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BANK RISK-TAKING AND COMPETITION IN THE ALBANIAN BANKING SECTOR

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Abstract
Exploring the link between competition and bank risk is an important issue for financial stability and for the economy as a whole. We have used bank level data to empirically test the relationship between bank risk and competition in Albania during the 2004-2014 period. Our results confirm the "competition-fragility" view for the total (and foreign) credit risk, where higher market power is associated with lower risk. Furthermore, we have revealed some aspects of the "competition-stability" relationship concerning nonperforming loans in local currency. We are providing evidence that, after the crisis, the relationship between total (plus foreign) credit risk and competition is nonlinear.

JEL Classification: G21, G32, C23
Keywords: Bank Competition, Credit Risk, Financial Stability, Lerner Index

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1. Introduction

The latest financial crisis has emphasised the crucial role competition and bank stability have had on the whole economy, which means that investigating this relationship is an important issue for financial stability [Beck (2008), Beck *et al.* (2012)]. In banking literature the determinants of bank risk-taking have been the object of considerable research efforts [Marcus (1984), Keeley (1990), Allen and Gale (2004), Beck *et al*. (2006), Jimenez, Lopez and Saurina (2007), Berger *et al.* (2009), Turik-Ariss (2009)]; however, the economic theory on the expected effect of increased competition on bank risk remains unclear [Marques-Ibanez, *et al.* (2014)].

Two are the main approaches that explore the relationship between bank competition and stability. The first approach, namely, the '*competition-fragility view'* or the traditional view, argues that more competition in the banking sector is related to increased bank fragility [Marcus (1984) and Keeley (1990), Allen and Gale (2000, 2004)]. Contrary to the first view, the second approach, or the *'competition-stability view'*, claims that higher competition among banks in the loan and deposit market increases and enhances financial stability, predicting a positive relationship between bank competition and bank stability (Boyd and De Nicolò, (2005)). Nevertheless, some authors [Boyd and De Nicolò (2005), Martinez-Miera and Repullo (2008)] predict a non-monotonic relationship between competition and bank risk, when allowing for the existence of bankruptcy cost or imperfectly correlated loan defaults.

Empirical literature also reflects the ambiguous results predicted from the theory. The explanation of mixed results is related with an inappropriate measure for the market power of banks and bank stability. In addition, most theoretical models do not make a distinction between market structure, i.e., concentration and competition, but rather assume a one-to-one mapping for the market structure to competition behaviour of banks (Beck, 2008). Boyd *et al* (2006) declare that another factor that explains differences between the two main theoretical views is that the effect of competition is investigated in two different markets.

The nexus between competition and bank risk has been investigated in many studies concerning advanced economies. In developing countries there has been little research and in the case of Albania there is one study that calculates bank competition, which, however, does not further calculate the link between competition and bank risk or stability. Investigation of the effects of competition in a developing country like Albania is an important issue for financial stability, because banks are the main source of financial intermediation.

The aim of this paper is to empirically test the relationship between bank competition and bank risk in Albania, using robust least square methods, and to investigate whether the latest financial crisis has affected this relationship. Furthermore, we are testing how bank characteristics have impacted the competition-risk-taking channel. Thus, this research work bridges the gap of empirical literature on the link between competition

and bank risk in Albania. For this purpose, we have used bank level data from the Bank of Albania Database for the period of 2004-2014.

Our results confirm the "*competition-fragility*" view for total (and foreign) loan risk, where higher market power is associated with lower risk. Moreover, we have found some elements of the "*competition-stability*" view for the link between competition and risk in the deposit market. We are providing evidence that, after the latest financial crisis, the relationship between bank stability as a whole and competition is nonlinear, thus, confirming Martinez-Miera and Repullo (2008) Model.

The remainder of this paper is organised as follows: The following section presents an overview of the theoretical and empirical literature on the relationship between competition and bank risk-taking. The third section describes the methodology and data, while in the fourth section we present the results and, finally, our conclusions.

2. Literature Review

Bank competition is very important for the financial market due to the impact it has on the efficiency of financial service production, on the quality of financial products and on the degree of innovation in the financial sector (Claessens, 2009). It has been a widely-held belief among policymakers that more competition in the banking sector is associated, *ceteris paribus,* with greater instability (more failures). The 2007-2009 financial crisis brought the connection between competition and bank stability to the fore once again (Marques-Ibanez *et al.* (2014).

Based on the theoretical literature, two are the main approaches that investigate the relationship between bank competition and stability. The first approach is the "*competition-fragility view"*, which argues that more competition in the banking sector is related to increased bank fragility. This approach is based on the *"charter value*" framework of banks, theoretically modelled by Marcus (1984) and Keeley (1990), according to which banks compete for collecting deposits and invest these in a set financial claim at various levels of risk. Consequently, in a more competitive market with increased pressures on profits, banks have stronger incentives to take excessive risk, which causes higher fragility. Otherwise, in an imperfect competition market, banks have greater opportunities to earn profit, so they have fewer incentives to take higher risks, thus enhancing banks stability. Allen and Gale (2004) state that in a more competitive market, banks face higher risks due to higher bank exposure caused from lack of information banks have on their borrowers. The main perception of this "*competition-fragility view"* is that in a more competitive market, banks have incentives to take higher risks, thus resulting in increased bank fragility.

The second approach is the "*competition-stability view"*, according to which competition and stability are positively related. Boyd and De Nicolò (2005) are mainly those who indicate that in a more competitive market, lower lending interest rates reduce the cost of borrowing for entrepreneurs and, this way, increase the

rate of effective investments. The authors have found a diminishing monotonic link between competition and bank risk. Similarly, in a more competitive market, banks will be facing lower credit risk, which would increase their stability. Martinez-Miera (2008) has extended the model of Boyd and De Nicolò (2005) by allowing a more imperfect correlation with loan defaults. Thus, a decrease in loan rates will reduce the performance of non-defaulting loans; in other words, they have found a U-shaped relationship between competition and risk, where economic structure plays an important role in this correlation.

The empirical literature we refer to in this study focuses on the connection between bank competition and bank risk (or stability). Despite the general theoretical framework, empirical results of the impact of bank competition on bank stability vary. There are two main strands of empirical literature that investigate the association between bank competition and bank (financial) stability; one strand is mainly based on a large, cross-country aggregated dataset, while the other is based on country bank level data.

Beck *et al.* (2006), using standard panel log-it models based on a cross-country dataset, have found that a more concentrated banking system is less likely to experience a banking crisis. Additionally, the authors have found that in a more concentrated banking market, banks have distributed the risks better. Schaeck *et al.* (2009), by investigating the relationship between competition and risk in 38 developed countries during 1980-2003, have found that a more competitive banking system is negatively related to systemic crises, thus supporting the "*competition-stability approach"*. Berger *et al.* (2009), by using bank-level data for 23 industrial states, have shown that banks with a higher degree of market power also face lower overall risk exposure, thus supporting the "*competition-fragility view"*. However, the authors provide some elements of the *"competition-stability view"*, where higher market power increases bank risk and this risk may be offset by higher equity capital ratios. Turik-Ariss (2009) has investigated how different degrees of market power have affected cost, profit, efficiency level and overall bank stability in emerging countries. They have shown that higher degree of market power has led to greater bank stability, thus supporting the "*competition-fragility*" view. Beck *et al.* (2012), by investigating the competition-stability relationship in different countries, have found that more intense competition will have higher impact on bank risk-taking incentives in countries which have stricter activity rules, more homogenous market structures, more generous deposit insurance and a more effective system of credit information sharing. By using regional data in 10 European countries over the 2000-2008 period, Liu *et al* have found a reversed U-shaped relationship between regional bank competition and stability, where regional economic conditions are found to play a significant role in determining the stability of European banks.

The second approach of empirical research investigates the relationship between bank competition and risk using bank-level data. Boyd *et al.* (2006), based on US data,

find that a more concentrated bank market (less intense competition) is, *ceteris paribus*, associated with greater risk of bank failure, thus confirming the *"competition-stability view"*. Jimenez *et al.* (2007) have not found any correlation between credit risks and bank competition in Spain; however, they have found that competition has positively affected credit risk, thus supporting the "*competition-fragility theory"*. Fungacova and Well (2009) have discovered that bank competition has affected financial stability of Russian banks, in accordance with the "*competition-fragility view"*. Iskenderoglu and Tomak (2013), when studying the association between competition and stability in the Turkish banking sector, have not found a clear relationship between the two main variables.

As Beck (2008) mentioned, one of the problems associated with such widely varied results is due to inadequate measures for bank stability and competition. The literature has identified that the main measures used to proxy bank stability are Z-score and the nonperforming loan ratio. Z-score is a measure of the distance from insolvency, defined as the sum of capital to assets ratio and return on assets, weighted by the standard deviation of return of assets, (Boyd, De Nicolò and Jalal 2006), where a higher Z-score ratio implies lower probability of bankruptcy and, vice versa, a lower Z-score ratio means higher bank instability. Another bank stability measure used in relevant literature is the non-performing loan ratio, which is an *ex-post* measure of credit rather than of overall risk. In this paper, bank stability is measured through the non-performing loan ratio. The main reason why we are focusing on credit risk is that credit risk is and remains the major risk of banks in Albania (Bank of Albania, 2014). Furthermore, we have used the Z-score index as an alternative measure to check the robustness of our main results.

Regardless of bank stability, measuring bank competition is a more challenging issue. In the literature there are three main groups of variables used to measure competition (Beck 2008). *The first* group includes market structure measures, such as concentration ratios, number of banks or Herfindahl indices. *The second* group consists of such measures as H-statistics, the Lerner index and the Boone indicator. These measures estimate the competitive behaviour of banks by measuring the reaction of output to input prices through imposing some restrictive assumptions of banks cost functions. The *third* group includes those indicators which provide information on the regulatory framework and the stability of the banking system. Given that we want to evaluate the competitive conditions of Albanian banks, we chose to calculate the Lerner index. As Jimenez, Lopez and Saurina (2007) have remarked, the Lerner index is considered to be a more accurate indicator of market power than concentration measures. The Lerner index varies at the bank level and is used as a proxy for current and future profits stemming from pricing power. Therefore, this index fits well with the theoretical concept of charter value, while this index makes it possible to measure the impact of pricing power on assets and funding risk of banks.

The association between competition and stability in the banking sector has been investigated in many studies for the case of advanced economies. However, in developing economies there has been little research [Turik-Ariss (2009), Iskenderoglu and Tomak, (2013)], and in the case of Albania, there is only one study by Note (2006). The author calculated bank competition in Albania based on the Panzar and Rosse methodology and she found that banks in Albania during the 1999-2006 period operated in a monopolistic banking system. Although this study does not explore the relationship between bank competition and stability in Albania it did reveal some evidence on competition in the banking system during that period. Investigation of the competition effect on the bank stability of an emerging country like Albania is an important issue for policymakers, since banks are the main source of financial intermediation (Vives, 2010). Thus, by investigating the relationship between bank competition and bank stability in Albania, this research study bridges the gap of empirical results and provides evidence on the effects of competition on bank risk in a developing country like Albania.

3. Methodology and Data

a. The Empirical Model

Based on the work of Jimenez, Lopez and Saurina (2007), Berger et al (2009), and Beck *et al* (2012), we have specified the link between competition and risk as follows:

$$Risk_{i,t} = \beta_0 + \beta_2 Risk_{i,t-1} + \beta_2 Competition\_id_{i,t} + \beta_3 (Competition_{id})^2_{i,t} + \beta_4 Bussines\_cycle_{i,t} + \sum_{k=1}^{m} \beta_5 Bank\_characteristic_{i,t} \quad (1)$$

Where subscripts *i* and *t* refer to bank and time period. Regressions are estimated using robust least square methods. This method allows a sound estimate of autoregressive parameters and fits the nonlinear trend of the series (Rousseeuw and Yohai, 1984). As we mention in the previous section, our main risk measure is the nonperforming loan as a ratio of total loan[1]. Furthermore, we tested if competition has a different impact on the risk[2] in foreign currency versus the risk of local currency, due to the fact that eurisation is a crucial issue in Albania.

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1. Like Jimenez, Lopez and Saurina (2007), we used the log transformation of NPL measures as follows: $\log\left(NPL_{i,t} / 1 - NPL_{i,t-4}\right)$, to ensure that the dependent variable spans over the interval $]-\infty, +\infty[$ $]-\infty, +\infty[$ (as opposed to between 0 and 1, and it is distributed symmetrically).
2. This is measured as the log transformation of nonperforming loan in foreign (and local) currency ratio.

Like Jimenz, Lopez and Saurina (2007), we have also used the Lerner index[3] as a measure of competition. Compared to other competition measures, the Lerner index represents a good measure of the bank-year market power, which can be computed even with a small number of banks and is a flexible indicator with straightforward interpretation. Furthermore, the Lerner index is computed to measure competition in the loan and deposit market. We also tested the nonlinear relationship between bank risk and competition by including the squared measure of competition.

As a measure of a business cycle we have used the current value of real GDP growth to detect significant credit risk developments along the cycle. Furthermore, we have empirically tested how bank characteristics, like Size (measured as the log of total assets), Credit risk exposure or specialisation, Loan rates (measured as the ratio of total loans to total assets) and bank profitability (ROA[4]), influence this relationship. In order to see how the financial (economic) crisis impacted the correlation between competition and risk, we calculated the model for the period after the financial crisis.

The main coefficients we considered are β_2 and β_3 where a positive and significant value of both coefficients implies a positive relationship between risk (NPL ratio) and competition, thus confirming the "*competition-stability*" view of Boyd and De Nicolò (2005). While a negative and significant value of both β_2 and β_3 parameters suggests that lower competition leads to lower risk, which is supportive of the franchise value paradigm or the "*competition-fragility*" view of Marcus (1984), Keeley (1990), and Allen and Gale (2004). Besides, a significant negative β_2 and a significant positive β_3 suggest a U-shaped relationship between competition and risk, like in the Martinez-Miera and Repullo (2008) Model.

We expect a negative relationship between GDP and risk, so better macroeconomic conditions are related to lower risk. In general, we expect a positive long-term relationship between risk and profitability, but, like Jimenez, and Lopez and Saurina (2007) support, this association can also be negative, due to the fact that higher credit risk is linked with higher losses and lower profitability. There is no clear relationship between a bank size and its risk level; we expect negative or positive correlations depending on how larger banks may diversify the risk or not. Furthermore, there is no general consensus on the impact that the loan-to-asset ratio has on bank risk; therefore, a negative or a positive impact is expected.

3. Dushku (2015) presents in detail the way in which this index is calculated for banks in Albania.
4. ROA is a moving average of three years of return on assets for bank i. E/TA presents the moving average of three years on equity (E) to total assets (TA) for bank i, while σ_ROAi is the standard deviation of return on assets over the period under study.

b. The Data

The main sources of data are balances and income sheet statements of 15 individual banks collected by the Bank of Albania during the 2004-2014 periods, while real GDP data are obtained from the National Institute of Statistics in Albania (Instat).

In Table 5 (Appendix) we present some descriptive statistics of our main variables. The average Nplt ratio for the total banking system is 11.58%, with a high dispersion across banks ranging from 0% to 54%. Average NPL ratio in foreign currency is 8.36% with a maximum of 39.5%, while Npl ratio in local currency is 3.2% with a maximum of 28%. We also calculated the Z-score index, with an average of 11%, a minimum of 2% and a maximum of 26%.

Generally speaking, the Lerner index for deposits has an average of 0.3 with a maximum of 0.97, which reflects the fact that, on average, competition in the deposit market is moderate. Furthermore, the Lerner index of the loan market has an average of 0.53 and a maximum of 0.96, which reflects that competition in this market is lower compared to that of the deposit market.

We show that banks in Albania have an average ROA of 0.07%, with a minimum of -10% and a maximum of 8.5%. Bank lending, measured as the ratio of loan to total assets, is one of the main activities of the banking sector in Albania, with an average of 48% and a maximum of 96%. Therefore, we confirm higher differences in bank lending activity in Albania. Differences are also apparent on the basis of size and the level of capitalization, with a mean of 10.2 % and 14 %, respectively.

4. Results

To ensure robust and unbiased results, we performed some preliminary tests. In addition, we have run unit root tests for the whole banking series of our sample. After performing unit root tests we rejected the null hypotheses for all the series considered in our model (Table 6, Appendix A).

Table 1 shows our main results, where nonperforming loans to total loans (Models 1 and 2) is our proxy for loan risk. Due to the higher level of credit in foreign currency in Albania, we tested whether there are differences in the correlation between risk and competition taking into account the risk involved in foreign and local currency (Models 3 to 6).

Calculated results have shown a negative and significant linear coefficient of the Lerner index in the loan market and a positive quadratic term for both total risk and foreign risk (Model 1 and Model 3). In order to evaluate the type of relationship between the degree of market power and NPL ratios, similar to Berger *et al.* (2009) we calculated the inflection point of each quadratic function and compared this inflection point with data distribution. In Model 1, the inflection point is 0.54 (the sign of quadratic term is positive) and we found that 53% of the data lay below this inflection point. So we confirmed a negative relationship between the degree of

market power and the total loan portfolio risk. The same results were also found for the relationship between foreign credit risk and market power (Model 3). In line with the "*competition-fragility*" view of Marcus (1984), Keeley (1990) and Allen and Gale (2004), our results indicate that more intense competition in the banking sector is associated with riskier loan portfolios.

In Models 2 and 4 we present the results calculated for the correlation between the Lerner index in the deposit market and the credit risk for total and foreign loans. We found a positive and significant coefficient for the Lerner index in both models and a significant quadratic term. In Model 2, the inflection point (the quadratic term sign is negative) is 0.48 and we found that 82 % of all data are below this inflection point, confirming a positive link between market power and risk. Additionally, in Model 4, the inflection point is 0.53 (the quadratic term sign is negative) and that 86 % of the data are below this inflection point, indicating a positive relationship between market power and risk. Therefore, there is a positive link between competition in the deposit market and risk, in line with the *competition-fragility* view.

Table 1. Competition impact on Credit risk

	Npl_ratio		**Npl_ratio_fcurrency**		**Npl_ratio_allcurrency**	
	Robust Least Square		**Robust Least Square**		**Robust Least Square**	
	Model 1	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6*
	Lerner_i_ loan market	Lerner_i_ deposit market	Lerner_i_ loan market	Lerner_i_ deposit market	Lerner_i_ loan market	Lerner_i_ deposit market
Npl_ratio (-4)	0.739*** (0.000)	0.735*** (0.000)	0.638*** (0.000)	0.652*** (0.000)	0.843*** (0.000)	0.859*** (0.000)
Lerner_i_	-2.049** (0.041)	1.029*** (0.005)	-2.864*** (0.017)	1.165*** (0.005)	0.0985 (0.922)	0.257 (0.458)
Lerner_i_ ^2	1.894** (0.0580)	-1.063*** (0.012)	2.640*** (0.029)	-1.089*** (0.024)	0.132 (0.894)	-0.316 (0.447)
Inflection point	*0.54*	*0.48*	*0.54*	*0.53*		
Sing of relationship	- *(negative)*	+ *(positive)*	- *(negative)*	+ *(positive)*		
GDP_G	-5.006*** (0.000)	-4.500*** (0.001)	-7.491*** (0.000)	-7.266*** (0.000)	-1.008 (0.4404)	0.222 (0.8810)
Roa	-0.1930*** (0.000)	-0.2100*** (0.000)	-0.2117*** (0.000)	-0.24020*** (0.000)	-0.0832*** (0.0000)	-0.0784*** (0.0001)
Loan_ratio	-0.1715 (0.1727)	-0.0617 (0.6572)	-0.1161 (0.4310)	-0.0738 (0.6384)	-0.4282*** (0.0008)	-0.0824 (0.5692)
Size	0.1241*** (0.0000)	0.1134*** (0.0000)	0.0970*** (0.0000)	0.08067*** (0.000)	0.0423*** (0.0208)	0.0700 *** (0.0011)
Nr. of observation	538	431	544	427	498	394
Nr. of banks	15	15	15	15	15	15
Adjusted R-squared	0.642	0.67	0.65	0.65	0.61	0.62

Note: Coefficient calculations are based on the robust least squares method, with robust standard errors based on Huber Type 1 correction. *, ** and *** indicate statistical significance at the 10 %, 5%, and 1 % levels, respectively.

Source: Author's Calculations.

Contrary to the above, we did not find any significant results between the competition index and the credit risk, (Table 1, Models 5 and 6) concerning credit risk in local currency (Models 5 and 6).

We found a negative and significant relationship between real GDP growth and all measures of nonperforming loans, which reflects the fact that higher economic growth is associated with a low risk level. We confirmed a negative and significant result between profitability and credit risk in all equations. This result shows that higher levels of nonperforming loans are associated with higher level of losses during a specific year, which negatively affects bank profitability. We also found a positive and significant correlation between bank size and risk, which suggests that larger banks have taken higher credit risks.

To summarise, we found a negative relationship between the market powers measured through the Lerner index in the loan market and total (foreign) loan risk, thus confirming the *'competition-fragility'* view. Hence, increased competition in the banking sector is likely to erode the franchise value of firms and encourage banks to increase their overall risk exposure. Since we found a positive and significant link between competition in the deposit market and risk, thus confirming the *'competition-stability'* view, higher market power is related with riskier loan portfolios.

We have also considered the impact market power or competition index has on the overall bank risk. As argued by Berger *et al.* (2009), we have to consider not only the risk on loan portfolios but the overall bank risk as well. Therefore, in Table 2 we present the impact the level of competitiveness has on the Z-score index, as an inverse proxy for the overall risk.

We found a negative and significant coefficient between the Z-score and the linear term of the Lerner index in the loan market and a positive and significant coefficient for the quadratic term. The inflection point in Model 1 (Table 2) is 0.53 (a positive quadratic term) and we found that 52% of all data are above this level, which implies a positive relationship between the market power and the Z-index. This result suggests a nonlinear link between competition and bank stability, thus confirming the Martinez-Miera and Repullo (2008) Model. However, we did not find any significant correlation between overall bank stability and competition in the deposit market. In both models presented in Table 2, we found a positive but insignificant relationship between the Z score index and macroeconomic conditions, which suggests that better macroeconomic conditions are associated with lower risk or higher bank stability. Moreover, we found a negative relationship between bank exposure and stability, implying that higher credit risk is not correlated with higher overall risk. We confirmed a positive and significant relationship between size and the Z-score, showing that larger banks take higher credit risk, but lower overall risk implying that larger banks are more stable due to the diversification of risk.

Table 2. Competition impact on Z-score

	Log (Z-score)	
	Robust Least Square	
	Model 1	Model 2
	Lerner_i_ loan market	Lerner_i_ deposit market
Log(Z_score(-4)	0.9421*** (0.000)	0.9356*** (0.000)
Lerner_i_	-0.5843*** (0.0004)	0.0344 (0.6740)
Lerner_i_^2	0.5624*** (0.0010)	0.02858 (0.7669)
Inflection point	*0.53*	
Sing of relationship	*+ (positive)*	
GDP_G	0.1163 (0.5621)	0.0915 (0.6650)
Loan_ratio	-0.3082*** (0.0000)	-0.3715 (0.0000)
Size	0.0378 (0.0000)	0.0284 (0.000)
Nr. of observation	596	464
Nr. of banks	15	15
Adjusted R-squared)	0.77	0.76

Note: Z_score is an inverse indicator of a bank's fragility; a higher value indicates greater bank stability. Coefficients calculated are based on the robust least squares method, with robust standard errors based on Huber Type 1 correction. *, ** and *** indicate statistical significance at the 10 %, 5%, and 1 % levels, respectively.

Source: Author's Calculations.

We have also tested whether the link between competition and risk changed after the last financial crisis. In order to examine this impact we calculated our model from 2007q4 until 2014q4 and we compared these with previous results (Table 3).

After the crisis we did not find a significant correlation between the Lerner index in the loan market and non-performing loans. Besides, we provide evidence of nonlinear link between competition in the deposit market and the risk measured through nonperforming loan ratios (Models 2 and 4, Table 3). We also checked how the relationship between overall bank stability and competition changed after the latest financial crisis. Results calculated are presented in Models 7 and 8 (Table 3) and show a negative and significant coefficient of the Lerner term and a positive and significant quadratic term.

The inflection point is -0.2 and we found that 99 % of the data lie above the quadratic term, which suggests a positive association between market power and bank stability, thus confirming Martinez-Miera and Repullo (2008) Model for a nonlinear link between market power and risk.

Table 3. Impact of financial crisis on bank credit risk and overall bank stability

	Npl_ratio		**Npl_ratio_fcurrency**		**NPl_ratio_allcurrency**		**Log (Z-score)**	
	Robust Least Square		**Robust Least Square**		**Robust Least Square**		**Robust Least Square**	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
	Lerner_ i_ loan market	Lerner_ i_ deposit market	Lerner_i _ loan market	Lerner_i_ deposit market	Lerner_i _ loan market	Lerner_i_ deposit market	Lerner_i_ loan market	Lerner_i_ deposit market
Lag_ dependent variable	0.754*** (0.000)	0.754*** (0.000)	0.710*** (0.000)	0.698*** (0.000)	0.791*** (0.000)	0.801*** (0.000)	0.957*** (0.000)	0.946*** (0.000)
Lerner_i_	-1.677 (0.116)	0.690** (0.038)	-1.117 (0.388)	0.882** (0.030)	0.886 (0.388)	-0.059 (0.852)	-0.891*** (0.000)	0.012 (0.899)
Lerner_i_^ 2	1.289 (0.228)	-0.563 (0.145)	0.557 (0.667)	-0.619 (0.184)	-0.508 (0.619)	0.056 (0.878)	1.0127 *** (0.000)	0.0291 (0.783)
Inflection point		*0.61*		*0.71*			*-0.2*	
Sing of relationship		+ ***(positive)***		+ ***(positive)***			+ ***(positive)***	
GDP_G	-2.258* (0.095)	-0.295 (0.842)	-3.772** (0.019)	-15.25*** (0.000)	0.552 (0.619)	1.1269 (0.388)	0.186 (0.5596)	-0.282 (0.346)
Loan_ratio	-0.093 (0.473)	-0.009 (0.965)	-0,062 (0.692)	-2.30 (0.181)	-0.587*** (0.000)	-0.424*** (0.004)	-0.321 *** (0.000)	-0.390*** (0.000)
Size	0.128*** (0.000)	0.119*** (0.000)	0.098*** (0.000)	0.072*** (0.004)	0.049*** (0.005)	0.72 *** (0.000)	0.039 *** (0.000)	0.0305*** (0.000)
ROA	-0.157*** (0.000)	-0.169*** (0.000)	-0.135*** (0.000)	-0.182*** (0.000)	-0.074*** (0.000)	-0.069*** (0.000)		
No. of observations	395	312	395	312	382	301	356	336
No. of banks	15	15	15	15	15	15	15	15
R-squared	0.65	0.67	0.63	0.67	0.65	0.65	0.78	0.76

Note: Coefficients calculated are based on the robust least squares method, with robust standard errors based on Huber Type 1 correction. *, ** and *** indicate statistical significance at the 10 %, 5%, and 1 % levels, respectively.

Source: Author's Calculations.

Furthermore, we found a negative and significant impact of business cycle indicators and all measures of risk and different results about credit risk exposure. We found a negative and significant relationship between risk and return in all models and a positive link between size and bank stability. Therefore, after the crisis the largest banks enjoyed lower overall risk.

5. Conclusions

Based on the theoretical literature, there are two main approaches exploring the relationship between bank competition and stability. The first approach is the '*competition-fragility'* view, which argues that more intense competition in the banking sector is correlated to increased bank fragility, because banks have incentives to take higher risk [(Marcus 1984), (Keeley 1990), (Allen and Douglas 2004)].

On the other hand, the second approach, i.e. the *'competition-stability'* view of Boyd and De Nicolò (2005), suggests a positive relationship between competition and risk. Additionally, Martinez-Miera and Repullo (2008) also found an inverted-U relationship between competition and risk. Regardless of the theoretical consensus, empirical results on the impact of bank competition on banks stability are still controversial and rather complex depending on how we calculate competition and bank risk.

In this study we tested the link between competition and risk (credit and overall risk) in the Albanian banking sector using the robust least square method during the 2004-2014 period. Moreover, we have tested how the financial crisis has changed this relationship. Our results confirm the '*competition-fragility'* view on total (and foreign) loan risk, where higher market power is associated with lower risk and we found some elements of the '*competition-stability'* view regarding the correlation between competition in the deposit market and risk. We provide evidence that, after the crisis, the relationship between overall bank stability and competition is nonlinear, thus confirming Martinez-Miera and Repullo (2008) Model.

Finally, we found that banks with higher credit risk exposure face higher risks, but larger banks, despite the fact that they have taken higher loan risks, benefited from greater bank stability. We have found a negative and significant correlation between overall (credit) risk and profitability and a negative and significant impact of real GDP on all measures of risk.

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Appendix A

Table 4. Descriptive statistic

Variables	Mean	Median	Max	Min	Std. Dev.	Observations
Nplt_ratio (%)	11.58	7.90	54.00	0.00	11.89	602
Nplt_r_allcurrency (%)	3.21	1.71	27.75	0.00	4.14	602
Nplt_r_fcurrency(%)	8.36	4.73	39.51	0.00	9.32	602
Z_score (%)	10.82	9.74	26.01	1.83	6.29	602
Lerner_i_dep	0.30	0.25	0.97	0.00	0.22	602
Lerner_i_loans	0.53	0.53	0.96	0.10	0.13	602
Size	10.22	10.48	12.69	7.23	1.36	602
Roa(%)	0.07	0.33	8.47	-9.94	1.44	602
Loan_ratio(%)	47.67	45.06	96.16	0.22	19.65	602
Gdp_g (%)	3.90	3.47	7.27	0.44	2.10	602

Source: Bank of Albania, Instat, IMF, Authors calculation (2015).

Table 5. Correlation coefficients

	Nplt_ratio	Nplt_r_ allcurrency	Nplt_r_ fcurrency	Z_score	Lerner_i_ dep	Lerner_i_ loans	Size	Roa	Loan_ ratio	Gdp_g
Nplt_ratio	1.00									
Nplt_r_ allcurrency	0.74(0.00)	1.00								
Nplt_r_ fcurrency	0.95 (0.00)	0.50 (0.00)	1.00							
Z_score	-0.23 (0.00)	-0.08 (0.11)	-0.26 (0.00)	1.00						
Lerner_i_ dep	0.12 (0.01)	-0.01 (0.86)	0.16 (0.00)	-0.01(0.89)	1.00					
Lerner_i_ loans	0.18 (0.00)	0.21 (0.00)	0.13 (0.01)	-0.03 (0.51)	-0.10 (0.05)	1.00				
Size	0.18 (0.00)	0.21 (0.00)	0.13 (0.01)	0.02 (0.62)	0.10 (0.04)	0.10 (0.03)	1.00			
Roa	-0.31 (0.00)	-0.14 (0.00)	-0.33 (0.00)	0.16 (0.00)	0.05 (0.31)	0.06 (0.24)	0.31 (0.00)	1.00		
Loan_ ratio	0.17 (0.00)	-0.02 (0.73)	0.23 (0.00)	-0.66 (0.00)	0.01 (0.77)	-0.10 (0.03)	0.10 (0.04)	-0.18 (0.00)	1.00	
Gdp_g	-0.66 (0.00)	-0.51 (0.00)	-0.62 (0.00)	0.11 (0.03)	0.03 (0.54)	-0.27 (0.00)	-0.32 (0.00)	0.21 (0.00)	-0.21 (0.00)	1.0

Note: p-values are in bracket.
Source: Authors'Calculations.

Table 6. Unit root test

	Fisher-type based on ADF test Ho: all panel contain a unit root	Fisher-type based on PP test Ho: all panel contain a unit root	Im-Pasaran-Shin test Ho: all panel contain a unit root
Log_tr (Nplt_ratio)	66.34*** (0.000)	97.6*** (0.000)	-3.34*** (0.000)
Log_tr (Nplt_r_ Allcurrency)	68.92*** (0.000)	121.77*** (0.000)	-3.18*** (0.000)
Nplt_r_ Fcurrency	64.93*** (0.000)	101.66*** (0.000)	-3.41*** (0.000)
Z_score	54.58*** (0.000)	48.41 (0.42)	-2.11*** (0.000)
Lerner_i_ Dep	81.97*** (0.000)	127.140*** (0.000)	-4.95*** (0.000)
Lerner_i_ Loans	44.23*** (0.0454)	56.67*** (0.0023)	-1.8*** (0.0358)
Size	68.85*** (0.000)	84.22*** (0.000)	-3.08*** (0.000)
Roa	80.72*** (0.000)	96.01*** (0.000)	-5.18*** (0.000)

Note: p-values are in bracket.
Source: Authors' Calculations.