and Risk-adjusted Equity to Assets ratio. It is interesting to note that our first main independent, Z-Score, appears to be negatively correlated to all competition indicators. When considering NPL, this variable is negatively correlated to Boone and Lerner index and positively correlated to HHI. Once again, we cannot directly conclude on the relationship between stability and competition due to the different conclusions obtained with the correlation matrix.

5. EMPIRICAL ANALYSIS

5.1 Baseline Results

In the following three tables, we report the empirical results of estimation equation 1, using the Fixed Effects Model using Z-Score, ROA, Equity to assets ratio, Standard deviation of return on assets, Risk-adjusted return on assets, Risk-adjusted equity to assets ratio and NPL ratio as the dependent variables. Fixed Effects Model was chosen instead of Random Effects after doing the Hausman test in which we rejected the null hypothesis. We estimate three estimates for each dependent variable, one for each measure of competition, Boone, HHI and Lerner index. In these first regressions, both control and macroeconomic control variables are present, and uses all banks in the sample in the timespan 2008-2018.

The results show that the coefficients of Boone Indicator (Table 5) are negative and significant at a 5% (or lower) for three variables Z-Score, Equity to assets and Risk adjusted Equity to Assets, indicating a positive relationship between competition and stability. For these variables are consistent with Competition-Stability hypothesis. In the case of NPL, the relationship is positive but is not a consistent result. Comparing the 3 variables of competition Boone indicator is the variable with more significant results in the Portuguese case.

In HHI (Table 6) results none of the variables considered were significant at 10% level. When compared to the result obtained in the first regression, the sign of the relationship between stability and competition is different in the case of Standard Deviation of Return on Assets, which now suggest that lower competition has a positive effect on bank's stability.

In the Table 7 are depicted estimation results using Lerner index as a measure of bank competition. The finding indicates that the impact of this indicator on Z-Score, Equity to Assets ratio, Risk-adjusted Equity to Assets ratio and NPL ratio, is negative, although it is only significant for Z-Score and Risk-adjusted Equity to Assets ratio. It is only significantly positive for Risk-adjusted Return on Assets.

Decomposing Z-Score in its components gives us insights on which components are responsible for the positive impact of the three measures of competition on this measure of stability. It means that when exists a lower level of competition, banks are less probable to deplete their equity and therefore the lower the probability of default. On one hand in all regressions the coefficients of ROA were positive, it indicates that competition affects negatively profitability. The higher the competition is the less banks are efficient in using their assets to generate earnings. On the other hand, we have the opposite effect on Equity to Assets ratio (K). This is a measure of solvency, and the signal indicates banks are encouraged to hold more capital when have a lower market power. The result of asset return volatility is not conclusive. The coefficients of this variable in Boone and Lerner indicate that higher competition reduce volatility, while the coefficient in HHI suggests otherwise. It is easier to explain the latter, if we are in a competitive market in order to gain market share a bank increases asset risk to increase its returns. The two additional variables created, Risk-adjusted Return on Assets and Risk-adjusted Equity to Assets ratio have negative and significant coefficients being aligned with the Competition-Stability theory. Overall, higher competition makes banks to reduce asset portfolio risk and have a lower risk-adjusted capitalization ratio.

In all the regressions (with exclusion of the regression when using Risk-adjusted return on assets) the coefficient of Bank Size (ln_assets) is negative and in some cases significant related to bank stability measures indicating that big banks are less stable than small banks. The same happens to Provisions to Assets, this time the exception is the regression using Equity to Assets ratio, meaning that banks that have a small loan loss reserve when compared to their total assets also tend to riskier. A negative relationship was also found in Non-Interest Revenue, so banks that bet more on non-traditional bank activities are less stable.

Additionally, when analysing the effects of macroeconomic variables, we have mixed signals. For example, Inflation rate has a positive effect on NPL, so when the economic uncertainty caused by a higher rate of inflation causes Non Performing Loans to increase, this may happen due to a higher volume of non-performing loans or a rationing of credit by banks or a combination of both. Despite having some mixed signals some variables go in the direction expected, as unemployment grow and interest rates increase fragility increases.

Although in our regressions we did not have very significant results in the cases that they are we have more cases with a negative relationship between competition and stability variables, negative values suggest less competition in the market. In general, our results suggest that higher banking competition results in bank stability. The first conclusion is that the Portuguese case goes against the empirical results in other studies that showed that the majority of single countries studies support Competition-Fragility hypothesis.

Table V
Regressions of alternative stability measures on Boone Indicator

VARIABLES	(1) z_score	(2) roa	(3) k	(4) sd3_roa	(5) risk_roa	(6) risk_k	(7) npl
Boone	-48.65***	4.483*	-9.135**	1.658	-1.600*	-47.05***	34.88
	(16.39)	(2.574)	(4.159)	(2.031)	(0.956)	(16.00)	(122.0)
Bank Size	-2.787	-0.807	-15.51***	-2.725***	0.324	-3.110	-86.72*
	(6.933)	(1.089)	(1.760)	(0.859)	(0.404)	(6.767)	(51.62)
Provs_Assets	-0.0535	-0.338***	0.812***	-0.345***	-0.0158	-0.0377	-1.786
	(0.580)	(0.0910)	(0.147)	(0.0719)	(0.0338)	(0.566)	(4.317)
Loans_Assets	-0.112	0.0125	-0.0157	0.0126	0.00806	-0.120	0.291
	(0.100)	(0.0157)	(0.0254)	(0.0124)	(0.00584)	(0.0977)	(0.745)
Wholesale	-0.106	-0.00137	0.0139	0.00497	-0.0240**	-0.0821	1.989
	(0.165)	(0.0260)	(0.0420)	(0.0205)	(0.00964)	(0.161)	(1.231)
Prop_revenue	-0.511*	-0.0800*	-0.102	0.0420	-0.0298*	-0.481	-1.434
	(0.308)	(0.0484)	(0.0781)	(0.0382)	(0.0180)	(0.301)	(2.293)
GDP_PT	-3.382	0.0471	0.206	0.306	0.0876	-3.469	152.6**
	(10.04)	(1.577)	(2.548)	(1.245)	(0.586)	(9.800)	(74.75)
GDP_EA	4.829	-0.0437	0.401	-0.662	-0.160	4.989	-189.9**
	(11.42)	(1.793)	(2.897)	(1.415)	(0.666)	(11.14)	(85.00)
Unemployment	-4.590	-0.231	-0.478	-0.0588	-0.218	-4.371	33.32
	(3.088)	(0.485)	(0.784)	(0.383)	(0.180)	(3.014)	(22.99)
Inflation	-5.855	0.167	0.0844	1.225	0.0141	-5.869	182.3**
	(10.51)	(1.651)	(2.668)	(1.303)	(0.613)	(10.26)	(78.27)
IR_Short_EU	-9.382**	-0.390	-1.880*	-0.541	-0.152	-9.229**	-30.61
	(4.290)	(0.674)	(1.089)	(0.532)	(0.250)	(4.187)	(31.94)
IR_Long_EU	5.066	-0.922	-0.183	-0.930	-0.219	5.286	0.113
	(5.357)	(0.841)	(1.359)	(0.664)	(0.312)	(5.228)	(39.88)
Ratings_PT	28.05	-1.540	8.576	-2.375	0.245	27.81	-283.1
	(39.00)	(6.124)	(9.896)	(4.833)	(2.274)	(38.06)	(290.3)
Constant	123.2	21.24	237.1***	44.92***	1.146	122.1	852.6
	(110.0)	(17.27)	(27.91)	(13.63)	(6.412)	(107.3)	(818.7)
Observations	289	289	289	289	289	289	289
R-squared	0.154	0.087	0.469	0.159	0.145	0.149	0.040
Number of id	29	29	29	29	29	29	29

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table VI
Regressions of alternative stability measures on HHI

VARIABLES	(1) z_score	(2) roa	(3) k	(4) sd3_roa	(5) risk_roa	(6) risk_k	(7) npl
HHI	-785.5	72.70	-62.42	-9.226	-45.77	-739.7	9,105*
	(705.2)	(109.7)	(178.0)	(86.22)	(40.64)	(688.2)	(5,140)
ln_assets	-2.737	-0.812	-15.52***	-2.722***	0.328	-3.065	-87.97*
	(7.039)	(1.095)	(1.776)	(0.861)	(0.406)	(6.869)	(51.31)
Provs_Assets	-0.119	-0.332***	0.803***	-0.344***	-0.0186	-0.101	-1.491
	(0.589)	(0.0916)	(0.149)	(0.0720)	(0.0339)	(0.575)	(4.291)
Loans_Assets	-0.113	0.0126	-0.0160	0.0127	0.00805	-0.121	0.279
	(0.102)	(0.0158)	(0.0256)	(0.0124)	(0.00585)	(0.0992)	(0.741)
Wholesale	-0.105	-0.00150	0.0139	0.00503	-0.0239**	-0.0808	1.962
	(0.168)	(0.0261)	(0.0424)	(0.0205)	(0.00967)	(0.164)	(1.224)
Prop_revenue	-0.486	-0.0823*	-0.0979	0.0414	-0.0288	-0.457	-1.528
	(0.313)	(0.0486)	(0.0789)	(0.0382)	(0.0180)	(0.305)	(2.278)
GDP_PT	5.085	-0.737	0.651	0.501	0.634	4.451	31.56
	(13.91)	(2.163)	(3.510)	(1.700)	(0.801)	(13.57)	(101.4)
GDP_EA	-8.302	1.171	-0.926	-0.696	-0.859	-7.443	-66.24
	(14.92)	(2.320)	(3.765)	(1.824)	(0.860)	(14.56)	(108.7)
Unemployment	-3.369	-0.346	-0.719	0.0988	-0.0678	-3.301	-14.83
	(4.890)	(0.760)	(1.234)	(0.598)	(0.282)	(4.772)	(35.65)
Inflation	7.182	-1.037	1.580	1.184	0.666	6.516	77.32
	(13.19)	(2.052)	(3.329)	(1.613)	(0.760)	(12.88)	(96.17)
IR_Short_EU	-11.19**	-0.222	-1.839	-0.641	-0.301	-10.89**	9.027
	(5.352)	(0.832)	(1.351)	(0.654)	(0.308)	(5.223)	(39.01)
IR_Long_EU	14.10	-1.760	-0.270	-0.484	0.495	13.60	-185.4
	(15.54)	(2.416)	(3.922)	(1.900)	(0.895)	(15.17)	(113.3)
Ratings_PTb	8.510	0.252	2.351	-0.627	0.201	8.309	-525.7*
	(42.40)	(6.594)	(10.70)	(5.184)	(2.443)	(41.38)	(309.1)
Constant	257.5**	8.840	256.2***	42.94***	6.998	250.5**	141.4
	(119.7)	(18.62)	(30.21)	(14.64)	(6.898)	(116.8)	(872.6)
Observations	289	289	289	289	289	289	289
R-squared	0.128	0.078	0.459	0.156	0.139	0.123	0.052
Number of id	29	29	29	29	29	29	29

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table VII
Regressions of alternative stability measures on Lerner Index

VARIABLES	(1) z_score	(2) roa	(3) k	(4) sd3_roa	(5) risk_roa	(6) risk_k	(7) npl
Lerner	-5.292*	0.160	-0.840	0.156	0.292*	-5.584**	-5.389
	(2.751)	(0.430)	(0.692)	(0.337)	(0.159)	(2.681)	(20.25)
ln_assets	-2.869	-0.857	-15.18***	-2.822***	0.277	-3.146	-81.93
	(7.050)	(1.102)	(1.773)	(0.864)	(0.406)	(6.871)	(51.90)
Provs_Assets	-0.246	-0.331***	0.788***	-0.341***	-0.00997	-0.237	-1.806
	(0.591)	(0.0925)	(0.149)	(0.0725)	(0.0341)	(0.576)	(4.353)
Loans_Assets	-0.0859	0.0118	-0.0110	0.0117	0.00633	-0.0922	0.331
	(0.102)	(0.0160)	(0.0257)	(0.0125)	(0.00590)	(0.0998)	(0.754)
Wholesale	-0.129	-0.00183	0.0180	0.00347	-0.0238**	-0.106	2.072*
	(0.168)	(0.0263)	(0.0423)	(0.0206)	(0.00969)	(0.164)	(1.238)
Prop_revenue	-0.521*	-0.0805	-0.105	0.0427	-0.0275	-0.493	-1.503
	(0.312)	(0.0488)	(0.0784)	(0.0382)	(0.0180)	(0.304)	(2.296)
GDP_PT	-7.042	0.226	-0.0420	0.312	0.0528	-7.094	157.8**
	(10.18)	(1.592)	(2.561)	(1.248)	(0.587)	(9.924)	(74.97)
GDP_EA	3.931	0.210	-0.221	-0.510	-0.289	4.219	-191.8**
	(11.57)	(1.809)	(2.908)	(1.418)	(0.666)	(11.27)	(85.15)
Unemployment	-8.357***	0.0477	-0.986	0.0159	-0.309*	-8.047***	37.35*
	(2.969)	(0.464)	(0.746)	(0.364)	(0.171)	(2.893)	(21.85)
Inflation	-3.055	-0.230	0.967	1.035	0.192	-3.247	182.0**
	(10.57)	(1.653)	(2.659)	(1.296)	(0.609)	(10.30)	(77.84)
IR_Short_EU	-7.591*	-0.562	-1.474	-0.622	-0.110	-7.481*	-30.78
	(4.304)	(0.673)	(1.082)	(0.528)	(0.248)	(4.195)	(31.69)
IR_Long_EU	-2.644	-0.240	-1.553	-0.689	-0.457*	-2.187	6.101
	(4.795)	(0.750)	(1.206)	(0.588)	(0.276)	(4.673)	(35.30)
Ratings_PTb	-12.62	2.426	0.459	-0.862	-1.256	-11.36	-255.2
	(36.64)	(5.729)	(9.213)	(4.491)	(2.111)	(35.71)	(269.7)
Constant	211.5*	14.99	245.5***	44.16***	4.154	207.3*	703.5
	(109.2)	(17.07)	(27.45)	(13.38)	(6.290)	(106.4)	(803.6)
Observations	288	288	288	288	288	288	288
R-squared	0.137	0.077	0.456	0.161	0.149	0.134	0.041
Number of id	29	29	29	29	29	29	29

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

After doing the regressions with full model I run the regressions firstly without macroeconomic variables then without bank control variables to see if the results remain the same without these variables. In general, the results remained more or less the same, in terms of significance and signal. In appendix Table A2 we have the results on HHI when we did not take into account Y variables because when compared to the results obtained in estimation of equation 1 was the case that presented more changes. Regarding signal, it occurred a change, in the ROA, that now has a negative sign, being completely

align with the other components and Z-Score itself. The coefficient of this variable is in this case significant at 10% level (or lower) for 6 out of 7 measures of stability. In the original results, it was only significant for NPL, but when we take out of the estimation macroeconomic controls the opposite verifies.

Due to lack of space to present all the results from the regressions done, the authors will be completely available to present them if necessary.

5.2 Robustness Tests

5.2.1 Crisis period

To confirm if Competition-Stability still applies when only considering the period of crisis, we divided the sample in crisis period, including observations of 2008 to 2010, being P1 and a post crisis period, with observations from 2011 onwards, being P2.

Table 8 reports the results of the signs of the coefficients of each measure of stability on each measure of competition, constructed from tables A3, A4 and A5. Firstly, we can point that for some variables it is determinant if we are in a crisis or in a post period, take for example Equity to Assets Ratio and Risk-adjusted return on assets. In the estimation of equation 1 the coefficients on Boone, Lerner and HHI were negative, when considering post crisis sample the same applies. The difference is in the signal of the coefficient in HHI and Lerner index in the crisis period, it is positive and significant. We can observe a different behaviour of this variable, in the crisis period the results are consistent with Competition-Fragility theory, a negative relationship between competition and stability. In a crisis and with more competition a bank holds a lower volume of capital. In the case of Risk-adjusted return on assets the results, we also observe changes concerning Boone and Lerner in crisis period vis-à-vis post crisis. In the case of Risk-adjusted Equity to Assets, we can observe that do not exist differences when taking into account two different periods in the timespan, the results continue to support the Competition-Stability theory.

We can conclude that if we took the period of crisis of our sample, as many other authors have done, we would have reached the same results when compared to baseline model. The same do not apply when we only take into account this period of turmoil. Both Boone and Lerner have more results that are in support of Competition-Stability, but once more, we do not achieve many significant results. We have to refer that the size of the sample is very different, P1 has 72 observations while P2 the remaining 217.

Table VIII
Signs and significance of coefficient in crisis and post crisis period

	Z-Score		**ROA**		**K**		**Sd3_ROA**		**Risk ROA**		**Risk K**		**NPL**	
Variables	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2
Boone	+	−	−*	+	−	−	−***	+	+	−*	−	−	−	+*
HHI	−	−	+***	+	+***	−	+***	+	−	−*	−	−	+**	+*
Lerner	−	−	−**	−	+	−*	−	−	−	+	−	−	−	−

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5.2.2 Size, Capitalization and Liquidity

Important banks characteristics such as Size, Capitalization and Liquidity may have an impact on how competition affect their stability therefore we divided the sample into two subsamples, for each of the referred bank characteristic. Size is proxied by total assets, we considered that a bank is larger when its total assets are equal or greater than 1 000 million euros. Capitalization is given by Equity to assets ratio and Liquidity by Loans to Assets. A bank is categorized as high capitalization and high liquidity if it has values above the median of each variable.

In the first regressions, the coefficient of Banks Size on each measure of competition was negative with exception of Risk-adjusted Return on Assets. When assessing the results of estimation with the division between small and big banks we can see some

differences comparing to the original sample. In the case of ROA for big banks, we have the opposite sign (positive) with significance in Boone indicator. For a bank with higher volume of assets, a higher degree of competition leads to fragility. The coefficients of Z-Score and Risk-adjusted Return on Assets remain negative and were the ones that were significant therefore, once more it supports Competition-Stability.

Regarding capitalization, the results remain in general the same. For this variable it is important to stress out that during our timespan were imposed by Basel III that Minimum Tier 1 capital rises from 4% to 6%, not only banks must increase their level of capital but also its quality so if this study is replicated the mean of K should be higher.

When comparting the results of banks with low liquidity to high ones we have two possible results. First, the coefficients of Z-Score, ROA, Risk-adjusted Return on Assets and Risk-adjusted Equity to Assets ratio have the same signals as in the original regression, no existing difference between low and high liquidity. Secondly, for Equity to Assets ratio, Standard Deviation of Return on Assets and NPL ratio the coefficient has opposite signs for each type of bank. For K and NPL ratio banks with low liquidity have negative coefficient, but in contrary to other measures a high NPL is not desirable, we can consider this as a risk instead of a stability measure.

Table IX
Regression accounting for size, capitalization and liquidity

	Size				Capitalization				Liquidity			
	Small		Big		Low		High		Low		High	
Variables	(1)	(7)	(1)	(7)	(1)	(7)	(1)	(7)	(1)	(7)	(1)	(7)
Boone	-40.44	-9.827	-66.36***	46.52**	-27.53	1.061	-55.09**	90.25	-54.57***	0.844	-42.82*	18.23
	(27.27)	(302.4)	(22.35)	(21.97)	(17.95)	(1.248)	(25.48)	(260.7)	(20.16)	(1.250)	(25.42)	(231.8)
HHI	-183.1	18,299	-1,373	1,654*	-321.9	27.44	-434.4	14,978	-1,822**	61.76	50.37	16,783*
	(1,127)	(12,211)	(969.8)	(934.5)	(820.6)	(56.61)	(1,020)	(10,121)	(817.7)	(49.95)	(1,129)	(10,043)
Lerner	-3.245	54.18	-7.259**	-0.00872	0.277	-0.228	-27.50***	23.48	-2.742	-5.176***	-6.778*	9.937
	(8.588)	(93.85)	(3.205)	(3.162)	(2.352)	(0.161)	(8.596)	(90.06)	(27.92)	(1.609)	(3.853)	(35.01)

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

6. Conclusion

In the last few years the Portuguese Banking System has been going through a restructuring phase due to the role that excessive risk existing in bank's balance sheets had in the global financial crisis of 2008. The Basel III agreement has the aim of improving regulation, supervision and risk management of banking systems. The key principles are applied to all countries that signed the agreement but one important point to take into consideration is that each system is affected differently by regulations. The conclusions retrieved from this study can be helpful for regulatory entities to understand in a more insightful way how the Portuguese system works and how they should regulate competition in this sector.

The main contribution of this study is to perform a test on the relationship between competition and stability for the Portuguese Banking System. The approach taken to examine this relationship was to perform regressions with Z-Score (and its components) and NPL as dependent variables and as proxies of competition we had 3 different measures of competition, the Boone indicator, the Lerner index and the Herfindahl-Hirschman index (HHI). Besides the dependent and independent variables referred we also controlled for macroeconomic conditions and banks characteristics. Our panel dataset includes annual information for 29 banks for the period of 2006 to 2018.

From the baseline model the main conclusion is that the Competition-Stability theory suits the Portuguese case, and we obtained more significant results when using Boone Indicator than when other measures were used. Next, we considered the model without control variables, major differences occurred in HHI when we did not accounted for macroeconomic variables resulting in more significant results, but also consistent with Competition-Stability. Finally, 4 robustness tests were performed, considering the period of crisis, bank size, capitalization and liquidity. When the period of crisis is not considered in the sample, we would reach the same results when compared to baseline model. For Size and Capitalization results remained more or less the same. When considering banks with high and low liquidity for several measures (Equity to Assets ratio, Standard Deviation of Return on Assets and NPL ratio) the impact that competition has depends

on the volume of liquidity. Overall, our conclusions support the Competition-Stability view. As competition arise in this market, resulting a higher number of players, willingness to take risk decreases and consequently improvement of overall bank stability.

The main difficulty in studying the relationship between competition and stability in Portugal was lack of information existing to do so. Contrary to other Central Banks, the Bank of Portugal only has a database with indicators for the banking system as a whole, instead of having information for each bank. Moody's database has the information needed but for a very limited number of years (2013-2017). The added value of this study is the construction of the database behind it, and the information of 8 of the 13 years presented was retrieved manually from each individual report. In sum, we did a richer analysis than the studies previously done in which Portugal was a part of the sample.

Further research can consider Mutual Agricultural Credit Banks and Savings Banks increasing the sample size. More important than the size of the sample is the timespan used, it could be beneficial to use information regarding more years, but that would only be possible if all banks provide their reports prior to 2006 or Bank of Portugal provides such information. It would also be interesting to test this relationship using other models (random effects, pooled OLS, first differences) to check whether the conclusions remain the same or not. To access competition an interesting path is to use different measures such as Panzar-Rosse approach or Bresnahan-Lau method as they embody different aspects when compared to HHI, Boone or Lerner.

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APPENDIX

Table A1
Correlation Matrix

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
(1)	1.000																					
(2)	0.025	1.000																				
(3)	0.308	-0.019	1.000																			
(4)	-0.143	0.363	-0.031	1.000																		
(5)	0.503	0.203	-0.070	-0.108	1.000																	
(6)	0.998	0.012	0.322	-0.140	0.454	1.000																
(7)	0.006	-0.069	0.012	0.016	-0.035	0.009	1.000															
(8)	-0.164	-0.003	-0.208	-0.066	-0.089	-0.163	0.025	1.000														
(9)	-0.281	0.078	-0.154	-0.022	-0.184	-0.278	-0.014	0.629	1.000													
(10)	-0.026	0.109	-0.132	-0.006	0.231	-0.041	-0.034	0.101	0.087	1.000												
(11)	0.045	0.146	-0.215	-0.032	0.044	0.043	-0.016	0.012	-0.022	0.139	1.000											
(12)	-0.119	-0.187	0.182	0.208	-0.182	-0.111	0.043	-0.104	0.001	-0.135	-0.255	1.000										
(13)	-0.063	0.071	-0.125	0.059	0.056	-0.068	0.008	0.175	0.139	0.174	0.246	0.135	1.000									
(14)	0.075	-0.036	0.137	0.001	-0.142	0.087	0.058	-0.213	-0.169	-0.075	0.173	-0.079	-0.172	1.000								
(15)	0.003	-0.058	-0.036	0.066	-0.027	0.005	0.012	-0.206	-0.136	-0.037	-0.192	-0.146	-0.277	0.333	1.000							
(16)	0.109	0.042	0.133	0.049	0.076	0.108	-0.013	-0.709	-0.352	-0.046	0.005	0.048	-0.057	0.168	0.187	1.000						
(17)	0.003	0.036	0.111	0.070	-0.027	0.005	-0.016	-0.526	-0.167	-0.048	-0.009	0.055	-0.045	0.106	0.133	0.780	1.000					
(18)	-0.068	-0.015	-0.063	0.040	-0.047	-0.067	0.032	0.364	0.090	0.051	0.023	-0.061	0.055	-0.060	-0.075	-0.234	0.281	1.000				
(19)	-0.226	-0.005	-0.032	-0.022	-0.205	-0.219	-0.009	0.295	0.499	-0.056	-0.056	0.080	0.007	-0.135	-0.102	-0.494	-0.122	0.002	1.000			
(20)	-0.077	-0.026	-0.163	-0.072	0.013	-0.080	-0.013	0.617	0.206	0.116	0.028	-0.115	0.117	-0.099	-0.183	-0.315	-0.281	0.417	-0.251	1.000		
(21)	-0.123	-0.015	-0.211	-0.076	-0.052	-0.123	-0.008	0.950	0.507	0.114	0.017	-0.124	0.166	-0.197	-0.210	-0.656	-0.515	0.370	0.124	0.746	1.000	
(22)	-0.033	-0.009	-0.153	-0.029	0.030	-0.036	0.015	0.706	0.266	0.119	0.042	-0.126	0.141	-0.122	-0.152	-0.571	-0.502	0.483	-0.167	0.682	0.697	1.000

(1) Z-score, (2) ROA, (3) Equity to assets ratio, (4) Standard deviation of ROA, (5) Risk-adjusted ROA, (6) Risk-adjusted Equity to assets ratio, (7) NPL, (8) HHI, (9) Boone Indicator, (10) Lerner Index, (11) Bank Size, (12) Provisions to assets ratio, (13) Total loans to assets ratio, (14) Wholesale to total deposits ratio, (15) Non-interest to total revenue, (16) PT GDP growth, (17) EA GDP growth, (18) PT Inflation rate, (19) PT Unemployment rate, (20) EU Short run interest rate, (21) EU Long run interest rate, (22) PT banks ratings

Table A2
Regression of alternative stability measures on HHI without macroeconomic variables

VARIABLES	(1) z_score	(2) roa	(3) k	(4) sd3_roa	(5) risk_roa	(6) risk_k	(7) npl
HHI	-401.5***	-33.29*	-106.3***	-29.14*	-26.68***	-374.8***	808.
	(125.4)	(18.83)	(30.96)	(14.88)	(7.195)	(122.1)	(891.
ln_assets	0.846	-0.671	-14.70***	-2.539***	0.504	0.342	-71.1
	(7.135)	(1.072)	(1.762)	(0.847)	(0.410)	(6.948)	(50.7
Provs_Assets	-0.453	-0.310***	0.766***	-0.321***	-0.0418	-0.411	-0.66
	(0.588)	(0.0883)	(0.145)	(0.0698)	(0.0337)	(0.572)	(4.17
Loans_Assets	-0.118	0.0154	-0.0153	0.0122	0.00760	-0.125	0.17
	(0.103)	(0.0155)	(0.0255)	(0.0123)	(0.00592)	(0.100)	(0.73
Wholesale	-0.0327	-0.00595	0.0241	0.00116	-0.0181*	-0.0146	2.111
	(0.169)	(0.0254)	(0.0418)	(0.0201)	(0.00971)	(0.165)	(1.20
Prop_revenue	-0.281	-0.0653	-0.0475	0.0539	-0.0209	-0.260	-0.42
	(0.308)	(0.0463)	(0.0762)	(0.0366)	(0.0177)	(0.300)	(2.19
Constant	117.6	19.39	244.3***	44.36***	0.828	116.8	758.
	(109.0)	(16.37)	(26.92)	(12.94)	(6.257)	(106.2)	(775.
Observations	289	289	289	289	289	289	289
R-squared	0.052	0.064	0.437	0.135	0.072	0.051	0.01
Number of id	29	29	29	29	29	29	29

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A3
Regression on Boone accounting for crisis (1-7) and post crisis (8-14)

VARIABLES	(1) z_score	(2) roa	(3) k	(4) sd3_roa	(5) risk_roa	(6) risk_k	(7) npl	(8) z_score	(9) roa	(10) k	(11) sd3_roa	(12) risk_roa	(13) risk_k	(14) npl
Boone	0.546	-29.53*	-0.515	-17.25***	1.034	-0.488	-2.673	-34.84	8.344	-9.486	3.331	-3.604*	-31.24	675.3*
	(86.91)	(14.82)	(7.374)	(6.348)	(5.713)	(83.22)	(2.347)	(41.78)	(6.278)	(10.65)	(5.218)	(1.978)	(41.03)	(351.4)
ln_assets	-18.32	-26.06***	-5.171*	-15.28***	-2.006	-16.31	-1.325	-9.099	0.104	-13.50***	-2.214*	0.0632	-9.162	-192.2**
	(30.73)	(5.240)	(2.608)	(2.245)	(2.020)	(29.43)	(0.830)	(9.750)	(1.465)	(2.486)	(1.218)	(0.462)	(9.576)	(82.00)
Provs_Assets	0.203	-1.520***	-1.177***	-0.671***	-0.0322	0.235	1.221***	-0.188	-0.0265	1.264***	-0.435***	-0.0534	-0.134	-0.628
	(2.168)	(0.370)	(0.184)	(0.158)	(0.143)	(2.076)	(0.0585)	(0.805)	(0.121)	(0.205)	(0.101)	(0.0381)	(0.791)	(6.770)
Loans_Assets	-0.0580	-0.0156	-0.00713	-0.00723	-0.0130*	-0.0450	-0.00391	-0.409	0.0657*	0.0936	0.0601*	0.0240**	-0.433*	0.633
	(0.104)	(0.0177)	(0.00879)	(0.00757)	(0.00681)	(0.0992)	(0.00280)	(0.256)	(0.0384)	(0.0652)	(0.0319)	(0.0121)	(0.251)	(2.151)
Wholesale	0.256	0.0388	0.0470	-0.00524	-0.00209	0.258	0.00576	-0.207	-0.0180	0.0684	-0.00414	-0.0166	-0.191	0.335
	(0.475)	(0.0809)	(0.0403)	(0.0347)	(0.0312)	(0.455)	(0.0128)	(0.241)	(0.0362)	(0.0614)	(0.0301)	(0.0114)	(0.236)	(2.024)
Prop_revenue	0.521	-0.318**	-0.0240	-0.170**	-0.0142	0.535	-0.0269	-0.976**	-0.0405	-0.0910	0.0840	-0.0455**	-0.931**	-3.640
	(0.868)	(0.148)	(0.0736)	(0.0634)	(0.0571)	(0.831)	(0.0234)	(0.414)	(0.0622)	(0.106)	(0.0517)	(0.0196)	(0.407)	(3.482)
GDP_PT	-8.147	38.77***	5.995	21.45***	-1.396	-6.752	3.954*	0.585	3.056	7.316	-3.130	-2.359	2.943	1,590**
	(77.84)	(13.27)	(6.604)	(5.686)	(5.117)	(74.53)	(2.102)	(91.42)	(13.74)	(23.31)	(11.42)	(4.329)	(89.79)	(768.9)
GDP_EA	2.941	-26.19***	-4.391	-14.43***	0.829	2.112	-2.747*	-8.475	-5.064	-12.36	4.896	3.807	-12.28	-2,406**
	(52.39)	(8.932)	(4.445)	(3.827)	(3.444)	(50.16)	(1.415)	(141.2)	(21.21)	(35.99)	(17.63)	(6.685)	(138.6)	(1,187)
o.Unemployment	-	-	-	-	-	-	-							
o.Inflation	-	-	-	-	-	-	-							
o.IR_Short_EU	-	-	-	-	-	-	-							
o.IR_Long_EU	-	-	-	-	-	-	-							
o.Ratings_PTb	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unemployment								-7.972*	-0.732	-0.616	-0.256	-0.0484	-7.923*	-1.827
								(4.364)	(0.656)	(1.113)	(0.545)	(0.207)	(4.286)	(36.70)
Inflation								-4.049	0.592	2.566	-0.126	-0.590	-3.460	580.4**
								(28.85)	(4.335)	(7.356)	(3.603)	(1.366)	(28.33)	(242.6)
IR_Short_EU								-6.915	6.621	25.56	-13.13	-6.594	-0.321	3,830*
								(256.5)	(38.55)	(65.41)	(32.04)	(12.15)	(252.0)	(2,158)
IR_Long_EU								6.068	-1.748	-8.366	2.933	1.133	4.935	-920.2*
								(65.48)	(9.840)	(16.70)	(8.179)	(3.101)	(64.31)	(550.8)
Constant	275.0	381.4***	84.96**	225.1***	31.90	243.1	19.36	307.2	15.80	226.4***	26.98	-3.246	310.4	6,067**
	(442.1)	(75.37)	(37.51)	(32.29)	(29.06)	(423.3)	(11.94)	(278.9)	(41.90)	(71.10)	(34.83)	(13.21)	(273.9)	(2,345)
Observations	72	72	72	72	72	72	72	217	217	217	217	217	217	217
R-squared	0.118	0.575	0.582	0.677	0.189	0.114	0.931	0.208	0.044	0.439	0.199	0.236	0.202	0.071
Number of id	25	25	25	25	25	25	25	29	29	29	29	29	29	29

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A4
Regression on HHI accounting for crisis (1-7) and post crisis (8-14)

VARIABLES	(1) z_score	(2) roa	(3) k	(4) sd3_roa	(5) risk_roa	(6) risk_k	(7) npl	(8) z_score	(9) roa	(10) k	(11) sd3_roa	(12) risk_roa	(13) risk_k	(14) npl
HHI	-284.1	1,007***	442.7***	495.2***	-25.76	-258.4	131.8**	-949.5	227.4	-258.5	90.76	-98.21*	-851.3	18,403*
	(1,784)	(319.3)	(151.4)	(142.1)	(117.3)	(1,708)	(48.97)	(1,138)	(171.1)	(290.3)	(142.2)	(53.91)	(1,118)	(9,575)
ln_assets	-18.38	-22.79***	-5.114**	-13.37***	-2.120	-16.26	-1.028	-9.099	0.104	-13.50***	-2.214*	0.0632	-9.162	-192.2**
	(28.82)	(5.158)	(2.445)	(2.296)	(1.895)	(27.60)	(0.791)	(9.750)	(1.465)	(2.486)	(1.218)	(0.462)	(9.576)	(82.00)
Provs_Assets	0.202	-1.514***	-1.177***	-0.667***	-0.0324	0.235	1.221***	-0.188	-0.0265	1.264***	-0.435***	-0.0534	-0.134	-0.628
	(2.140)	(0.383)	(0.182)	(0.171)	(0.141)	(2.049)	(0.0587)	(0.805)	(0.121)	(0.205)	(0.101)	(0.0381)	(0.791)	(6.770)
Loans_Assets	-0.0581	-0.0119	-0.00707	-0.00508	-0.0131*	-0.0449	-0.00357	-0.409	0.0657*	0.0936	0.0601*	0.0240**	-0.433*	0.633
	(0.102)	(0.0182)	(0.00863)	(0.00810)	(0.00669)	(0.0974)	(0.00279)	(0.256)	(0.0384)	(0.0652)	(0.0319)	(0.0121)	(0.251)	(2.151)
Wholesale	0.256	0.0181	0.0466	-0.0173	-0.00136	0.258	0.00389	-0.207	-0.0180	0.0684	-0.00414	-0.0166	-0.191	0.335
	(0.465)	(0.0832)	(0.0394)	(0.0370)	(0.0306)	(0.445)	(0.0128)	(0.241)	(0.0362)	(0.0614)	(0.0301)	(0.0114)	(0.236)	(2.024)
Prop_revenue	0.520	-0.275*	-0.0232	-0.145**	-0.0157	0.536	-0.0230	-0.976**	-0.0405	-0.0910	0.0840	-0.0455**	-0.931**	-3.640
	(0.848)	(0.152)	(0.0720)	(0.0675)	(0.0558)	(0.812)	(0.0233)	(0.414)	(0.0622)	(0.106)	(0.0517)	(0.0196)	(0.407)	(3.482)
GDP_PT	-3.710	-0.520	-0.633**	-0.193	-0.153	-3.557	-0.170**	106.3	-22.25*	36.09*	-13.23	8.573**	97.69	-458.2
	(2.904)	(0.520)	(0.246)	(0.231)	(0.191)	(2.780)	(0.0797)	(83.00)	(12.47)	(21.16)	(10.37)	(3.930)	(81.52)	(698.1)
GDP_EA	-	-	-	-	-	-	-							
o.Unemployment	-	-	-	-	-	-	-							
o.Inflation	-	-	-	-	-	-	-							
o.IR_Short_EU	-	-	-	-	-	-	-							
o.IR_Long_EU	-	-	-	-	-	-	-							
o.Ratings_PTb	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unemployment								-171.2	33.91*	-56.67*	20.45	-13.03**	-158.2	748.9
								(126.3)	(18.99)	(32.22)	(15.78)	(5.983)	(124.1)	(1,063)
Inflation								-4.490	-1.566	0.332	-0.589	0.312	-4.801	-69.32
								(7.423)	(1.115)	(1.893)	(0.927)	(0.352)	(7.291)	(62.43)
IR_Short_EU								35.92	-8.981*	13.45	-3.947	3.545**	32.38	-194.3
								(34.16)	(5.134)	(8.711)	(4.267)	(1.618)	(33.55)	(287.3)
IR_Long_EU								269.1	-59.47*	100.7*	-39.51	21.95**	247.1	-1,519
								(232.1)	(34.88)	(59.18)	(28.99)	(10.99)	(228.0)	(1,952)
Constant								-49.94	11.67	-23.62*	8.288	-4.660*	-45.28	165.5
								(54.30)	(8.160)	(13.85)	(6.783)	(2.572)	(53.34)	(456.7)
	342.6	100.1	-19.80	82.67*	39.52	303.1	-15.64	653.8**	-67.22	320.7***	-6.157	32.61**	621.2**	-652.2
Observations	(536.0)	(95.93)	(45.48)	(42.70)	(35.25)	(513.2)	(14.71)	(300.9)	(45.21)	(76.71)	(37.58)	(14.25)	(295.5)	(2,531)
R-squared														
Number of id	72	72	72	72	72	72	72	217	217	217	217	217	217	217

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A5
Regression on Lerner accounting for crisis (1-7) and post crisis (8-14)

VARIABLES	(1) z_score	(2) roa	(3) k	(4) sd3_roa	(5) risk_roa	(6) risk_k	(7) npl	(8) z_score	(9) roa	(10) k	(11) sd3_roa	(12) risk_roa	(13) risk_k	(14) npl
Lerner	-35.68	-21.34**	4.425	-6.332	-1.073	-34.61	-0.494	-4.537	-0.00873	-1.300*	-0.138	0.219	-4.756	-4.476
	(59.53)	(10.14)	(5.025)	(4.655)	(3.929)	(56.99)	(1.639)	(3.081)	(0.466)	(0.782)	(0.387)	(0.146)	(3.023)	(26.05)
ln_assets	-15.15	-20.86***	-5.515**	-12.79***	-2.023	-13.13	-0.984	-8.971	0.0880	-13.26***	-2.250*	0.0238	-8.995	-189.0**
	(29.55)	(5.035)	(2.494)	(2.311)	(1.950)	(28.29)	(0.814)	(9.744)	(1.475)	(2.474)	(1.223)	(0.461)	(9.564)	(82.41)
Provs_Assets	0.0476	-1.606***	-1.158***	-0.695***	-0.0371	0.0847	1.219***	-0.338	-0.0275	1.229***	-0.441***	-0.0475	-0.291	-0.649
	(2.173)	(0.370)	(0.183)	(0.170)	(0.143)	(2.081)	(0.0598)	(0.809)	(0.122)	(0.205)	(0.102)	(0.0382)	(0.794)	(6.843)
Loans_Assets	-0.0628	-0.0147	-0.00648	-0.00592	-0.0133*	-0.0495	-0.00364	-0.270	0.0659	0.135*	0.0639*	0.0170	-0.287	0.799
	(0.103)	(0.0175)	(0.00868)	(0.00804)	(0.00679)	(0.0985)	(0.00283)	(0.273)	(0.0413)	(0.0693)	(0.0342)	(0.0129)	(0.268)	(2.307)
Wholesale	0.322	0.0576	0.0384	-0.00561	0.000628	0.322	0.00480	-0.225	-0.0184	0.0685	-0.00567	-0.0165	-0.209	0.396
	(0.481)	(0.0820)	(0.0406)	(0.0376)	(0.0318)	(0.461)	(0.0133)	(0.241)	(0.0364)	(0.0611)	(0.0302)	(0.0114)	(0.236)	(2.034)
Prop_revenue	0.345	-0.380**	-0.00146	-0.176**	-0.0210	0.366	-0.0254	-0.993**	-0.0398	-0.105	0.0851	-0.0433**	-0.950**	-3.791
	(0.904)	(0.154)	(0.0763)	(0.0707)	(0.0596)	(0.865)	(0.0249)	(0.414)	(0.0627)	(0.105)	(0.0520)	(0.0196)	(0.406)	(3.502)
GDP_PT	-5.491	14.87***	5.284**	7.118***	-0.447	-5.044	1.702**	71.22	-13.96	25.69	-9.808	5.195*	66.03	193.5
	(23.69)	(4.035)	(1.999)	(1.852)	(1.563)	(22.68)	(0.652)	(61.92)	(9.373)	(15.72)	(7.770)	(2.927)	(60.77)	(523.7)
GDP_EA	1.127	-10.22***	-3.910***	-4.849***	0.193	0.934	-1.240**	-99.57	16.54	-35.21	13.19	-5.901	-93.67	-614.8
	(16.83)	(2.868)	(1.421)	(1.316)	(1.111)	(16.11)	(0.464)	(91.17)	(13.80)	(23.15)	(11.44)	(4.309)	(89.48)	(771.0)
o.Unemployment	-	-	-	-	-	-	-							
o.Inflation	-	-	-	-	-	-	-							
o.IR_Short_EU	-	-	-	-	-	-	-							
o.IR_Long_EU	-	-	-	-	-	-	-							
o.Ratings_PTb	-	-	-	-	-	-	-							
Unemployment								-7.281	-1.079	-0.171	-0.457	0.0800	-7.361	-24.65
								(5.399)	(0.817)	(1.371)	(0.677)	(0.255)	(5.299)	(45.66)
Inflation								8.721	-2.634	5.992	-1.428	0.845	7.876	317.9*
								(20.75)	(3.141)	(5.268)	(2.604)	(0.981)	(20.37)	(175.5)
IR_Short_EU								153.8	-30.20	65.43	-27.02	9.832	144.0	768.2
								(179.1)	(27.12)	(45.48)	(22.48)	(8.467)	(175.8)	(1,515)
IR_Long_EU								-21.94	4.145	-14.94	5.020	-1.488	-20.45	-421.6
								(50.72)	(7.677)	(12.88)	(6.364)	(2.397)	(49.77)	(428.9)
Constant								116.3	-28.70	32.80	-11.74	12.31*	104.0	-2,299*
								(142.9)	(21.64)	(36.29)	(17.94)	(6.756)	(140.3)	(1,209)
Observations	249.1	320.7***	87.50**	194.2***	32.66	216.5	14.94	367.0	5.146	231.9***	24.79	2.941	364.0	4,984**
	(422.5)	(71.98)	(35.66)	(33.03)	(27.88)	(404.5)	(11.63)	(243.2)	(36.81)	(61.74)	(30.52)	(11.49)	(238.7)	(2,057)
R-squared														
Number of id	72	72	72	72	72	72	72	216	216	216	216	216	216	216

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A6

Regression on Boone accounting for size, capitalization and liquidity

	Big Banks					High Capitalization					High Liquidity				
VARIABLES	roa	k	sd3_roa	risk_roa	risk_k	roa	k	sd3_roa	risk_roa	risk_k	roa	k	sd3_roa	risk_roa	risk_k
Boone	8.321**	-13.97**	2.747	-0.608	-65.75***	-1.054	-10.01***	0.934	-2.320	-52.76**	-0.404	-10.50***	0.327	-0.616	-42.20*
	(3.790)	(5.635)	(3.204)	(1.205)	(22.13)	(1.250)	(3.088)	(0.710)	(1.400)	(24.75)	(1.133)	(2.938)	(0.612)	(1.252)	(24.69)
ln_assets	-2.277	-13.38***	-3.633*	-0.689	-8.091	-1.065	-28.19***	-0.477	0.247	-27.75*	1.610***	-14.92***	-0.613**	0.938	-11.13
	(2.499)	(3.716)	(2.113)	(0.795)	(14.59)	(0.831)	(2.052)	(0.472)	(0.930)	(16.44)	(0.525)	(1.362)	(0.284)	(0.580)	(11.45)
Provs_Assets	-0.183	0.117	-0.0540	-0.271**	1.847	-0.285***	-0.484**	0.0331	-0.0493	-0.134	-0.511***	-0.783*	0.0664	-0.131	0.220
	(0.364)	(0.541)	(0.308)	(0.116)	(2.124)	(0.0769)	(0.190)	(0.0436)	(0.0861)	(1.522)	(0.155)	(0.401)	(0.0836)	(0.171)	(3.372)
Loans_Assets	0.00790	-0.0135	0.00547	0.00701	-0.166	0.0308*	0.106**	0.0155	0.0399**	-0.764**	0.0376	0.0803	-0.0472***	0.0579**	-0.0758
	(0.0181)	(0.0269)	(0.0153)	(0.00576)	(0.106)	(0.0166)	(0.0409)	(0.00941)	(0.0186)	(0.328)	(0.0243)	(0.0631)	(0.0132)	(0.0269)	(0.530)
Wholesale	-0.00682	0.0191	-0.00148	-0.0147	-0.115	0.0145	-0.0540	0.000710	-0.00719	-0.337	0.0125	-0.0591*	0.0118*	-0.00302	-0.566**
	(0.0465)	(0.0692)	(0.0393)	(0.0148)	(0.272)	(0.0152)	(0.0375)	(0.00862)	(0.0170)	(0.301)	(0.0130)	(0.0336)	(0.00700)	(0.0143)	(0.282)
Prop_revenue	0.104	-0.0219	0.211**	-0.0183	-1.621**	0.0169	-0.0975	-0.0180	0.00509	-0.654	-0.0312	-0.0316	0.0383***	0.00959	-0.721*
	(0.120)	(0.179)	(0.102)	(0.0383)	(0.703)	(0.0303)	(0.0749)	(0.0172)	(0.0340)	(0.600)	(0.0190)	(0.0492)	(0.0103)	(0.0210)	(0.414)
GDP_PT	-1.199	0.0195	0.250	0.230	3.461	-0.529	-3.033*	0.152	-0.0293	-14.09	0.148	-2.665	0.472	-0.656	-19.28
	(2.291)	(3.406)	(1.936)	(0.728)	(13.37)	(0.733)	(1.810)	(0.416)	(0.821)	(14.50)	(0.728)	(1.888)	(0.393)	(0.804)	(15.86)
GDP_EA	0.201	0.680	-0.988	-0.447	-0.0673	0.344	3.461*	-0.272	0.0760	15.89	0.0163	3.742*	-0.614	0.670	17.95
	(2.614)	(3.886)	(2.210)	(0.831)	(15.26)	(0.817)	(2.017)	(0.464)	(0.915)	(16.17)	(0.822)	(2.132)	(0.444)	(0.908)	(17.92)
Unemployment	-0.626	0.0140	-0.336	-0.232	-3.282	0.0818	-0.832	0.0414	-0.105	-8.541*	0.0944	-0.472	0.279**	-0.388	-11.15**
	(0.721)	(1.072)	(0.609)	(0.229)	(4.208)	(0.243)	(0.600)	(0.138)	(0.272)	(4.807)	(0.231)	(0.599)	(0.125)	(0.255)	(5.031)
Inflation	0.120	-0.830	1.505	0.250	0.477	-0.196	-3.127*	0.265	-0.357	-12.58	-0.283	-3.048	0.591	-1.044	-17.93
	(2.406)	(3.577)	(2.034)	(0.765)	(14.05)	(0.746)	(1.841)	(0.423)	(0.835)	(14.76)	(0.754)	(1.956)	(0.408)	(0.833)	(16.44)
IR_Short_EU	1.140	-2.127	-0.182	-0.00794	-13.72**	-0.0919	-1.961*	0.134	0.0676	-6.392	-0.222	-1.377	0.306	-0.173	-13.28*
	(0.983)	(1.461)	(0.831)	(0.312)	(5.737)	(0.401)	(0.989)	(0.227)	(0.449)	(7.929)	(0.346)	(0.898)	(0.187)	(0.383)	(7.550)
IR_Long_EU	-2.601**	0.828	-1.043	-0.443	7.014	0.0128	-0.717	-0.204	0.130	5.619	0.328	-0.839	-0.356	0.163	2.651
	(1.226)	(1.823)	(1.037)	(0.390)	(7.160)	(0.450)	(1.112)	(0.256)	(0.504)	(8.911)	(0.413)	(1.072)	(0.223)	(0.457)	(9.009)
Ratings_PTb	-7.660	9.556	-4.827	-0.630	30.89	-0.667	3.460	-1.025	1.885	18.94	0.909	7.918	-1.489	1.367	6.062
	(8.843)	(13.15)	(7.476)	(2.811)	(51.63)	(3.254)	(8.035)	(1.847)	(3.643)	(64.40)	(2.961)	(7.683)	(1.601)	(3.273)	(64.56)
Constant	52.58	214.2***	62.32*	17.85	198.6	13.06	423.2***	9.089	-2.985	552.4**	-22.85***	230.0***	6.565	-7.828	366.8**
	(40.67)	(60.48)	(34.39)	(12.93)	(237.5)	(12.78)	(31.55)	(7.253)	(14.31)	(252.9)	(8.251)	(21.41)	(4.462)	(9.119)	(179.9)
Observations	163	163	163	163	163	144	144	144	144	144	145	145	145	145	145
R-squared	0.066	0.229	0.125	0.229	0.221	0.230	0.696	0.101	0.120	0.255	0.335	0.636	0.463	0.192	0.196
Number of id	20	20	20	20	20	26	26	26	26	26	19	19	19	19	19

Table A7

Regression on HHI accounting for size, capitalization and liquidity

	Big Banks					High Capitalization					High Liquidity				
VARIABLES	roa	k	sd3_roa	risk_roa	risk_k	roa	k	sd3_roa	risk_roa	risk_k	roa	k	sd3_roa	risk_roa	risk_k
HHI	185.1	-252.9	54.52	-53.63	-1,320	-87.43*	-105.5	20.25	-47.34	-387.1	-65.82	-95.07	4.918	-8.057	58.42
	(162.5)	(243.0)	(135.9)	(50.81)	(960.6)	(48.44)	(126.6)	(27.99)	(55.42)	(990.4)	(49.32)	(135.7)	(26.89)	(54.96)	(1,097)
ln_assets	-2.269	-13.45***	-3.624*	-0.649	-8.297	-1.088	-28.57***	-0.444	0.165	-29.76*	1.578***	-14.90***	-0.612**	0.937	-10.84
	(2.536)	(3.793)	(2.121)	(0.793)	(14.99)	(0.820)	(2.141)	(0.474)	(0.938)	(16.76)	(0.522)	(1.435)	(0.285)	(0.581)	(11.61)
Provs_Assets	-0.111	-0.00336	-0.0303	-0.276**	1.280	-0.301***	-0.560***	0.0413	-0.0695	-0.521	-0.508***	-0.775*	0.0661	-0.130	0.233
	(0.367)	(0.549)	(0.307)	(0.115)	(2.170)	(0.0757)	(0.198)	(0.0437)	(0.0866)	(1.547)	(0.154)	(0.422)	(0.0837)	(0.171)	(3.416)
Loans_Assets	0.00847	-0.0146	0.00569	0.00713	-0.171	0.0319*	0.109**	0.0151	0.0408**	-0.751**	0.0391	0.0842	-0.0474***	0.0581**	-0.0703
	(0.0184)	(0.0274)	(0.0153)	(0.00574)	(0.109)	(0.0164)	(0.0428)	(0.00946)	(0.0187)	(0.335)	(0.0242)	(0.0665)	(0.0132)	(0.0269)	(0.538)
Wholesale	-0.00869	0.0222	-0.00210	-0.0146	-0.100	0.0158	-0.0479	6.46e-05	-0.00560	-0.307	0.0117	-0.0622*	0.0119*	-0.00322	-0.574**
	(0.0471)	(0.0705)	(0.0394)	(0.0147)	(0.279)	(0.0150)	(0.0392)	(0.00866)	(0.0172)	(0.307)	(0.0129)	(0.0354)	(0.00701)	(0.0143)	(0.286)
Prop_revenue	0.0708	0.0391	0.199*	-0.0189	-1.344*	0.0176	-0.117	-0.0165	0.00136	-0.764	-0.0310	-0.0284	0.0382***	0.00978	-0.708*
	(0.121)	(0.180)	(0.101)	(0.0377)	(0.713)	(0.0299)	(0.0781)	(0.0173)	(0.0342)	(0.611)	(0.0188)	(0.0518)	(0.0103)	(0.0210)	(0.419)
GDP_PT	-3.176	2.604	-0.319	0.883	17.26	0.625	-2.025	-0.0849	0.519	-11.09	0.960	-2.019	0.427	-0.587	-22.27
	(3.101)	(4.637)	(2.593)	(0.970)	(18.33)	(0.982)	(2.564)	(0.567)	(1.123)	(20.07)	(0.953)	(2.622)	(0.520)	(1.062)	(21.20)
GDP_EA	2.943	-3.205	-0.165	-1.145	-19.96	-0.926	1.530	0.0537	-0.691	8.074	-0.831	2.135	-0.540	0.545	17.06
	(3.321)	(4.966)	(2.777)	(1.038)	(19.63)	(1.052)	(2.749)	(0.608)	(1.204)	(21.51)	(1.026)	(2.823)	(0.559)	(1.143)	(22.82)
Unemployment	-1.097	0.499	-0.456	0.0142	-0.315	0.505	-0.948	-0.00709	-0.00147	-10.11	0.414	-0.748	0.277	-0.391	-14.60*
	(1.103)	(1.650)	(0.922)	(0.345)	(6.522)	(0.355)	(0.927)	(0.205)	(0.406)	(7.257)	(0.338)	(0.930)	(0.184)	(0.377)	(7.519)
Inflation	-2.525	3.017	0.700	0.853	19.91	0.922	-1.077	-0.0494	0.389	-3.773	0.440	-1.267	0.514	-0.913	-15.42
	(2.930)	(4.382)	(2.450)	(0.916)	(17.32)	(0.928)	(2.424)	(0.536)	(1.061)	(18.97)	(0.908)	(2.497)	(0.495)	(1.011)	(20.19)
IR_Short_EU	1.594	-2.624	-0.0623	-0.224	-16.65**	-0.460	-2.497**	0.226	-0.150	-8.525	-0.484	-1.536	0.319	-0.193	-12.10
	(1.227)	(1.835)	(1.026)	(0.384)	(7.255)	(0.442)	(1.155)	(0.256)	(0.506)	(9.041)	(0.399)	(1.096)	(0.217)	(0.444)	(8.864)
IR_Long_EU	-5.229	4.028	-1.772	0.588	24.78	1.642	0.356	-0.511	0.834	7.928	1.614	-0.293	-0.412	0.245	-4.119
	(3.576)	(5.348)	(2.990)	(1.118)	(21.14)	(1.052)	(2.750)	(0.608)	(1.204)	(21.52)	(1.074)	(2.954)	(0.586)	(1.197)	(23.89)
Ratings_PTb	-6.341	5.519	-4.184	0.537	15.96	0.991	-2.293	-0.797	1.231	-16.37	2.613	2.208	-1.371	1.109	-30.54
	(9.779)	(14.62)	(8.176)	(3.058)	(57.81)	(3.347)	(8.743)	(1.934)	(3.828)	(68.42)	(3.180)	(8.748)	(1.734)	(3.544)	(70.73)
Constant	26.04	255.2***	53.98	22.30*	399.3	21.52*	452.4***	5.626	5.410	694.8***	-16.64*	254.3***	5.640	-6.190	427.3**
	(41.89)	(62.64)	(35.02)	(13.10)	(247.6)	(12.80)	(33.43)	(7.393)	(14.64)	(261.6)	(9.033)	(24.85)	(4.925)	(10.07)	(200.9)
Observations	163	163	163	163	163	144	144	144	144	144	145	145	145	145	145
R-squared	0.041	0.200	0.121	0.234	0.180	0.249	0.667	0.091	0.104	0.224	0.344	0.596	0.462	0.191	0.176
Number of id	20	20	20	20	20	26	26	26	26	26	19	19	19	19	19

Table A8

Regression on Lerner accounting for size, capitalization and liquidity

	Big Banks					High Capitalization					High Liquidity				
VARIABLES	roa	k	sd3_roa	risk_roa	risk_k	roa	k	sd3_roa	risk_roa	risk_k	roa	k	sd3_roa	risk_roa	risk_k
Lerner	-7.259**	0.116	-0.422	-0.0641	0.148	-0.880**	-0.499	1.145***	0.670	-28.17***	-0.00914	-0.955**	0.194**	0.156	-6.934*
	(3.205)	(0.546)	(0.815)	(0.455)	(0.170)	(0.423)	(1.112)	(0.220)	(0.486)	(8.299)	(0.172)	(0.455)	(0.0912)	(0.189)	(3.739)
ln_assets	-19.52	-1.937	-14.24***	-3.650*	-0.515	-0.670	-28.13***	-1.123**	-0.264	-14.48	1.578***	-14.35***	-0.676**	0.845	-10.01
	(15.47)	(2.636)	(3.935)	(2.194)	(0.821)	(0.849)	(2.233)	(0.441)	(0.977)	(16.66)	(0.531)	(1.407)	(0.282)	(0.584)	(11.55)
Provs_Assets	0.250	-0.0990	-0.0476	-0.0369	-0.261**	-0.318***	-0.548***	0.0647	-0.0511	-1.224	-0.526***	-0.764*	0.0795	-0.138	-0.741
	(2.191)	(0.373)	(0.557)	(0.311)	(0.116)	(0.0757)	(0.199)	(0.0393)	(0.0871)	(1.486)	(0.158)	(0.418)	(0.0837)	(0.174)	(3.431)
Loans_Assets	-0.140	0.00874	-0.0139	0.00618	0.00629	0.0453**	0.115**	-0.00258	0.0299	-0.305	0.0400	0.109	-0.0551***	0.0542*	0.281
	(0.109)	(0.0186)	(0.0277)	(0.0155)	(0.00579)	(0.0176)	(0.0462)	(0.00912)	(0.0202)	(0.345)	(0.0258)	(0.0683)	(0.0137)	(0.0284)	(0.561)
Wholesale	-0.0865	-0.00898	0.0237	-0.00178	-0.0152	0.0175	-0.0417	-0.00595	-0.0101	-0.197	0.0120	-0.0552	0.0111	-0.00431	-0.563**
	(0.278)	(0.0474)	(0.0708)	(0.0395)	(0.0148)	(0.0151)	(0.0396)	(0.00782)	(0.0173)	(0.295)	(0.0130)	(0.0345)	(0.00691)	(0.0143)	(0.283)
Prop_revenue	-1.196*	0.0555	0.0622	0.195*	-0.0160	0.0301	-0.124	-0.0298*	-0.00753	-0.353	-0.0305	-0.0285	0.0376***	0.00999	-0.667
	(0.708)	(0.121)	(0.180)	(0.100)	(0.0376)	(0.0303)	(0.0796)	(0.0157)	(0.0348)	(0.594)	(0.0191)	(0.0505)	(0.0101)	(0.0210)	(0.415)
GDP_PT	-2.372	-0.776	-0.788	0.346	0.265	-0.594	-3.133	0.0259	-0.259	-14.70	0.0761	-3.362*	0.570	-0.683	-26.06
	(13.72)	(2.337)	(3.490)	(1.946)	(0.728)	(0.722)	(1.898)	(0.375)	(0.830)	(14.17)	(0.737)	(1.951)	(0.391)	(0.810)	(16.02)
GDP_EA	-0.551	0.592	0.135	-0.809	-0.552	0.352	2.687	-0.111	0.0701	12.97	0.0528	3.535	-0.696	0.631	21.35
	(15.65)	(2.666)	(3.981)	(2.220)	(0.831)	(0.803)	(2.112)	(0.417)	(0.924)	(15.76)	(0.833)	(2.206)	(0.442)	(0.916)	(18.12)
Unemployment	-8.746**	-0.0990	-0.907	-0.178	-0.245	0.0524	-1.370**	-0.0355	-0.369	-9.837**	0.0430	-1.279**	0.332***	-0.437*	-15.99***
	(4.113)	(0.701)	(1.046)	(0.583)	(0.218)	(0.228)	(0.601)	(0.119)	(0.263)	(4.483)	(0.220)	(0.583)	(0.117)	(0.242)	(4.789)
Inflation	3.968	-0.587	0.270	1.233	0.360	-0.253	-2.116	0.217	-0.179	-11.00	-0.291	-2.438	0.639	-0.983	-18.62
	(14.29)	(2.434)	(3.633)	(2.026)	(0.758)	(0.728)	(1.913)	(0.378)	(0.837)	(14.28)	(0.758)	(2.007)	(0.402)	(0.834)	(16.48)
IR_Short_EU	-10.54*	0.749	-1.468	-0.310	0.0188	-0.00497	-1.943*	-0.0209	-0.0589	-3.366	-0.222	-0.996	0.281	-0.188	-12.07
	(5.777)	(0.984)	(1.469)	(0.819)	(0.307)	(0.397)	(1.043)	(0.206)	(0.456)	(7.787)	(0.347)	(0.919)	(0.184)	(0.382)	(7.549)
IR_Long_EU	-2.482	-1.367	-1.215	-0.623	-0.553	-0.148	-1.682	-0.0868	-0.101	-0.901	0.266	-2.270**	-0.294	0.0857	-3.872
	(6.506)	(1.108)	(1.654)	(0.923)	(0.345)	(0.424)	(1.115)	(0.220)	(0.487)	(8.318)	(0.387)	(1.025)	(0.205)	(0.426)	(8.418)
Ratings_PTb	-21.76	-0.586	-2.160	-2.421	-1.256	-0.611	-5.179	-1.309	-0.796	1.743	0.648	-0.389	-1.362	0.826	-21.34
	(49.19)	(8.379)	(12.51)	(6.976)	(2.611)	(3.029)	(7.966)	(1.573)	(3.484)	(59.45)	(2.825)	(7.482)	(1.500)	(3.108)	(61.44)
Constant	489.3*	35.17	248.3***	58.74*	15.81	7.931	435.8***	19.39***	9.738	398.2	-21.52***	238.4***	6.712	-5.362	435.7**
	(249.1)	(42.43)	(63.35)	(35.33)	(13.22)	(13.02)	(34.24)	(6.761)	(14.97)	(255.5)	(8.189)	(21.69)	(4.346)	(9.008)	(178.1)
Observations	163	163	163	163	163	143	143	143	143	143	144	144	144	144	144
R-squared	0.207	0.031	0.195	0.120	0.232	0.262	0.661	0.268	0.117	0.302	0.336	0.604	0.480	0.202	0.202
Number of id	20	20	20	20	20	26	26	26	26	26	19	19	19	19	19