Does bank competition affect bank stability after the global financial crisis?

Shijaku, Gerti

Bank of Albania

17 November 2016

Does bank competition affect bank stability after the global financial crisis?

Gerti Shijaku[1]

2017

ABSTRACT

This paper addresses the dynamic relationship between competition and bank stability in Albanian banking system during the period 2008 - 2015. To this purpose, we construct a proxy for bank competition as referred to the Boone indicator. We also calculated the Lerner index and the efficient adjusted Lerner index, as well as the profit elasticity index and the Herfindahl–Hirschman Index. The main results provide support for the "competition – stability" view – that lower degree of market power sets banks to less overall risk exposure. The results further show that increasing concentration will have a larger impact on bank's fragility. Similar, bank stability is positively linked with macroeconomic conditions and capital ratio and inverse with operational efficiency. We also used a quadratic term of the competition measures to capture a possible non-linear relationship between competition and stability, but find no supportive evidence.

JEL Codes: C26, E32, E43, G21, H63.

Keywords: Bank Fragility, Competition, Boone and Lerner indicator, Panel Data, GMM.

1. INTRODUCTION

[1] Research Department, Bank of Albania,
Tel: +355692160010
email gshijaku@bankofalbania.org,
shijakugerti@gmail.com

The international process of banking liberalisation, triggered by excessive bank risk taking, has gone hand in hand with an increased occurrence of systemic banking crises, culminating in the GFC of 2007-2009 (Beck, et al., (2013). This has yet again heightened interest in the relationship between completion, market structure and financial stability. However, there is not yet a scientific consensus on whether bank competition mitigates or exacerbates financial stability as the predications emerging from the theoretical models and empirical studies are ambiguous and so far are also inconclusive (Kasman and Carvallo, 2014). The traditional view argues that fiercer competition among banks would give banks proper incentives to behave prudently and therefore lead to a more efficiency banking system, which benefits bank stability (Boyd and De Nicolo 2005, Beck et al., 2006, Schaeck et al., 2009 and Schaeck and Cihak 2014). However, others have challenged this view, instead arguing that higher competition among banks reduces market power and profits margins, which essentially lowers the franchise value of banks. This as a result will encourage banks to take greater risks so as to make up the loss of declined franchise value, which may also lead to crisis (Keeley 1990, Allen and Gale 2004, Boyd, et al., 2006, Agorakia, et al., 2011, Leroy and Lucotte 2017). On top of these mainstream views, others argue that U-shaped relationship exists as lower degree of bank concentration may reduce the borrower's probability of default (risk-shifting effect), but also the interest payments from performing loans, which serve as a buffer to cover loan losses (margin effects) (Martinez-Miera and Repullo 2010).

This similarly inconclusive debate is particularly critical for Albania, as the Albanian financial system is currently centred on banks, where a large number of banks operate in a specific small opened economy, and equity market is remarkably underdeveloped. at the end of 2015, the ratio of financial system assets to GDP reached 99.2%, with the banking sector owning 91.4% of financial system assets (90.6% of GDP), while stock market capitalization is the lowest in South East Europe. On the one hand, development of the banking sector has been the main driving force behind economic prospect, while improving market and macroeconomic condition, as well as increasing competition has motivated larger foreign banks in more developed countries, most in the Eurozone, operating at relatively low margins to extend cross-border operations into potentially new and more profitable market such that in Albania. On the other hand, such patterns are also raising concerns about increased competition in the banking sector as it is often criticised for being "overbanked" and that bank stability may be triggered by excessive bank risk taking due to further competition, which may shift their focus towards increasing profits while ceasing to monitor and properly assess risk.

The GFC did not affect the Albanian economy as strongly as its SEE neighbours. At the same time, banks showed an apparent resilience during this period and similarly they emerged from the GFC in a relatively stable position. Although, there are a number of challenges in the why banks are regulated and managed, while among other things the problems of banks being "too-big-too-fail has also emerged, especially in terms of market share as the 6 largest banks hold nearly 80% of the market. To that, still at a ratio of nearly 16.2% for the whole market and 22.2% for the systemic banks, the Herfindahl–Hirschman index (HHI) suggests that the banking sector is "moderately concentrated". Similarly, evidences (See also Graph 1 in Appendix A) show that there is a close linear relationship between the degree of market power and extend to which banks are exposure to greater instability, which suggests that competition foreheads bank fragility over time. Therefore the effect of the regulatory framework on competition and banks' risk-taking incentives and ultimately bank stability make it a particularly interesting environment in which to study the competition-stability nexus.

Against this background, the existing literature provides a fairly comprehensive review on competition-stability nexus, but of these cases still one question need to be answered empirically as there is no evidence on the nature of this relationship in the case of a small-opened emerging economy, namely Albania, and in particular after the GFC. The main question, therefore, addressed in this paper focuses on what is the effect of competition on banks stability after the GFC. The paper makes use of a sample with data for 16 banks operating in the Albanian financial sector over the period 2008 – 2015. The empirical estimation approach follows a five-step procedure. First, we constructed a composite individual bank stability indicator as explained by Shijaku (2016a). Second, we calculate a competition indicator as suggested by Boone (2008). Then, empirical estimation is based on a dynamic two-step General Method of Moments

(GMM) with unbalance panel with quarterly data for the period 2008 – 2015. Finally, we deepen our empirical analysis either by splitting the sample with regards to large and small banks or checking for non-linearity relationship between competition and stability in the case of Albanian banking sector. Finally, we use also other alternative measure of competition which includes the use Lerner index and the efficiency adjusted Lerner index, as well as the profit elasticity index and the Herfindahl–Hirschman Index.

This paper complements and extends existing literature on this issue in several aspects. First, to the best of our knowledge this is the first study to investigate empirically competition-stability nexus focusing only on the period after the GFC, which may highlight the impact of the global turmoil on individual bank risk exposure. Second, since it focuses only on a single country, it avoids any pitfall as described by Uhde and Heimeshoff (2009) related to data issues and ensure comparability across both dependent and independent variables. Nor do we use data from the Bankscope database. Third, different from previous empirical work, this paper does neither focus on real episodes of banking crises nor use binary approach as a proxy for instability episodes. Neither it does use the Z-score or credit risk as an in-variant measure of the bank's risk-taking behaviour and distance to solvency, to which Fu, et al., (2014) provides some arguments against nor uses a Lerner index as an competitive proxy. As a first, approach we therefore gauge the relationship between the two by using instead a more sophisticated proxy for bank stability that is based on a wide set of consolidated balance sheet data and the principal component analyses approach as explained by Shijaku (2016a). Hence, our measurement of bank risk directly captures the possibility of outright bank defaults or/and stability conditions. This approach is advantageous even to the fact that it avoids any pitfalls of using the binary approach to crises episodes. At our best knowledge, no previous study has employed such bank stability indicator as the dependent variable to investigate the competition-bank stability nexus and we believe this is an important step forward toward a better understanding of the underlying mechanisms. On the one hand, we use an alternative competition indicator, as proposed by Boone (2008), which incorporates also the concept of efficiency structure based on bank behaviour. Finally, we provide appropriate evidence, by fragmentising this sector according to the size of the banks, addressing whether certain institutions show different concentration behaviour than others.

By way of preview, we find reasonable evidence supporting the "competition-stability" view that greater competition increase bank stability. This implies that there is not trade-off for policymakers between competition and bank soundness in the banking sector in Albania. The robustness check tests also confirm our main findings that support the "completion-stability" view. The results further indicate that greater concentration has a negative impact on bank stability. At the same time, we do not find any evidence of a non-linear relationship in the competition – stability nexus. Nor do we find when we split the sample to account for small banks and large banks. To this approach, we find that this positive relationship is stronger for small banks rather the large banks. Finally, as for control variables, we find that macroeconomic conditions are relatively important for bank stability. Similarly, bank stability is also conditional to improving operation efficiency and capital structure of the banks.

The remainder of the paper is structured as follows. Section 2 summarises the literature review. Section 3 presents the methodology with regards to model specification and data. The main results are presented in Section 4. The material concludes in section 5.

2. LITERATURE REVIEW

The impact of bank competition on financial stability remains a widely debated and controversial issue, both among policymakers and academics, long before the GFC started. Both at theoretical and empirical level, the issue remain still ambiguous and unresolved, despite a large body of literature (Kasman and Carvallo 2014).

2.1. THEORETICAL LITERATURE

From a theoretical perspective, there are two major streams with utterly opposite views. The competition-fragility view[2] argues on a (negative) margin effect hypothesis assuming that a competition endangers bank stability. The idea is that increasing competition should erode banks' net present value of profits to zero. Without potential

[2] See among others Keeley (1990) Matutes and Vives (2000); Hellmann, Murdock, and Stiglitz (2000); Allen and Gale (2004); Beck, Asli Demirgüç-Kunt, and Levine (2006); Evrensel, (2008); Wagner (2010); and De Haan and Poghosyan, (2012).

to make future profits (i.e. zero franchise value) banks would relax their investment selection requirements, which in return would give them an incentive to expand or/and take on new riskier policies, including high-risk and high yield investments, in an attempt to maintain the former level of profits. Conversely, the competition-stability view[3] argues on a (positive) margin effect hypothesis. The ideas is that banks that have some market power (i.e. positive franchise value) tend to undertake some "credit rationing" and therefore might be more prudent in the aspect of risk-taking as they have 'something to lose', which induce them adverse selection to risky investments (those that jeopardize future profits may not be accepted by banks authorities). Similarly, the considerable market power of only few banks would enhance profits through higher interest rate on loans [Boyd, et al., (2004)], which may provide banks with higher "capital buffer" to protect them from adverse external risks and moral hazard (risk shifting) with a negative impact on the stability of the banking system (Beck, et al. 2006, Berger and Bouwman 2013, Fiordelisi and Mare 2014). Finally, different from the two mainstream views above, Martinez-Miera and Repullo (2010) modify the model in Body and De Nicolo (2005) assuming that U-shaped relationship exists. They show evidence that the probability of bank default first goes down, but then does up after a certain point as bank completion increase, which is also supported by findings of Berger, et. al, (2009), Jeona and Limb (2013), Jiménez, et. al., (2013), Liu, et. al., (2013), Samantas (2013).

2.2. EMPIRICAL LITERATURE

In line with appropriate theoretical views, many recent studies have tried to analyse empirically the nexus between competition and stability in the banking system. Several works has tested the competition-stability nexus by focusing on competition indicators that are based on the structure-conduct-paradigm (Beck, et. al. 2006, Boyd, et. al. 2006, de Haan and Poghosyan 2012a, de Haan and Poghosyan 2012b, Mirzaei, et. al. 2012, Căpraru and Andrieş 2015, Fernández, et. al. 2016, Pawlowska 2016) and the relatively market-power hypothesis (Hesse and Čihák 2007, Levy Yeyati and Micco 2007, Uhde and Heimeshoff 2009, Wagner 2010, Fiordelisi and Mare 2014, Pawlowska 2016) and have found mixed evidence. For instance, Boyd and De Nicoló (2005) show that in a

[3] See among others Boot, et al. (2000), Bond and De Nicolò (2005), Berger, et al. (2009); De Nicolò and Lucchetta (2009); Beck, et al. (2006); Berger and Bouwman (2013).

concentrated market banks tend to be more risk-taking and an increase in concentration both in loan and deposit markets brings in higher loan rates charged to borrowers. Boyd, et. al. (2006) using a cross-sectional sample of about 2,500 U.S. banks in 2003 and a panel data set of about 2,600 banks in 134 non-industrialized countries for 1993-2004. Authors find that banks' probability of failure increases with market concentration, even though as Berger, et. al. (2009) suggests their conclusions are drawn using the concentrations, which might be insufficient measures of market structure. Bushman, et. al. (2016) using a new text-based measure of competition (which captures managers current perceptions of competitive pressures deriving from any and all sources, including potential entrants, non-bank competitors and labour markets) provide robust evidence that greater competition increase both individual bank risk and bank's contribution to system-wide risk. Authors also show that higher competition is associated with lower underwriting standards, less timely loan loss recognition and a shift towards non-interest revenue. Leroy and Lucotte (2017) use the Z-score and systemic dimensions of risk and the Lerner index as in Ahamed and Mallick (2017) to analyse the relationship between competition and bank risk across a large sample of European listed banks over the period 2004–2013. Results suggest that competition encourages bank risk-taking and then increases individual bank fragility. Indeed, contrary to our previous results, the authors find that competition enhances financial stability by decreasing systemic risk. This result can be explained by the fact that weak competition tends to increase the correlation in the risk-taking behaviour of banks. Other papers that confirm the competition-fragility view include Beck, et al., (2013), Jiménez, et al., (2013), Soedarmonoa, et al., (2013), Fu, et al., (2014), Weiß, et al. (2014).

By contrast, Beck, et. al. (2006) and De Nicolò, et. al. (2009) found that crises are less likely in economies with more concentrated banking systems. Another work by Schaeck et. al. (2009) uses the Panzar and Rosse H-Statistics, as an alternative measure of the degree of competitiveness for competition in 38 countries during 1980–2003 and concludes that more competitive banking systems are less prone to systemic crises and that time to crisis is longer in a competitive environment. Jiménez, et al., (2013) use a unique dataset for the Spanish banking system and report that standard measure of market concentration do not affect the NPL ratio, but found evidence in favour of the franchise value paradigm when using the Lerner indexes. Amidu and Wolfe (2013) investigates how the level of competition affects diversification and stability using a sample of 978 banks in 55 emerging and developing countries over the period 2000–2007. The core finding is that competition increases stability as diversification across and within both interest and non-interest income generating activities of banks increases. Their analysis identifies revenue diversification as a channel through which competition affects bank insolvency risk in emerging countries. Other recent empirical papers that validate "competition-stability" view include Jiménez, at al., (2010), Nguyen, et al., (2012), Amidu, (2013), Jeona and Limb (2013), Schaeck and Cihak (2014). There are also other papers that validate both views. Berger, et. al. (2009) analyse empirically the link between credit risk (NPL ratio), bank stability (Z-index) and the capital ratio (capital ratio) and several measures of market power (Lerner and HHI), using bank level data from Bankscope on 8235 banks in 23 developed countries. Their results suggest, consistent with the traditional "competition-fragility" view, banks with a higher degree of market power also have less overall risk exposure. However, the data also provide some support for the one element of the competition-stability view – that market power does increase loan risk, which may be offset in part by higher capital rations.

The above mention empirical papers produce cross-country evidence. A few studies focus on a single banking sector. For example Zhao, et. al. (2010) examine the degree to which deregulatory measure aimed at promoting competition lead to higher risk-taking in Indian banking system. The authors show evidence improved competition through deregulation does not lead to efficiency gains, but rather encourage further risk-taking. Fungacova and Weill (2013) analyse this issue based on a large sample of Russian banks over the period 2001-2007 and in line with the previous literature they also employ the Lerner index as the metric of bank competition. Results clearly support the view that tighter bank competition enhances the occurrence of bank failures. Kasman and Kasman (2015) analyse the relationship between competition (proxies by the efficiency-adjusted Lerner) and bank stability (proxies by Z-Score and NPL ratio) on Turkish banking system industry. The main results indicate that competition is negatively related to the NPL ratio, but positively related to the Z-Score. At the same time, only a few papers are loosely related to the research question we address in case of Albania. The most relevant work is by Dushku (2016)[4] who investigates the link between completion (measured by Lerner Index) and bank risk-taking (measured by Z-Score) for 15 banks operating in Albanian banking system during the period 2004 – 2014. The author finds a positive link between competition and bank risk and show that the nexus between total (plus foreign) credit risk and competition is nonlinear.

Similar to the theoretical debate, it is obviously that the biggest obstacle and the conclusions of the extant empirical research vary greatly and depend heavily on the indicators chosen for measuring the bank competition and the degree of risk as well as on the data used [Bushman, et. al. (2016)]. Therefore, one key challenge that explains the mixed results is related with the inappropriate measure to identify properly bank competition and bank stability [Pawlowska (2016)]. In terms of the bank risk measure, the available measure is even more limited, while the biggest concern is that most of them do not distinguish which aspect of risks they effectively approximate. For example, Carbó, et. al. (2009) found that existing indicators of competition (i.e. Lerner index, the H-Statistics) give different conclusions concerning the degree of competition as they tend to measure different things[5].

This paper complements and extends existing literature on this issue as it make use of superior indicators to measure the state of bank competition and banks stability. Most existing empirical studies investigating this relationship at the microeconomic level focus either on credit risk alone, using some form of credit risk measure such as non-performing loans, or resort to bank risk measures constructed from balance sheet information, such as a Z-Score. In fact, while the Z-score can be interpreted as the number of standard deviations by which a bank is removed from insolvency, the non-performing loans (NPL) ratio focuses on credit risk only. Hence, neither of them is a perfect substitute calculations to account for actual bank distress or the probability of default, which are without doubt the most appropriate concepts to define bank risk (Fu,

[4] Note (2006) applies the Panzar-Rosse methodology to measure the competition degree in the Albanian banking system during the period 1999 - 2006. The author finds that Albanian banks operate in monopolistic competition conditions.
[5] See also Bikker, et. al. (2012).

et al., 2014, Kick and Prieto 2015). One concern Beck, et al., (2013) in their empirical analysis is that Z-Score and Lerner both include profitability in the numerator and any positive relationship between the two might thus be mechanical rather than economically meaningful. To that, we neither focused on real episodes of banking crises nor use binary approach as a proxy for instability episodes, which both may either provide insufficient data for estimation purpose or be based on threshold level that are easily criticised. In fact, we extend empirical findings by including instead a more sophisticated proxy for bank stability that is based on a wide set of consolidated balance sheet data and the principal component analyses approach as explained by Shijaku (2016). At our best knowledge, no previous study has employed such bank stability indicator as the dependent variable to investigate the competition-bank stability nexus and we believe this is an important step forward toward a better understanding of the underlying mechanisms. On the one hand, we use a new measure of competition based on the reallocation of profits from inefficient banks to efficient ones as proposed by Boone, (2008), which has been used in recent studies (Van Leuvensteijn, et. al. 2011, Van Leuvensteijn, et. al. 2013, Kasman and Carvallo 2014, Schaeck and Čihák 2014, Duyguna, et. al. 2015, Kasman and Kasman 2015).

3. METHODOLOGY APPROACH

3.1. DEPENDANT VARIABLE

The empirical literature provides a good description of how one might attempt to build a composite indicator of stability, but obviously this paper follows the Uniform Financial Rating System approach, introduced by the US regulation in 1979, referred to as CAELS rating (Capital adequacy, Asset quality, Earnings, Liquidity and Sensitivity to market risk (See Table 2 in Appendix)[6]. First, using the statistical methods, each indicator included in each of these categorises is normalised into a common scale with mean of zero and standard deviation of one[7]. The formula is given as:

$$Z_t = \left(\frac{X_t - \bar{\mu}}{\bar{\sigma}}\right) \qquad (3)$$

[6] This approach is also used by International Monetary Fund Compilation Guide 2006 on Financial Soundness Indicators, but others authors e.g. Altman (1986), Sere-Ejembi, et. al., (2014) and Cleary and Hebb (2016).

[7] Normalizing the values avoids introducing aggregation distortions arising from differences in the means of the indicators.

Where, X_t represents the value of indicators X during period t; μ is the mean and σ is the standard deviation. Second, all the normalised values of the set of correlated indicators used within one category is then converted into a single uncorrelated index by means of the statistical procedure, namely the principal component analysis (PCA) approach, which is yet again standardised through the procedure in Eq. (3). Then, the estimated sub-index are transformed between the values [0, 1] using exponential transformation [1 / (1 + exp(-Z*)]. Finally, the BSI is derived as a sum of the estimated exponential transformed sub-indexes, as follows:

$$BSI_{t,w} = \omega_1 \sum_{i=1}^{n} Z^*_{t,C} + \omega_2 \sum_{i=1}^{n} Z^*_{t,A} + \omega_3 \sum_{i=1}^{n} Z^*_{t,E} + \omega_4 \sum_{i=1}^{n} Z^*_{t,L} + \omega_5 \sum_{i=1}^{n} Z^*_{t,S} \quad (4)$$

$$\sum_{*=a,b,c,d,e} \omega^* = 1 \quad (5)$$

Where, n is the number of indicators in each sub-index; '*C'* relates to the capital adequacy; '*A*' represents a proxy to asset quality; 'E' represents a proxy to earnings; '*L*' represents a proxy to liquidity efficiency categorises; and '*S*' is related to the sensitivity of market risk. Z* is the exponential transformed simple average of the normalised values of each indicator included into the sub-index of the individual bank stability index. Then, the estimated index is a relatively measurement, where an increase in the value of the index at any particular dimension indicates a lower risk in this dimension for the period, compared with other periods.

The advantage of this approach is fourfold. First, CAELS represents a useful "complement" to on-side examination, rather than a substitute for them [Betz, et. al., (2014)], and thereby creates an internal comprehensive monthly-based supervisory "thermometer" measurement to evaluate bank stability in real time and on an uniform basis and for identifying those institutions requiring special supervisory attention and concern with regards to both the present and future banking sector conditions. Second, as suggested by ECB (2007), it reflects more the Albanian financial structure by attaching more weight to banking sector as it is the most prominent agents in the financial markets, while it takes advantages of a broad range of bank level data. Third, the PCA approach highlights the most common factor identifying the patterns in the data without much loss of information, which at the same time solves for any problem of endogeneity mention above. Four, it does not take the probability form of the binary approach, which might expose it either to limitations of insufficient number of episodes or to the vulnerability of the methodology employed to calculate the threshold level, which might even provide falls banking distress signals. Rather it consists of a simpler approach that is easier to explain and implements and most importantly allows analysing the state of the bank as it develops and to that it is applicable for cross-section comparisons. Finally, the estimated index is a relatively measurement, where an increase in the value of the index at any particular dimension indicates a lower risk in this dimension for the period, compared with other periods.

3.2. MEASURING COMPETITION: THE BOONE INDICATOR

The literature review offers several methods to estimate competitive levels of a specific sector since this indicator cannot directly be measured. Some of them fall under the so-called the Structural-Conduct-Performance (SCP) approach, which frequently includes measures of the market share and concentration ratio, numbers of banks or the Herfindhal-Hirschmann Index (HHI). The other methods are influenced by the New Empirical Industrial Organisation literature, which has been developed primarily from the non-structural models of Iwata (1974), Breshnahan (1982), Panzar and Rose (1987) and Lerner (1934) index or price-to-cost margin (PCM) approach[8]. In addition to these already popular measures, an alternative measure of competition as proposed first by Boone (2004) and further developed by Boone (2008) measures the impact of efficiency on performance in terms of profit. The idea of this profit-elasticity index, which also referred as the Boone indicator (β), rests on the assumption that banks with superior efficiency, i.e. banks with lower cost, gain more benefits in terms of profit as a result of market share reallocation from less efficient banks to more efficient one and this effect becomes stronger in a highly competitive market structure. This means that in a more competitive market banks sacrifice more for being in a cost disadvantage position. Put differently, banks are punished more harshly in terms of profits for cost inefficiency. Therefore, the stronger this effect is the larger in absolute value β will be, which is also

[8] The Lerner index has been widely used in recent research including Berger, et. al., (2009), Cipollini and Fiordelisi (2012); Fu, et al (2014). Dushku (2015) calculates it in the case of Albania by considering the difference between price and marginal cost as a percentage of prices.

an indication of more competitive conditions in that particular market. In the empirical application, the simplest equation to identify the Boone indicator, for bank *i* at time *t* is defined as follows:

$$ln(\pi_{it}) = \alpha + \sum_{l=1...T}^{L} \beta ln(MC_{l,it}) + \sum_{k=1}^{K} \omega\lambda_{k,it} + \varepsilon_{it} \quad (1)$$

where π and MC denotes the profit and the marginal cost for banks (proxy efficiency) of bank *i* at time t respectively; α is the bank fixed effect; λ is a set of control variable associated with the coefficient ω; ln is the log-linearized transformation of the variables; and ε is an idiosyncratic shock. The market equilibrium condition is E = 0. The E-statistic is $\sum_{l=1}^{L} \beta$, which gives the profit elasticity, that is, the percentage change in profits of bank *i* as a result of a percentage change in bank *i*'s costs. This indicator is in theory is expected to have a negative value, i.e. the increase in costs reduces profit, which can be interpreted as a reduction in the ability of the bank to affect its losses due to an increase in competition.

Theoretically, efficient banks may choose to translate lower costs either into higher profits or into lower output prices in order to gain market share. As a consequence, using this measure for analysing competition in the banking sector, some researcher[9] transform the formula of Boone indicator and replace the value of profit with a bank market share, as follows:

$$ln(MS_{it}) = \alpha + \sum_{l=1...T}^{L} \beta ln(MC_{l,it}) + \sum_{k=1}^{K} \omega\lambda_{k,it} + \varepsilon_{it} \quad (2)$$

Where, MS is the market share of bank *i* at time *t*. In addition, as in the case of the Lerner index, Boone indicator require in its calculation an estimation of the marginal costs, which, based on Fiordelisi and Mare (2014) and Dushku (2015), is estimated through the trans-log cost function (TCF), as follows:

$$lnTC_{it} = \alpha_0 + \alpha_1 lnQ_{it} + 0.5\alpha_2(lnQ_{it})^2 + \sum_{j=1}^{3} \beta_j lnP_{it_j} \quad (3)$$

[9] Van Leuvensteijn, et. al., (2011), Tabak, et. al., (2012), Van Leuvensteijn, et. al., (2013).

$$+\sum_{j=1}^{3}\sum_{k=1}^{3}\theta_{jk}lnP_{it_j} * lnP_{it_k} + \sum_{j=1}^{3}\gamma_j lnQ_{it} * lnP_{it_j}$$

$$+\tau_1 Trend + 0.5\tau_2(Trend)^2 + \tau_3 Trend * lnQ + CRISIS + \varepsilon_{it}$$

Where, TC is the total costs of bank *i* at time *t*, Q is bank output, P is a vector of input prices, namely labour price (P_1), price of borrowed funds (P_2) and capital price (P_3), $Trend$ is a time trend capturing the dynamics of the cost-function (efficiency) over time, $CRISIS$ is a dummy variable to account for the effect of the global financial crises, which takes a value of 1 during the GFC and 0 otherwise, and α, β, θ, γ and τ are coeeficients to be estimated. ε_{it} is a two-component error term computed as follows:

$$\varepsilon_{it} = \mu_{it} + \omega_{it} \tag{4}$$

Where, ω_{it} is a two-side error term, and μ_{it} is a one-sided distribance term representing inefficiency. Then, from Equation (3), assuming that inputs' prices are homogeneous, the marginal cost can be derived as follows:

$$MC_{it} = \frac{\delta TC_{i,t}}{\delta Q_{i,t}} = \frac{TC_{i,t}}{Q_{i,t}}\left[\hat{\alpha}_1 + \hat{\alpha}_2 lnQ_{it} + \sum_{j=1}^{3}\hat{\gamma}_j lnP_{it_j} + \hat{\tau} Trend\right] \tag{5}$$

The cost function must be homogenous of degree one in input prices which imposes some restrictions on the parameter estimates. Linear homogeneity means that the percentage increase in all the three input prices raises the value of the cost by that same proportion. This property implies that the value of the three inputs included in the cost function represent the total cost. The linear homogeneity in input prices property requires the following restrictions on the parameter estimates to hold:

$$\sum_{j=1}^{3}\theta_j = 1 \tag{6.1}$$

$$\sum_{j=1}^{3}\beta_j = 0 \tag{6.2}$$

$$\sum_{j=1}^{3}\sum_{k=1}^{3}\theta_{jk} = 0 \tag{6.3}$$

For the research purpose we estimate Boone indicator, using both Equation (1) and Equation (2). However, the former is operationally impossible due to the negative net income generated by some of the banks operating in the Albanian banking system in 2008-2010. To overcome this problem the value of the bank profit is replaced by the volume of net interest profit. Then, Eq. (1) and Eq. (2) are often run by using the Ordinary Least Square (OLS) approach with random effects.

3.3. THE EMPIRICAL APPROACH

The empirical model specification draws on the extensive review of previous studies, but it also departs from Shijaku (2016a) and Shijaku (2016b) to consider the link between competition and bank stability instead of market power or concentration. The model is specified as follows:

$$CAELS_{i,t} = \alpha + \beta_1 * X'_{i,t} + \varepsilon_{i,t} \quad (7)$$

Where, $CAELS_{i,t}$ is a stability indicator of bank i at time t, with i = 1, ..., N and t = 1, ..., T. α is a constant term. $X'_{i,t}$ is a vector of explanatory variables grouped into three main categories: (1) $Banking'_{i,t}$ is a set of bank-specific explanatory variables, namely operational efficiency and leverage ratio; $Market'_{i,t}$ is an industry explanatory variable that proxy by the Lerner index; $Macroeconomics'_{i,t}$ is a set of control variables that account for state of economy, which consists of two variables such as output and primary sovereignty risk; β is a vector of coefficients to be estimated. $\varepsilon_{i,t}$ is an error terms that is assumed to be identically and independently distributed with mean of 0 and variance $\sigma_u^2 A = \pi r^2$.

The model is estimated follows strictly the approach as in Shijaku (2016) through means a dynamic General Method of Moments (GMM) weights differences (AB-1-step) as proposed by Arellano and Bond (1991) and Arellano and Bover, (1995), while we use all the past information of $X'_{i,t}$ up to 4 lags as instruments variable. Then, the Haussmann test is used for over-identifying restrictions based on the sample analogy of the moment conditions adapted in the estimation process, thereby as to determine the validity of the instrument variables (i.e. tests of the lack of serial correlation and consistency of instruments variables).

3.4. DATA

The sample data for this study consists of quarterly data gathered and complied by the Bank of Albania, which is taken from balance sheet and income statement items of 16 banks operating in Albania. The strength of the dataset is its sample coverage and reliability of information. It covers all banks operating in Albania in the last two decade. The sample consists of 960 quarterly data for 16 banks operating in Albania, since 2001 Q01.

The variables used to calculate the competition indicator as a follow. *TC* is the sum of personnel expenses, other administrative expenses and other operating expenses. The bank's single output, *Q*, is proxy by bank total assets. P_1 is calculated as the ratio of personnel expenses over total assets. P_2 is the ratio of other administrative expenses plus other operating expenses over total fixed assets. P_3 is the ratio of interest expenditure over the sum of total deposits. $CRISIS$ takes the value of 1 during the period 2008 Q03 – 2010 Q04, and 0 otherwise. All variables are log-linearized, besides the *CRISIS*.

The empirical study focuses on the period 2008 Q02 – 2015 Q03. That includes a total panel balanced observations with 448 observations and 28 periods. The variables used for empirical analysis are approximated as follows. *CAELS* is transformed into an index, taking as the base year the average performance during the year 2010. It is a relatively measurement, where an increase in the value of the index at any particular dimension indicates a lower risk in this dimension for the period, compared with other periods. *EFFICIENCY* is proxy as gross expenditure to gross income ratio. *LEVERAGE* presents the logarithm of the equity to asset ratio of individual banks. *BOONE* is a non-structural competition index variable as explained above. It is transformed also into an index, taking as the base year the average performance during the year 2010 and enters the model as log-transformed. The macroeconomic variables are aggregated indicators that represent the state of the economy. *GDP* represents the gross domestic production. It is transformed in real terms by deflated with the Consumer Price Index. *PSRISK* represents the spread between domestic 12 months T-Bills and the German 12 months T-Bills. They are transformed in real terms by subtracting the respective domestic and German annual inflation rate. All the data represent the end-period values. They are log-transformed, besides the *PSRISK*. The bank-specific variables and the stability indicator are estimated individually for each bank.

Further, the dataset developed for this paper has several sources. Data on *GDP* are taken from the Albanian Institute of Statistics. Data on the domestic T-Bills rate are taken from the Ministry of Finance. Data on German 12 months T-Bills rate and German Consumer Price Index are taken from Bloomberg. The rest of the data are taken from Bank of Albania.

Finally, prior to the empirical estimation, all the data have been subject to a unit root test procedure on the argument to understand their properties and also to be sure that their order of integration fulfils the criteria for our empirical estimation approach. The latter is a pre-required condition in order to receive consistent and unbiased results. Therefore, the unit root test approach includes the Augmented Dickey-Fuller (ADF) and the Phillips-Peron (PP) Fisher Chi-square tests. The reason is twofold. First, these tests are built on the same null hypothesis that panel variable are stationary. Second, they are mostly used for unbalanced panel model, as it is our sample. Results are presented in Table 2 in Appendix. Findings imply that some of variables included in our specified model are integrated of order zero I(0). This means that they are stationary. Therefore, they enter the model in level. This set of variables includes *EFFICIENCY* and *LEVERAGE*. The other variables, namely *CAELS*, *GDP, PSRISK* and *BOONE* are found to be integrated of order one, I(1). This means they pose non-stationary properties. Therefore, they enter the model as first difference, since it will transform them into a stationary stance[10].

4. EMPIRICAL RESULTS

4.1. MAIN RESULTS

[10] These results are robustness also to other unit root test approaches, including the Im, Pesaran and Shin W-stat test and Fisher test. Data can be provided upon request.

This section reports the results from the model as specified in in Eq. [7], which are reported in Table 3, in Appendix. We estimate 5 regressions. In each regression we use the same measure of competition, but to some methodological changes. First, column [1] reports the results of a linear relationship between competition and stability including all banks operating in Albania. Second, column [2] presents the results with regards to a possible non-linearity relationship. Then, the other columns report results with regards to alternative sample. Therefore, column [3] and column [4] show the results as presented previously, but with regards to a sample consisting of large banks. Similarly, column [5] and [6] provide results with regards to small banks. All models are estimated through the GMM approach. At the bottom of the table, we report the specification test results for the GMM estimation[11]. The results show that the null hypothesis cannot be rejected. According to this test, all GMM equations are properly specified.

We first analyse the results of estimated parameter with regards to the external and internal variables. The results indicate that all the coefficients of the explanatory variables have the expected signs. They accomplish also previous studies as reported by Shijaku (2016a) and (2016b). First, macroeconomic conditions are found to be relatively crucial factors for bank stability. The coefficient of *GDP* is positive in all regressions, suggesting that increases in economic growth have a positive effect on bank stability. This effect is found to be relatively stronger for small banks. One possible explanatory for this is that small banks in Albania are more exposed to individuals and small and medium enterprises, which in respond might be affected more by economic turmoil. The coefficient of primary sovereignty risk, presented by *PSRISK*, is significant negative in all the regressions, besides for small banks, suggesting that a higher spread ratio decreases bank stability. Evidences show, however, that the effect is stronger for large banks. This might be explained also by the fact that this group of banks is the main one that supports the domestic government borrowing and hold the main stock of bank lending to the private sector. On the other hand, at the given magnitude of the coefficients suggests that the interest rate pass-through effect on bank stability is found

[11] Haussmann test indicates whether the instruments are uncorrelated with the error term. The GMM does not require distributional assumptions on the error term and it is more efficient that the Two Least Two Square approach as it accounts for heteroskedasticity Hall (2005).

to be relatively low. Second, bank specific factors are also found to impact bank stability. The coefficients of both *EFFICIENCY* and *LEVERAGE* are statistically significant. The magnitude of the coefficients indicates that there is a trade-off between operational efficiency and capital in terms of bank stability. The former has a positive sign suggesting that operational efficiency and capital structure have an impact on bank stability. This suggests that bank stability increases through improving operational efficiency and a better capital structure. By contrast, we found that capital is relatively more important for small banks compared to the higher effect of operational efficiency found for large banks.

Table 3 also summarises the regressions results when taking the Boone indicator as the measure of competition. As mentioned before, it emphasizes the effect of an increase in marginal cost on the decrease in market shares. The results indicate that the coefficient of Boone indicator is significantly positive, suggesting that competition increases bank stability, given that higher value of the Boone indicator signify a higher degree of competition. At the same time, since Boone indicator is significant, change of marginal cost has more effects on profits, which means the market share is subject to more competition. Similarly, as competition in the banking sector increases it is likely to boost the franchise value of firms and encourage banks to lower their overall risk exposure, thus confirming the competition-stability view in the case of Albania. This fining is consistent with the "competition-stability view" of other recent studies (Berger and Bouwman 2013, Fiordelisi and Mare 2014, Schaeck and Cihak 2014) that greater bank competition is associated with higher bank stability.

Finally, for a robustness test following Jimenez, et al., (2013, Liu, et al. (2013), Fu, et al., (2014), Kasman and Kasman (2015), we used also a quadratic term of the measures of competition to capture a possible non-linear relationship between competition and bank stability. Results as reported in Table 3, column [2] in Appendix reveal an important consideration that is that we did not find evidence of non-linearity relationship between competition and stability in the case of Albanian banking system, thus rejecting Martinez-Miera and Reputto (2010) model. Nor did we find when we spitted the sample with regards to small and large banks as reported in Table 2, column

[4] and column [6] in appendix][12]. Furthermore, as our measures for competition mainly focus on the lending market, it should be kept in mind that this conclusion is quite subject to loan markets.

4.2. ROBUSTNESS CHECKS

In an attempt to further enrich our analysis and as a complementary proof we run a number of robustness checks on our main model, as specified in Equation (7), but this time we use five different alternative measures as proxy for bank competition, and which are used also as explanatory variables to get more robust results. The robustness checks are generally robust with the findings of the previous sections as Table 4 in Appendix A reports our main results[13]. Firstly, column [1] shows the impact of competition, as measured by an alternative Boone indicator that includes also bank capital (Equity) in the estimation of the TCF model, on bank stability [See also Equation (B.1 and B.2) in Appendix B]. Our main results are maintained as in the previous sections re-confirming that competition boost bank stability.

Secondly, as a robustness check, we also used the estimates of marginal cost from Equation (5) to calculate the Lerner index [*LERNER*][14] and the efficiency adjusted Lerner index [*LERNER**][15], as well as to estimate the profit elasticity [*PROFITELASTICITY*][16], the results of which are respectively reported in column [2], [3] and [4]. The results show that the *LERNER* and the efficiency adjusted Lerner are significantly negatively related to *CAELS*. As mention previously since the Lerner index is inversely proportional to bank stability and thus it appears that the negative sign for both these competition measures show that increases in the degree of bank pricing power are positively related to individual bank stability in Albanian banking sector. By contrast, the coefficient of *PROFITELASTICITY* exhibit a positive sign, suggesting that lower elasticity of profit would boost bank stability. These results provide yet again

---

[12] We used also a cubic term of the measures of competition to capture a possible non-linear relationship between competition and bank stability, bust still found no supportive evidence. Results are provided upon request.

[13] Results are also robust to methodological changes to which we used the GMM White Period 2nd Step approach. The Arellano and Bond test results also require significant AR(1) serial correlation and lack of AR(2) serial correlation (See also Kasman and Kasman, 2015).

[14] Following Fiordelisi and Mare (2014) we calculated the Lerner index as $LERNER_{it} = \frac{P_{i,t} - MC_{i,t}}{P_{i,t}}$. The index is a linear straight forward indicator that takes the value between 0 and 1, with lower value indicating greater degree of competition.

[15] [See also Equations (B.3) in Appendix B for the approach used to estimate this index].

[16] [See also Equations (B.4) in Appendix B for the approach used to estimate this index].

other strong supportive evidences for the competition-stability view, which can apply to the Turkish banking industry.

Finally, we also examine the impact of bank concentration on the stability of Albanian banks using the Herfindahl index (also known as Herfindahl–Hirschman Index, or HHI)[17]. The results are reported in Table 4, Column (5) in Appendix A. The negative coefficient for the HHI indicator supports a negative link between market power and bank stability. This suggests that lower bank concentration ratio leads to a decrease in bank insolvency risk, and therefore a higher degree of bank stability. That is that the less concentrated the banking system is the more stable banks are. By conctrast, we find that the impact of bank concentration is relatively higher that extend to which competition effects bank stability.

On the one hand, it is very clear that the results remain as those analysed in the previous sections as in all the regressions, we find that bank market power is negatively related to bank stability, meaning that there is a positive relationship between higher degree of competition and stability. These results support both theories of competition-stability view and concentration-fragility view in the case of Albania showing that banks under less degree of market power are, on average, more stable. On the other hand, it could be treated as a robustness check of the results which further strengths our conclusions in terms of competitions.

5. CONCLUSIONS

The developments in the banking market leading to the financial crisis in 2008 have once again heightened interest in the determinants of bank risk. An increasingly competitive environment caused by the growing internationalization of financial markets and the emergence of non-bank players in the market for corporate financing has often been seen as contributing to increasing banks' incentives to take risks. This perception of the effects of higher competition on bank risk is confirmed by a large array of theoretical and empirical banking models.

---

17 The HHIA is calculated using bank total asset as inputs ($HHIA = \sum_{i=1}^{n} s_i^2$, where s represents the market share of each bank in total assets in the market). It can range from 0 to 1.0, moving from a huge number of very small firms to a single monopolistic producer. Increases of the index generally indicate a decrease in competition and an increase of market power, and vice versa.

This paper continues the series of studies performed with the sample data of the Albanian banking sector. It has the purpose to fill in the information gap of analysing whether competition improves or reduces banking stability for banks operating in Albanian banking system during the period 2008 – 2015. Although there have been several articles we improve on the existing literature along three crucial dimensions. First, in contrast to other bank-level studies, we use the most direct measure of bank stability available, which is generated from the unique supervisory dataset collected by the Bank of Albania to which we analyse the bank competition-stability nexus. Second, we deepen our empirical analysis either by splitting the sample with regards to large and small banks. Finally, we also check for non-linearity relationship between competition and stability in the case of Albanian banking sector.

In summary, the main result of this paper is that competition increases bank stability and results appear to hold for a wide array of other alternative model specifications, estimation approaches and variable construction. Besides this major finding, we also found that concentration is inversely correlated to bank stability suggesting that a more concentrated banking system is more vulnerable to systemic instability. The overall results suggest that higher pricing power and less concentration could simultaneously lead to higher bank stability, thus bolstering the competition-stability view suggesting that bank competition and bank soundness go hand in hand with each other. Similar, under a concentration-stability view, a greater bank concentration easies market power, which increases profit margins, and results in higher franchise value. At the same time, we found no evidence of non-linearity relationship between competition and stability in the case of Albanian banking system. Furthermore, an interesting point is that we find that the relationship between bank competition and bank stability is stronger for small banks rather than large banks. Similarly, we did not find any non-linearity relationship between competition and bank stability in the case of small banks. Nor do we find for large banks. Finally, as for control variables, results reconfirm previous studies in the case of Albanian banking sector. First, macroeconomic conditions are relatively important for bank stability. Similarly, bank stability is also conditional to improving operation efficiency and capital structure of the banks.

REFERENCES

Agorakia, K. Maria-Eleni, Manthos D. Delisb, and Fotios Pasiourasc. (2011). “Regulations, Competition and Bank Risk-Taking in Ttransition Countries.” Journal of Financial Stability, 7(1):38–48.

Ahmed, M. Mostak, and Sushanta Mallick. (2017). “Does Regulatory Forbearance Matter for Bank Stability? Evidence from Creditors’ Perspective.” Journal of Financial Stability 28:163-180.

Allen, Franklin, and Douglas Gate. (2004). “Competition and Financial Stability.” Journal of Money, Credit and Banking, 36(3), 453-480.

Amidu, Mohammed. (2013). “The Effects of the Structure of Banking Market and Funding Strategy on Risk and Return.” International Review of Financial Analysis, 28, 143–155.

Amidu, Mohammed, and Simon Wolfe. (2013). “Does bank competition and diversification lead to greater stability? Evidence from emerging markets.” Review of Development Finance, 3(3):152–166.

Ansari, J., and Goyal, A., (2014), “Bank Competion, Managerial Efficiency and Interest Rate-Pass-through in India”, Contemporary Issues in Bank Financial Management, in Simon Grima, Frank BEzzina (ed.), Vol. 97, Emerald Group Publishing Limited.

Arellano, M., Bond, S., (1991), “Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations”, The Review of Economic Studies, Vol. 58 (2), (Apr. 1991), 277-297.

Arellano, M., Bover, O., (1995). “Another Look at the Instrumental Variables Estimation of Error Components Models”, Journal of Econometrics, Vol. 68 (1), (Jul. 1995), 29-51.

Beck, Thorsten, Asli Demirgüç-Kunt, and Ross Levine. (2006). “Bank concentration, competition, and crises: First results.” Journal of Banking & Finance, 30(5), 1581-1603.

Beck, Thorsten, Olivier De Jonghe, and Glenn Schepens. (2013). “Bank Competition and Stability: Cross-country Heterogeneity” Journal of Financial Intermediation, 22(2):218-244.

Berger, Allen N., Leora F. Klapper, and Rima Turk-Ariss. (2009) “Bank Competition and Financial Stability.” Journal of Financial Services Research, 35, 99-118.

Berger, Allen N., and Christa H.S. Bouwman. (2013) “How Does Capital Affect Bank Performance During Financial Crises?.”, Journal of Financial Economics, 19,146-176.

Betz, F., Oprica, S., Peltonen, T., Sarlin, P., (2014), "Predicting Distress In European Banks", Journal of Banking and Finance, Vol. 45, 225-241.

Bikker. A. Jacob, Sherrill Shaffer, and Laura Spierdijk. (2012). "Assessing Competition wi the Panzar-Roose Model: The Role of Scale, Costs, and Equilibrium", The Review of Economics and Statistics, 94, 1025-1044.

Boone, Jan, Jan van Ours, and Henry van der Wiel. (2007). "How (not) to measure competition." CPB Discussion Paper, No 91, December (2007).

Boone, Jan. (2008). "A New Way to Measure Competition.", Economic Journal, 118: 1245- 1261.

Boot, Arnoud W.A., and Anjan V. Thakor. (2000) "Can Relationship Banking Survive Competition." The Journal of Finance, 55(2), 679-713.

Boyd, John H., Gianni De Nicoló, and Bruce D. Smith. (2004) "Crises in Competitive versus Monopolistic Banking Systems", Journal of Money, Credit and Banking, 36(3), 487-506.

Boyd, John H. and Gianni De Nicoló. (2005). "The Theory of Bank Risk Taking and Competition Revisited." The Journal of Finance, 60(3), 1329-1343.

Boyd, John H., Gianni De Nicolò, and Abu M. Jalal. (2006). "Risk-Taking and Competition Revisited: New Theory and New Evidence Prepared." International Monetary Fund, WP/06/297.

Bresnahan, F. Timothy. (1982). "The Oligopoly Solution Concept is Identify." Economics Letters, Volume 10, Issues 1–2, Pages 87–92.

Bushman, M. Robert, Bradley, E. Hendricks, Christopher D. Williams. (2016). "Bank Competition: Measurement, Decision-Making, and Risk-Taking" Journal of Accounting Research, 54(3): 777–826.

Câpraru, Bogdon, and Alin Marius Andrieş, (2015). "Nexus between concentration and fragility across EU banking systems." Procedia Economics and Finance, 32, 1140-1147.

Carbó, Santiago, David Humphrey, Joaquín Maudos and Philip Molyneux. (2009). "Cross-country Comparisons of Competition and Pricing Power in European Banking." Journal of International Money and Finance, 28(1): 115-134.

Cipollini, Andrea, and Franco Fiordelisi. (2012). "Economic Value, Competition and Financial Distress in the European Banking System." Journal of Banking & Finance 36(11): 3101-3109.

Cleary, S., Hebb, G., (2016), "An Efficient and Functional Model for Predicting Bank Distress: In and out of Sample Evidence", Journal of Banking and Finance, Vol. 64, 101-111.

Clerides, Sofronis, Manthos D. Delis, Sotirios Kokas. (2015) "A New Data Set on Competition in National Banking Markets." Financial Market, Institutions and Instruments, 24(2-3): 267-311.

De Haan, Jakob, and Tigran Poghosyan. (2012a) "Bank size, market concentration, and bank earnings volatility in the US." Journal of International Financial Markets, Institutions and Money, 22(1), 35-54.

De Haan, Jakob, and Tigran Poghosyan. (2012b) "Size, market concentration, and bank earnings volatility in the US." Journal of Banking and Finance, 36, 3008-3016.

De Nicolò, Gianni, and Marcella Lucchetta. (2009). "Financial Intermediation, Competition, and Risk: A General Equilibrium Exposition" IMF Working Paper WP/09/105.

Demsetz, Harold. (1973), "Industry Structure, Market Rivalry, and Public Policy." The Journal of Law & Economics 16 (1): 1-9.

Dushku, Elona. (2015). "Lerner Index-Indicator of bank market power in Albania." Bank of Albania, Economic Review, H1.

Dushku, Elona. (2016). "Bank Risk-Taking and Competition in the Albanian banking sector", 10th South-Eastern European Economic Research Workshop "Including monetary policy and financial shocks and trends in modeling and policy analysis", 1-2 December 2016, Tirane, Bank of Albania, Forthcoming Working Paper.

Duyguna, Meryem, Mohamed Shabanb, and Thomas Weyman-Jonesc. (2015). "Measuring competition using the Boone relative profit difference indicator" Economics Letters, 132: 117-120.

European Central Bank, (2007), "Progress Towards a Framework for Financial Stability Assessment", Speech by José Manuel González-Páramo, Member of the Executive Board of the ECB, OECD World Forum on "Statistics, Knowledge and Policy", Istanbul, June 2007.

Evrensel, Ayşe Y. (2008). "Banking crisis and financial structure: A survival-time analysis." International Review of Economics & Finance, 17(4), 589-602.

Fernández, Ana, I., Franchisco González, and Nuria Suárez. (2016) "Banking Stability, Competition and Economic Volatility." Journal of Financial Stability, 22, 101-120.

Fiordelisi, Franco, Davide Salvatore Mare. (2014). "Competition and Financial Stability in European Cooperative Banks" Journal of International Money and Finance 45:1-16.

Fu, Xiaoqing, Yongjia Lin, and Philip Molyneux. (2014). "Bank competition and financial stability in Asia Pacific." Journal of Banking & Finance, 38, 64–77.

Fungacova, Zuzana, and Laurent Weill. (2013). “How Market Power Influences Bank Failures: Evidence from Russia. Economics of Transition, 21(2):301–322.

Griffith, Rachel, Jan Boone, and Rupert Harrison. (2005). “Measuring Competition.” Advanced Institute of Management Research Paper No. 022 , August (2005).

Hall, R., Alastair. (2005). “Generalized Methods of Moments.” Oxford University Press.

Hellmann, Thomas F., and Kevin C. Murdock. (2000). “Liberalization, Moral Hazard in Banking and Prudential Regulation: Are Capital Requirements Enough?.” American Economic Review, 90(1), 147-165.

Jeona, Q. Jin, and Kwang K. Limb. (2013). “Bank Competition and Financial Stability: A Comparison of Commercial Banks and Mutual Savings Banks in Korea.” Pacific-Basin Finance Journal, 25, 253-272.

Jiménez, Gabriel, Jose A. Lopez, and Jesús Saurina. (2013). “How does competition affect bank risk-taking?.” Journal of Financial Stability, 9(2), 185-195.

Iwata, Gyoichi. (1974). “Measurement of Conjectural Variations in Oligopoly.” Econometrica Volume 42, No. 5, Pages 947-966.

Kasman, Adnan, and Oscar Carvallo. (2014). “Financial Stability, Competition and Efficiency in Latin American and Caribbean Banking” Journal of Applied Economics, 17(2): 301-324.

Kasman, Saadet, and Adnan Kasman. (2015). “Bank Competition, Concentration and Financial Stability in the Turkish Banking Industry.” Economic Systems, 39, 502-517.

Keeley, Michael C. (1990). “Deposit Insurance, Risk, and Market Power in Banking.” The American Economic Review, 80(5), 1183-1200.

Kick, Thomas, and Estaban Prieto. (2015). “Bank Risk Taking and Competition: Evidence from Regional Banking Markets.” Review of Finance 19(3), 1185-1222.

Leon, Florian. (2014), “Measuring Competitionin Banking: A Critical Review of Methods.” CERDI, January (2014).

Lerner, P. Abba. (1934). “The Concept of Monopoly and the Measurement of Monopoly Power.” The Review of Economic Studies, 1(3), 157-175.

Leroy, Aurélien, and Yannick Lucotte. (2017). “Is there a competition-stability trade-off in European banking?.” Journal of International Financial Markets, Institutions and Money, 46, 199-215.

Levy Yeyati, Eduardo and Alejandro Micco. (2007). "Concentration and Foreign Penetration in Latin American Banking Sectors: Impact on Competition and Risk." Journal of Banking and Finance, 31(6), 1633-1647.

Liu, Hong, Phil, Molyneux, and JOHN O. S. WILSON. (2013). "Competition and Stability in European Banking: A Regional Analysis." The Manchester School, 81(2):176–201.

Martinez-Miera, David, and Rafael Repullo. (2010). "Does competition reduce the risk of bank failure?." Review of Financial Studies 23(10), 3638-3664.

Matutes, Carmen , and Xavier Vives. (2000). "Imperfect Competition, Risk Taking, and Regulation in Banking." European Economic Review, 44(1), 1-34.

Mirzaei, Ali, Tomoe Moore, and Guy Liu. (2013) "Does Market Structure Matter on Banks' Profitability and Stability? Emerging vs. Advanced Economies.", Journal of Banking and Finance, 37 (8), 2920-2937.

Note, Sofika. (2006). "Competition in the Albanian Banking System." Bank of Albania Working Paper.

Nguyen, My, Michael Skully, and Shrimal Perera. (2012). "Market Power, Revenue Diversification and Bank Stability: Evidence from Selected South Asian Countries." Journal of International Financial Markets, Institutions and Money, 22(4): 897–912.

Pawlowska, Malgorzata. (2016). "Does the Size and Market Structure of the Banking Sector have an Effect on the Financial Stability of the European Union?." The Journal of Economic Asymmetrices.

Samantas, Ioannis. (2013). "Bank Competition and Financial (in) Stability in Europe: A Sensitivity Analysis." MPRA Paper No. 51621.

Schaeck, Klaus, Martin Cihak, and Simon Wolfe. (2009) "Are Competitive Banking Systems More Stable?." Journal of Money, Credit and Banking 41(4), 711-734.

Schaeck, Klaus, and Martin Čihák. (2014), "Competition, Efficiency, and Stability in Banking.", Financial Management 43 (1): 215–241.

Sere-Ejembi, A., Udom, I.S., Salihu, A., Atoi, N.V., and Yaaba, B.N., (2014), "Developing Banking System Stability Index for Nigeria", CBN Journal of Applied Statistics, Vol. 5 (1), June (2014).

Shijaku, Gerti. (2016a). "Banking Stability and its Determinants: A Sensitivity Analysis on Methodological Changes." in the Economic Review 2016, 6H-1, 2016, Bank of Albania, 18-30.

Shijaku, Gerti. (2016b). "Does primary sovereignty risk effect bank stability? Evidence from Albanian banking system." Bank of Albania, Forthcoming Bank of Albanian

Working Paper. Presented at the 2nd Policy Research Conference of the ECBN "Macroprudential Instruments financial cycles" organised by Bank of Slovenia ad CEPR, 29-30 September 2016, Slovenia.

Soedarmonoa, Wahyoe, Fouad Machrouhb, and Amine Tarazic. (2013). "Bank competition, crisis and risk taking: Evidence from emerging markets in Asia." Journal of International Financial Markets, Institutions and Money, 23, 196–221.

Tabak, M. Benjamin, Dimas M. Fazio, and Daniel O. Cajueiro. (2012). "The relationship between banking market competition and risk-taking: Do size and capitalization matter?." Journal of Banking & Finance 36 (12): 3361-3381.

Uhde, André, and Ulrich Heimeshoff. (2009). "Consolidation in Banking and Financial Stability in Europe Further Evidence." Journal of Banking and Finance, 33, 1299-1311.

Van Leuvensteijn, Michiel, Jacob A. Bikker, Adrian A.R.J.M. Van Rixtel and Christoffer Kok Sørensen. (2011). "A New Approach to Measuring Competition in the Loan Markets of the Euro Area.", Applied Economics, 43 (23): 3155-3167.

Van Leuvensteijn, Michiel, Jacob A. Bikker, Adrian A.R.J.M. Van Rixtel and Christoffer Kok Sørensen. (2013). "Impact of Bank Competition on the Interet Rate Pass-through in the Euro Area," Applied Economics, 45 (11): 1359-1380.

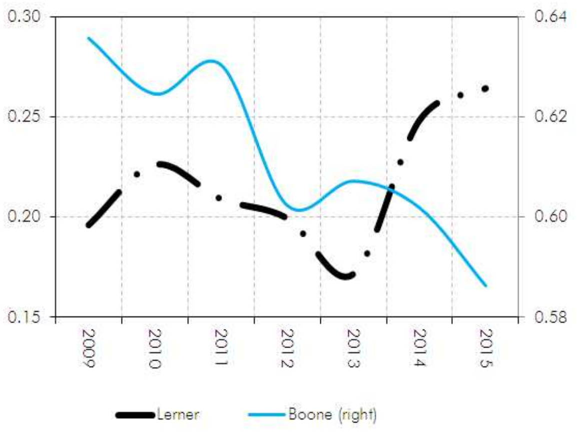
Wagner, Wolf. (2010). "Loan Market Competition and Bank Risk-taking." Journal of Financial Services Research 37(1), 71–81.

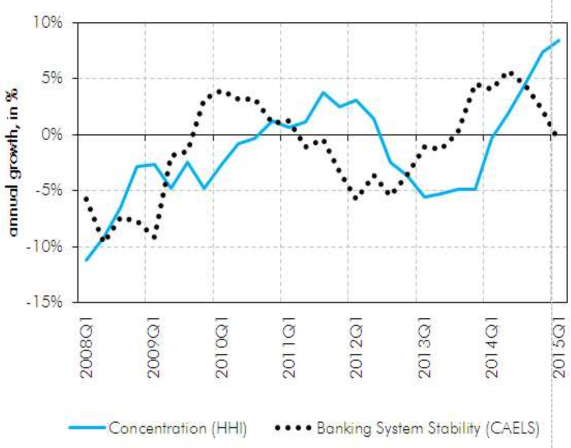
Weiß, Gregor N.F., Sascha Neumann, and Denefa Bostandzic. (2014). "Systemic Risk and Bank Consolidation: International Evidence." Journal of Banking & Finance, 40, 165-181.

Zhao, Tianshu, Barbara Casu and Alessandra Ferrari. (2010). "The impact of regulatory reforms on cost structure, ownership and competition in Indian banking." Journal of Banking & Finance 34(1), 246–254.

APPENDIX A

Graph 1. Bank competition and bank stability, 2008 -2015.





Source: Bank of Albania, Author's calculations

Table 1. Panel Unit Root Test.

Variable	ADF - Fisher Chi-square			PP - Fisher Chi-square		
	Intercept	Intercept and Trend	None	Intercept	Intercept and Trend	None
ΔCAELS	[0.0000]	[0.0000]	[0.0000]	[0.0018]	[0.0000]	[0.0000]
ΔGDP	[0.0000]	[0.0000]	[0.0000]	[1.0000]	[0.0000]	[0.0000]
ΔPSRISK	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[1.0000]	[0.0000]
ΔBOONE	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[1.0000]	[0.0000]
EFFICIENCY	[0.0000]	[0.0000]	[0.9649]	[0.0000]	[0.0000]	[0.8965]
LEVERAGE	[0.0000[	[0.0007]	[0.0001]	[0.0000]	[0.0006]	[0.0010]

Note: Δ is a first difference operator. Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Source: Author's calculations

Table 2. Correlation Analysis: Ordinary.

Sample: 2008Q2 2015Q3
Included observations: 480
Balanced sample (listwise missing value deletion)

	CAELS	GDP	PSRISK	BOONE	EFFICIENCY	LEVERAGE
CAELS	1	0.103	-0.070	0.047	-0.103	0.012
GDP	0.103	1	-0.016	0.061	-0.036	0.007
PSRISK	-0.070	-0.016	1	-0.039	-0.031	0.045
BOONE	0.047	0.061	-0.039	1	-0.068	-0.005
EFFICIENCY	-0.103	-0.036	-0.031	-0.068	1	0.366
LEVERAGE	0.012	0.007	0.045	-0.005	0.366	1

Source: Author's calculations

Table 3. Empirical Results through means of GMM approach.

Model Estimation	Banking System		Large Banks		Small Banks	
	[1]	[2]	[3]	[4]	[5]	[6]
ΔGDP	0.9449	0.9494	0.3924	0.3632	1.1628	0.8821
	[*0.03*]	[*0.05*]	[*0.32*]	[*0.41*]	[*0.04*]	[*0.09*]
ΔPSRISK	-0.0549	-0.0549	-0.0574	-0.0572	-0.0522	-0.0611
	[*0.06*]	[*0.05*]	[*0.07*]	[*0.07*]	[*0.12*]	[*0.27*]
ΔBOONE	0.2037	0.1996	0.0415	0.0488	0.2987	0.8184
	[0.03]	[*0.19*]	[*0.27*]	[*0.15*]	[*0.21*]	[*0.04*]
ΔBOONE^2		-0.0313		0.0677		13.70
		[*0.96*]		[*0.72*]		[*0.25*]
EFFICIENCY	-0.4119	-0.4118	-0.3976	-0.3910	-0.3201	-0.250
	[*0.08*]	[*0.08*]	[*0.13*]	[*0.14*]	[*0.23*]	[*0.33*]
LEVERAGE	0.5661	0.5674	0.0637	0.0514	0.3762	0.4989
	[*0.02*]	[*0.02*]	[*0.68*]	[*0.75*]	[*0.04*]	[*0.03*]
CRISIS			-0.0687	-0.0679	0.0290	0.040
			[*0.35*]	[*0.36*]	[*0.67*]	[*0.67*]
Cross-sections	16	16	6	6	10	10
Instrument rank	20	20	20	20	20	20
No. of observations:	448	448	162	162	270	270
J-statistic	18.4	18.3	13.2	13.1	18.7	12.2
Probability (J-statistic)	0.24	0.19	0.51	0.44	0.17	0.51

Table shows bank-level GMM regressions statistics on the empirical results. Haussmann tests (J-Statistics and the Probability of J-Statistics) investigates the validity of the instruments used, and rejection of the null-hypothesis implies that instruments are valid as they are not correlated with the error term. The Probability appears in parentheses [ ] below estimated coefficients.

Source: Author's Calculations

Table 4. Empirical Results through means of GMM approach.

Model Estimation	Banking System				
	[1]	[2]	[3]	[4]	[5]
ΔGDP	0.9805	1.0282	1.0895	0.8313	1.2343
	[*0.026*]	[*0.019*]	[*0.028*]	[*0.000*]	[*0.02*]
ΔPSRISK	-0.0548	-0.0267	-0.0451	-0.0348	-0.0267
	[*0.059*]	[*0.057*]	[*0.197*]	[*0.000*]	[*0.08*]
ΔBOONE*	0.0679				
	[*0.100*]				
LERNER		-0.0694			
		[*0.797*]			
LERNER*			-0.0337		
			[*0.651*]		
PROFITELASTICITY				0.0407	
				[*0.472*]	
HHI					-0.8172
					[*0.25*]
EFFICIENCY	-0.4065	-0.3540	-0.4444	-0.5050	-0.4173
	[*0.097*]	[*0.188*]	[*0.079*]	[*0.000*]	[*0.09*]
LEVERAGE	0.5324	0.3656	0.6289	0.0613	0.6238
	[*0.026*]	[*0.232*]	[*0.010*]	[*0.527*]	[*0.02*]
Cross-sections	16	16	16	16	16
Instrument rank	20	20	20	20	20
J-statistic	17.6	18.4	15.8	12.0	18.5
Probability of J-statistic	0.28	0.19	0.33	0.29	0.19
No. of observations:	448	493	434	480	480

Table shows bank-level GMM regressions statistics on the empirical results of the estimations using alternative measures of bank competition. Haussmann tests (J-Statistics and the Probability of J-Statistics) investigates the validity of the instruments used, and rejection of the null-hypothesis implies that instruments are valid as they are not correlated with the error term. The Probability appears in parentheses [ ] below estimated coefficients.

Source: Author's Calculations

Table 5. Empirical Results through means of GMM approach.

Model Estimation	Banking System				
	[1]	[2]	[3]	[4]	[5]
ΔGDP	0.8169	0.5475	0.7000	0.7092	0.9319
	[*0.00*]	[*0.00*]	[*0.00*]	[*0.00*]	[*0.00*]
ΔPSRISK	-0.0534	-0.0301	-0.0312	-0.0543	-0.0279
	[*0.00*]	[*0.00*]	[*0.00*]	[*0.00*]	[*0.00*]
ΔBOONE*	0.0581				
	[*0.00*]				
LERNER		-0.2042			
		[*0.08*]			
LERNER*			-0.0312		
			[*0.09*]		
PROFITELASTICITY				0.0304	
				[*0.42*]	
HHI					-0.9244
					[*0.00*]
EFFICIENCY	-0.2962	-0.1351	-0.3839	-0.2946	-0.2252
	[*0.07*]	[*0.16*]	[*0.00*]	[*0.05*]	[*0.09*]
LEVERAGE	0.3114	0.2042	0.4864	0.0522	0.4215
	[*0.06*]	[*0.09*]	[*0.00*]	[*0.63*]	[*0.00*]
Cross-sections	16	16	16	16	16
Instrument rank	20	20	20	20	20
No. of observations:	480	480	480	480	480
J-statistic	12.0	12.0	12.0	12.0	12.0
Probability of J-statistic	0.29	0.29	0.29	0.29	0.29
AR(1) [p-value]	0.07	0.00	0.00	0.00	0.59
AR(2) [p-value]	0.45	0.11	0.14	0.21	0.53

Table shows bank-level GMM regressions statistics on the empirical results of the estimations using alternative the White Period 2nd Step Approach. Haussmann tests (J-Statistics and the Probability of J-Statistics) investigates the validity of the instruments used, and rejection of the null-hypothesis implies that instruments are valid as they are not correlated with the error term. The Arellano and Bond test results also require significant AR(1) serial correlation and lack of AR(2) serial correlation (See also Kasman and Kasman, 2015). The Probability appears in parentheses [ ] below estimated coefficients.

Source: Author's Calculations

APPENDIX B

As a robustness test, we estimate an alternative measure of the marginal cost in the Boone indictor formula[18] following Leon (2014) and re-specify Equation (3) to include also additional control variable, namely bank capital. The specified model is expressed as follows:

$$lnTC_{it} = \alpha_0 + \alpha_1 lnQ_{it} + 0.5\alpha_2 (lnQ_{it})^2 + \sum_{j=1}^{3} \beta_j lnP_{it_j}$$
$$+ \sum_{j=1}^{3}\sum_{k=1}^{3} \delta_{jk} lnP_{it_j} * lnP_{it_k} + \sum_{j=1}^{3} \gamma_j lnQ_{it} * lnP_{it_j} \quad (B.1)$$
$$+\tau_1 Trend + 0.5\tau_2 (Trend)^2 + \tau_3 Trend * lnQ$$
$$+\omega_1 lnE_{it} + 0.5\omega_2 (lnE_{it})^2 + \omega_3 lnE_{it} * lnQ + CRISIS + \varepsilon_{it}$$

Where, E_{it} is total equity of bank i at time t. This model is estimated through the OLS approach. Then, assuming that inputs' prices are still homogeneous, Equation (4) is re-expressed as follows:

$$MC_{it} = \frac{TC_{i,t}}{Q_{i,t}} \left[\hat{\alpha}_1 + \hat{\alpha}_2 lnQ_{it} + \sum_{j=1}^{3} \hat{\gamma}_j lnP_{it_j} + \omega_3 lnE_{it} + \tau_3 Trend \right] \quad (B.2)$$

The most important findings, as reported in Table 5 in Appendix, is that the correlation between marginal costs calculated based on different approach have a relatively high level of correlation, which is also statistically significant. This means that changing methodology and augmenting the TCF model does not change the results and that banking sector in Albania exhibits competitive patterns.

Following Clerides, et al. (2015) and Kasman and Kasman (2015) we estimated the efficiency adjusted Lerner index at the bank level, as follows:

$$Adjusted\ LERNER_{it} = \frac{\pi_{i,t} + TC_{i,t} - MC_{i,t} * Q_{i,t}}{\pi_{i,t} + TC_{i,t}} \quad (B.3)$$

Where, $\pi_{i,t}$ is the profit of bank *i* at time *t*, and other are as previously defined. Similar to the conventional Lerner index, the Adjusted Lerner index also ranges from 0 to 1, with larger values implying greater market power. Then, Clerides, et al. (2015) measure the profit elasticity by deriving from the efficiency adjusted Lerner index by solving for π in equation (B.3) and differentiating with respect to MC, as follows:

$$Profit\ Elasticity_{it} = \frac{Q_{i,t} * MC_{i,t}}{Q_{i,t} * MC_{i,t} - TC_{i,t} * (1 - Adjusted\ LERNER_{it})} \quad (B.4)$$

Hence, the efficiency adjusted Lerner index and the profit elasticity are two closely related concepts.

[18] The results are provided upon request.