HOW DOES COMPETITION AFFECT BANK STABILITY AFTER THE GLOBAL CRISES IN THE CASE OF THE ALBANIAN BANKING SYSTEM?

GERTI SHIJAKU

Bank of Albania

Abstract

This paper addresses the dynamic relationship between competition and bank stability in the Albanian banking system during the period 2008 - 2015. For this reason, we estimate a new composite individual bank stability indicator that relies on bank balance sheet data. Then, we construct a proxy for bank competition as referred to by the Boone indicator. We also calculated the Lerner index and the efficiency adjusted Lerner Index, as well as the profit elasticity index and the Herfindahl–Hirschman Index. The main results provide strong supportive evidence for the "competition–stability" view – namely, that lower degree of market power sets banks to less overall risk exposure; results also show that increasing concentration has greater impact on bank fragility. Similarly, bank stability is positively linked to macroeconomic conditions and capital ratio and inversely proportionate to operational efficiency. We also used a quadratic term of the competition indicator to capture a possible non-linear relationship between competition and stability, but found no supportive evidence.

Note: The views expressed herein are those of the author and do not necessarily reflect the views of the Bank of Albania.

Corresponding Address: Gerti Shijaku, Research Department, Bank of Albania, Square Skenderbej, No 1, Post Code 1000, Tirane, Albania. E-mail: gshijaku@bankofalbania.org, shijakugerti@gmail.com

1. Introduction

The international process of banking liberalisation, triggered by excessive bank risk taking, has gone hand in hand with increased occurrence of systemic banking crises, culminating in the Global Financial Crises (henceforth, GFC) of 2007-2009 (Beck, *et al.* (2013). This has yet again heightened interest in the relationship between competition, market structure and financial stability. However, no scientific consensus has been reached as to whether bank competition mitigates or exacerbates financial stability, since predications emerging from theoretical models and empirical studies are ambiguous and, so far, also inconclusive (Kasman and Carvallo, 2014). The traditional view argues that fiercer competition in the banking sector would give banks proper incentives to behave prudently and would, therefore, lead to a more efficient system, which favours 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 arguing, instead, that more intense bank competition reduces market power and profit margins, which essentially lowers the franchise value of banks. As a result, this will encourage banks to take greater risks so as to make up for the loss of declined profit (franchise value), which may also lead them to take on more risky investment approaches, eventually increasing the probability of bank 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, Martinez-Miera and Repullo (2010) argue that there is a U-shaped relationship, since lower degree of bank concentration may reduce borrowers' probability of default (risk-shifting effect), as well as interest payments from performing loans, which serve as a buffer covering loan losses.

This similarly inconclusive debate is particularly critical for Albania, as the Albanian financial system mainly consists of the operation of the banking sector, where a large number of banks operate in a specific, small, open economy, and the equity market is remarkably underdeveloped. For example, by 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 capitalisation was the lowest in South-Eastern Europe. On the one hand, financial developments and innovations in the banking sector have been the main driving force behind economic prospects, while improving market and macroeconomic conditions, as well as increasing competition has motivated larger foreign banks in more developed countries, mostly in the Eurozone, operating at relatively lower margins, to extend cross-border operations into potentially new and more profitable markets, such as that of Albania. On the other hand, such patterns also become a rising concern about increased competition in the banking sector, often criticised for being "overbanked". Therefore, bank stability may be triggered by excessive bank risk-taking due to further competition, which may shift focus towards increasing

profits, while ceasing to monitor and assess risk properly. Still, the GFC did not affect the Albanian economy as strongly as it affected other countries in South-Eastern Europe. At the same time, banks showed apparent resilience during this period and, similarly, they emerged from the GFC in a relatively stable state. However, among other challenging issues, problems of banks being "too-big-to-fail have also emerged: firstly in terms of market share, since the 6 largest banks hold nearly 80% of the market, and, secondly, due to a ratio of nearly 16.2% for the whole market and 22.2% for large banks; in other words, the Herfindahl–Hirschman Index (HHI) suggests that the Albanian banking sector is "moderately concentrated". Similarly, evidence (See also Graph 1 in Appendix A) shows that there is a relatively close relationship between the degree of market power and the extent to which banks are exposed to greater instability, implying that competition precedes bank fragility. Therefore, the effect of the regulatory framework on competition and banks' risk-taking incentives as well as, ultimately, bank stability make this a particularly interesting environment in which to study the competition-stability nexus.

Against this background, existing literature provides a fairly comprehensive review on the competition-stability nexus, but there is still one question concerning these cases that needs to be answered empirically, since there is no evidence on the nature of this nexus in the case of a small-opened emerging economy, namely Albania, and, in particular, after the GFC. Therefore, the main question addressed in this paper focuses on how competition affects bank stability after the GFC. The paper makes use of a sample with quarterly 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 calculated a competition indicator, as suggested by Boone (2008). Then, empirical estimation was based on a dynamic (AB 1-step) General Method of Moments (GMM). Finally, we deepened our empirical analysis either by splitting the sample with regards to large and small banks or by checking for any non-linearity relationship between competition and stability in the case of the Albanian banking sector. Finally, we also used other alternative measures of competition, which include the use of the Lerner index and the efficiency-adjusted Lerner index, as well as the use of 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 empirically investigate the 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, it avoids any pitfall, as described by Uhde and Heimeshoff (2009), related to data issues and ensures comparability across both dependent and independent variables, since it focuses only on a single country. Besides, we do not

make use of data from the Bankscope database, but, rather, we use data taken from the Bank of Albania, which provides the most accurate and reliable banking dataset. Third, this paper uses neither real episodes of banking crises nor a binary approach as a proxy for instability moments. Furthermore, it does not use the Z-score or credit risk as an in-variant measure of bank risk-taking behaviour and distance to solvency, concerning that Fu *et al.* (2014) provide some arguments against being used as means of bank stability proxies. By contrast, rather than focusing only on one aspect of bank risk exposure, this paper proceeds by using, instead, a proxy that includes a wide set of consolidated balance sheet data with regards to different aspects of bank stability conditions; at the same time, it benefits through the use of the principal component analysis approach. Hence, we believe that our proxy stands out to be a much better approach to directly capture any possibility of outright bank defaults or/and instability episodes. This approach is also advantageous due to the fact that it avoids any pitfalls of using the binary approach to crises episodes. To the best of our knowledge, no previous study has employed such a bank stability indicator as the dependent variable to investigate the competition-stability nexus and we believe this is an important step forward toward better understanding the underlying mechanisms. Besides, we also use another alternative competition indicator, as proposed by Boone (2008), which also incorporates 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, and looking into whether certain institutions show different competition behaviour than others.

Empirical findings provide strong evidence supporting the "competition-stability" view that greater degree of competition further improves bank stability conditions. This implies that there is no trade-off between competition and bank stability in the banking sector in Albania. A number of robustness checks also confirm our main findings that support the "competition-stability" view. Results further indicate that greater concentration has a negative impact on bank stability. We find no evidence of a non-linear relationship in the competition-stability nexus. Similarly, there is no such evidence even when we split the sample to account for small banks and large banks. Furthermore, we find that the positive relationship in the competition-stability nexus is stronger for small banks rather than for large banks. Finally, bank stability is also found to be crucially sensitive to macroeconomic conditions, improving bank operation efficiency and capital structure.

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. Main results are presented in Section 4. Section 5 expresses the conclusions of our work.

2. Literature review

The issue of the competition-stability nexus still remains ambiguous and unresolved, despite a large body of theoretical and empirical literature (Kasman and Carvallo 2014) that explains the reasons for and the channels through which competition had affected bank stability, long before the GFC started.

2.1 Theoretical literature

From a theoretical perspective, there are two major streams with diametrically opposing views. On the one hand, it has been a widely-held belief that intense competition, *ceteris paribus*, worsens stability due to risk-taking on the asset side, as the numerous episodes of crises, including that of 2007-2009, show. Two of the channels through which competition might affect stability conditions are: (i) potential exacerbation of the coordination problem of depositors/investors on the liability side and fostering runs and/or panics, which may be of a systemic nature or events unrelated to fundamentals, such as bad news on bank assets; (ii) increasing incentives to take higher risk, either on the liability or the asset side, which increases the probability of default [Dushku (2016)]. Recently, these views have been reconciled by introducing asymmetric information and linking the probability of a run to the strength of fundamentals (Goldsein and Pauzner (2005) and Rochet and Vives (2004)). On the other hand, there are also those who believe that competition may be beneficial for a bank's portfolio risk, since it is expected to produce the same effects as competition might have in other sectors, namely, to improve efficiency and foster innovation [Hay and Liu, (1997)], thus leading to a wider variety of products, lower prices, wider access to finance and better service [OECD, (2010)].

The proponents of the competition-fragility view[1] argue that borrowers are heterogeneous and banks perform tests to sort them out, and an increase in the number of competing banks may worsen the quality of tests. The idea of a negative relationship between the two has been pervasive in relevant literature since the 1990s. As found by Keeley (1990), it is, in fact, the decline of banks' margins and charter values that might magnify problems between banks and depositors, thus inducing the former to take on new risks, which may, in part, be shifted to depositors and, ultimately, to the government, dramatically increasing their failure probabilities (Matutes and Vives, 2000). The idea is that increasing competition would lead to lower interest rates on loans. This would lower margins of their loans and would erode the banks' net present value of future profits to zero. Without the potential of making

---

1. 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).

future profits banks would acquire more risk and relax their investment selection requirements. In return, this would give them an incentive to expand or/and rely on new risky investment policies, including high-risk and high-yield investments, in an attempt to maintain the former level of profits. This behaviour dominates in more competitive markets, thus contributing to the destabilising effect on both asset and liability incentives. However, from another point of view, with regards to the assets side, lower interest rates would increase return on investment for borrowers, which would encourage them to expand more effort to succeed, thus off-shoring for the diminishing margins through higher lending and, as such, reducing the risk of the bank to default [Cartletti and Hartman, (2002)]. On the liability side, runs and systemic crises could occur either as a consequence of a co-ordination failure among depositors or as a rational response by depositors to a bank's impending insolvency, as well as due to the extent to which competition might affect the operation of the interbank market. In other words, banks with surplus liquidity and market power in the interbank market might face a choice with opposite effects: (i) refuse to finance inefficient banks increasing the probability of default or helping troubled banks in need of liquidity in order to prevent contagion [Carletti and Hartmann (2002), OECD (2010)].

Those who support the competition-stability view[2] argue that competition may be beneficial for a bank's portfolio risk. The idea behind the so-called "charter value" or the possible positive margin effect hypothesis is that banks with some market power tend to enjoy high returns and, thus, face high opportunity cost of going bankrupt [Berger, *et al.* (2009)]. Therefore, they tend to behave more prudently in regard to risk-taking by holding more equity capital and a less risky portfolio and by rejecting those risky investments that could affect their stability and, thereby, jeopardise future profits. For example, Boot and Thakor (2000) suggest that, because large banks tend to engage in credit rationing, they have fewer but higher quality credit investments, which enhance their financial soundness. Besides, market power in the banking sector could lead to higher quality loan portfolios, improved capital allocation and enhanced profits level [Boyd *et al.* (2004), Amidu and Wolfe, (2013)], which may boost a higher "capital buffer" to protect them from adverse external economic and liquidity shocks 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).

---

2. 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); Marques-Ibanez, *et al.*, (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 a U-shaped relationship exists. They show evidence that, at first, the probability of bank default goes down, but then goes up, after a certain point, as bank competition increases, which is also supported by the 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 empirically analyse the nexus between competition and stability in the banking system. Several authors have tested the competition-stability nexus by focusing on competition indicators 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, Câpraru and Andrieş 2015, Fernández *et al.* 2016, Pawlowska 2016) and the relative market-power hypothesis (Hesse and Čihák 2007, Levy Yeyati and Micco 2007, Uhde and Heimeshoff 2009, Wagner 2010, Fiordelisi and Mare 2014, Pawlowska 2016), but have found mixed evidence. For instance, Boyd and De Nicoló (2005) show that, in a concentrated market, banks tend toward more risk-taking and increasing concentration leads to higher loan rates charged to borrowers. Boyd *et al.* (2006) use 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-industrialised countries for 1993-2004. Authors find that banks' probability of failure increases with market concentration, even though as Berger *et al.* (2009) suggest their conclusions are drawn using some form of concentration indicators, which might be insufficient measures to properly proxy any market structure. Bushman *et al.* (2016) use a new survey approach of competition, which captures managers' current perceptions of competitive pressures deriving from all different sources, including potential entrants, non-bank competitors and labour markets. The authors provide strong evidence that greater competition increases both individual bank risk and banks' contribution to system-wide risk. They 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 Ahmed 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. This result can be explained by the fact that weak competition tends to increase 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 empirical study by Schaeck *et al.* (2009) uses the Panzar and Rosse H-Statistics as an alternative measure of competition in 38 countries, during the period 1980-2003, and conclude 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 measures of market concentration do not affect the NPL ratio; however, they found evidence in favour of the franchise value paradigm when using the Lerner index. Amidu and Wolfe (2013) investigate how the degree 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 increase. 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 *et al.* (2010), Nguyen *et al.* (2012), Liu and Molyneux (2012), Amidu, (2013), Jeona and Limb (2013), Schaeck and Cihak (2014).

In addition, there are also other papers that validate both views. Berger *et al.* (2009) empirically analyse the link between credit risk (NPL ratio), bank stability (Z-score index) and 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, consistent with the traditional "competition-fragility" view, suggest that banks with a higher degree of market power also have lower overall risk exposure. However, the data also provide some support for one element of the competition-stability view, namely, that market power increases loan risk, which may, in part, be offset by higher capital ratios.

The empirical papers mentioned above produce cross-country evidence. However, a few studies focus on a single banking sector. For example Zhao *et al.* (2010) examine the degree to which deregulatory measures aimed at promoting competition lead to higher risk-taking in the Indian banking system. The authors show evidence that improved competition through deregulation does not lead to efficiency gains but, rather, encourages 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 prior literature, they also employ the Lerner index as a measure 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 the 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 few papers

are loosely related to the research question we raise in the case of Albania. The most relevant work is by Dushku (2016)[3] who investigates the link between competition (measured by Lerner Index) and bank risk-taking (measured by Z-Score) for 15 banks operating in the Albanian banking system during the period 2004–2014. The author finds a positive link between competition and bank risk and shows that the nexus between total (plus foreign) credit risk and competition is non-linear.

Similar to the theoretical debate, empirical findings are also challenging. For example, Carbó *et al.* (2009) found that existing indicators of competition (i.e. Lerner index, the H-Statistics) lead to different conclusions concerning the degree of competition as they tend to measure different things[4]. Therefore, it is obviously that the biggest obstacle and the conclusions of extant empirical research vary widely and heavily depend on the indicators chosen for measuring the degree of bank competition risk as well as on the data used [Bushman *et al.* (2016)]. Therefore, one key challenge that explains such mixed results is related to the inappropriate measure used to properly identify bank competition and bank stability [Pawlowska (2016)]. In terms of the bank risk measure, the measure available is even more limited, while the biggest concern is that most measures make no distinction as to which aspect of risks they effectively approximate.

This paper complements and extends existing literature on this issue because it makes 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 the NPL ratios, or resort upon bank risk indicators constructed from balance sheet information, such as the 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 NPL ratio focuses only on credit risk, but leaves out concerns with regards to liquidity and capital risk or other sorts of risks linked to the market within which banks operate. Hence, neither of them is a perfect substitute calculation to account for actual bank distress or the probability of default, which are, without doubt, the most appropriate concepts for defining bank risk (Fu *et al.* 2014, Kick and Prieto 2015). One concern, as Beck *et al.* (2013) place in their empirical analysis, is that both Z-Score and Lerner include profitability in the numerator and any positive relationship between the two might, thus, be mechanical rather than economically meaningful. In addition, we neither focused on real episodes of banking crises nor did we use a binary approach as a proxy for insta-

---

3. The 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.
4. See also Bikker *et al.* (2012).

bility episodes, both of which may either provide insufficient data for estimation purposes or be based on a threshold level and, therefore, may be easily criticised or produce false signals of instability moments. By contrast, we extend empirical findings by including, instead, a more sophisticated proxy for bank stability based on a wide range of information that includes different aspect of bank risk exposure rather than focusing only on credit risk or profitability; at the same time our work benefits through the use of the principal component analysis approach. To the best of our knowledge, no previous study has employed such a bank stability indicator as the dependent variable to investigate the competition-bank stability nexus and we believe this is an important step forward towards better understanding the underlying mechanisms. Besides, 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[5].

3. Methodology Approach

3.1 Dependant variable

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 Shijaku (2016a)[6]. First, using statistical methods, all indicators included in each of these categories are normalised into a common scale with a mean value of zero and standard deviation of one[7]. The formula is as follows:

$$Z_t = \left(\frac{X_t - \bar{\bar{\mu}}}{\bar{\sigma}} \right) \tag{1}$$

where, X_t represents the value of indicators X during period t; μ is the mean value and σ the standard deviation. Second, all normalised values of the set of correlated indicators used within one category are 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 based on the procedure in Equation (1). Then, the estimated sub-indices are transformed between the values

---

5. See also Van Leuvensteijn *et al*. 2011, Van Leuvensteijn *et al*. 2013, Kasman and Carvallo 2014, Marques-Ibanez *et al*. (2014), Schaeck and Čihák 2014, Duyguna *et al*. 2015, Kasman and Kasman 2015).

6. This approach is also used by the International Monetary Fund Compilation Guide 2006 on Financial Soundness Indicators, but also other authors, such as, Altman (1986), Sere-Ejembi *et al*. (2014) and Cleary and Hebb (2016).

7. Normalising the values avoids introducing aggregation distortions arising from differences in the mean values of indicators.

[0, 1] using exponential transformation $[1 / (1 + \exp(-Z^*))]$. Finally, our bank stability index (*CAELS*) is derived as a sum of the estimated exponentially transformed sub-indices, as follows:

$$BSI_{t,w} = \omega_1 \sum_{i=1}^{n} Z^*_{t,C} + \omega_2 \sum_{i=1}^{n} Z^*_{t,A} + \omega_3 \sum_{i=1}^{n} Z^*_{t,E} + \omega_4 \sum_{i=1}^{n} Z^*_{t,L} + \omega_5 \sum_{i=1}^{n} Z^*_{t,S} \quad (2)$$

$$\sum_{*=a,b,c,d,e} \omega^* = 1 \quad (3)$$

Where, *n* is the number of indicators in each sub-index; '*C*' relates to capital adequacy; '*A*' represents a proxy to asset quality; '*E*' represents a proxy to earnings; '*L*' represents a proxy to liquidity efficiency categories; and '*S*' is related to the sensitivity of market risk. Z^* is the exponentially 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 relative measurement, where an increase in the value of the index for any particular dimension indicates a lower risk in this dimension for the period when 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 [Betz *et al*. (2014)]. Thereby, it creates an internal comprehensive monthly-based supervisory "thermometer" measurement to evaluate bank stability in real time and on a uniform basis, which, in return, can be used to identify those institutions that require special supervisory attention and concern with regards to both present and future banking sector conditions. Second, as suggested by ECB (2007), *CAELS* reflects more accurately the Albanian financial structure, since it attaches more weight to the banking sector, which includes the most prominent agents in the financial markets, while it takes advantage of a broad range of bank level data. Third, the PCA approach highlights the most common factor identifying patterns in the data without much loss of information, which, at the same time, resolves any issue of endogeneity between the left-hand side and the right-hand side variables. Fourth, it does not assume the probability form of the binary approach, which might expose it either to limitations of an insufficient number of episodes or to the vulnerability of the methodology employed to calculate the threshold level. The latter might even provide false banking distress signals. Rather, it consists of a simpler approach that is easier to explain and implement. Most importantly, it allows analysing the state of the bank as it develops and it is also applicable in cross-section comparisons.

3.2 Measuring competition: The Boone indicator

The literature review offers several methods for estimating the degree of competition within a specific sector, since this indicator cannot be directly measured. Some of the methods fall under the so-called 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, and have been primarily developed from the non-structural models of Iwata (1974), Breshnahan (1982), Panzar and Rose (1987) and Lerner (1934) index or the price-to-cost margin (PCM) approach[8]. In addition to these already popular measures, an alternative measure of competition, as proposed by Boone (2008), measures the impact of efficiency on performance in terms of profit. The idea of this profit-elasticity index, which is also referred to as the Boone indicator (β), lies in the assumption that banks with superior efficiency, i.e. banks with lower marginal costs, gain more benefits in terms of profit as a result of market share reallocation from a less efficient to a more efficient bank 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. To put it differently, banks are punished more harshly in terms of profits for cost inefficiency. Therefore, the stronger this effect is, the higher β will be in absolute value, which is also an indication of greater degree of competitiveness 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:

$$ln(\pi_{it}) = \alpha + \sum_{l=1...T}^{L} \beta ln(MC_{l,it}) + \sum_{k=1}^{K} \omega\lambda_{k,it} + \varepsilon_{it} \qquad (4)$$

Where, π and MC denote the profit and the marginal cost for banks (proxy efficiency), respectively; α is the bank fixed-effect; λ is a set of control variables associated with coefficient ω; ln is the log-linearised 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 the cost of this bank. Theoretically, this indicator is expected to have a negative value, i.e. the increase in costs reduces profit, which can be interpreted as a reduction in the capacity of the bank to affect its losses due to an increase in competition. For this reason, we would expect that more efficient banks may choose to translate lower costs either

---

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.

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

$$ln(MS_{it}) = \alpha + \sum_{l=1...T}^{L} \beta ln(MC_{l,it}) + \sum_{k=1}^{K} \omega \lambda_{k,it} + \varepsilon_{it} \tag{5}$$

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

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

$$+ \sum_{j=1}^{3} \sum_{k=1}^{3} \theta_{jk} lnP_{it_j} * lnP_{it_k} + \sum_{j=1}^{3} \gamma_j lnQ_{it} * lnP_{it_j} \tag{6}$$

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

Where, TC is the total costs of bank i at time t, Q is the 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 GFC, and $\alpha, \beta, \theta, \gamma$ and τ are coefficients to be estimated. ε_{it} is a two-component error term computed as follows:

$$\varepsilon_{it} = \mu_{it} + \omega_{it} \tag{7}$$

Where, ω_{it} is a two-side error term, and μ_{it} is a one-sided disturbance term representing inefficiency. Then, from Equation (6), assuming that input prices are homogeneous, the marginal cost can be derived as follows:

$$MC_{it} = \frac{\delta TC_{i,t}}{\delta Q_{i,t}} = \frac{TC_{i,t}}{Q_{i,t}} \left[\hat{\alpha}_1 + \hat{\alpha}_2 lnQ_{it} + \sum_{j=1}^{3} \hat{\gamma}_j lnP_{it_j} + \hat{\tau} Trend \right] \tag{8}$$

---

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

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

$$\sum_{j=1}^{3} \theta_j = 1 \tag{9.1}$$

$$\sum_{j=1}^{3} \beta_j = 0 \tag{9.2}$$

$$\sum_{j=1}^{3} \sum_{k=1}^{3} \theta_{jk} = 0 \tag{9.3}$$

For the purpose of our research we estimated the Boone indicator using both Equation (4) and Equation (5). 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 bank profit value was replaced by the volume of net interest profit. Then, Equation (4) and Equation (5) were often run 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 size. The model is specified as follows:

$$CAELS_{i,t} = \alpha + \beta_1 * X'_{i,t} + \varepsilon_{i,t} \tag{10}$$

where, $CAELS_{i,t}$ is our stability indicator of bank i at time t, with i = 1, ..., N and t = 1, ..., T, expressed as a function of a set of explanatory variables ($X'_{i,t}$) 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 proxy by the Lerner index; $Macroeconomics'_{i,t}$ is a set of control variables that account for the state of the economy, which consists of two variables, namely, output and primary sovereignty risk. α is a constant term. β is

a vector of coefficients to be estimated. $\varepsilon_{i,t}$ is an error term that is assumed to be identically and independently distributed with a mean value of 0 and variance $\sigma_u^2 A = \pi r^2$.

One potential problem with Equation [10] is the fact that, as a partially specified model, it puts together a variety of variables and, so, it nests a conditional restriction with a variety of unconditional ones leading to over identification problems. Under these circumstances, Maximum Likelihood estimators need to identify the moments whose squares are minimised in order to satisfy only the subset of correct restrictions. To correct this issue, the estimation approach strictly follows the methodology as in Shijaku (2016b), which, based on the dynamic General Method of Moments (GMM), weighs differences (AB-1-step) as proposed by Arellano and Bond (1991) and Arellano and Bover, (1995). Han and Phillips (2010) suggest GMM is constructed to be capable of achieving partial identification of stochastic evolution and to be robust for the remaining un-modelled components. In practical terms, GMM is also a virtuous approach to deal with potential endogeneity and dynamic panel data problems in model estimation [Anderson and Hsiao (1981)]. Furthermore, the GMM weighted differences first step (AB-1-step) approach would also resolve un-ward (down-ward bias in standard errors (t-statistics), due to its dependence on estimated values (as it uses estimated residuals from an one-step estimator), which might lead to unrealistic asymptotic statistical inference [Judson and Owen, (1999); Bond and Windmeijer (2002); Ansari and Goyal (2014)], particularly in the case of a data sample with a relatively small cross-sectional aspect [Arellano and Bond (1991)]. The instrument variable is based on past information of $X'_{i,t}$, and, to limit the number of instruments, we restrict ourselves to 4, i.e. the lag range used in generating the instruments as suggested by Roodman (2006). Then, the Sergan and Hansen test is used for over-identifying restrictions based on the sample analogy of the moment conditions adopted in the estimation process, thereby determining the validity of instrument variables (i.e. tests of lack of serial correlation and consistency of instrument variables).

3.4 Data

Sample data for this study consist of quarterly data gathered and complied by the Bank of Albania 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 decades. The sample consists of 960 quarterly sets of data for 16 banks operating in Albania, since 2001 Q01.

Variables used to calculate the competition indicator are as a follows: *TC* is the sum of personnel expenses, other administrative expenses and other operating expenses. The bank's single output, Q, is a proxy for total bank 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. $CRISIS$ is a dummy variable that takes the value of 1 during the period 2008 Q03–2010 Q04, and 0 otherwise. All variables are log-linearised, besides the *CRISIS*.

The empirical study focuses on the period 2008 Q02–2015 Q03, as the second half of 2008 marks the beginning of the pass-through effects of GFC on the Albanian economy[10]. That includes a total panel of balanced observations with 448 observations and 28 periods. The variables used for empirical analysis are approximated as follows. The bank-specific variables and the stability indicator are individually estimated for each bank. *CAELS* is transformed into an index, taking the average performance during the year 2010 as the base year. *EFFICIENCY* is the gross expenditure to gross income ratio. *LEVERAGE* presents the equity to asset ratio of individual banks. *BOONE* is a non-structural competition index variable, as explained above. It is also transformed into an index, taking the average performance during the year 2010 as the base year and enters the model as log-transformed. These bank-specific variables and the stability indicator are individually estimated for each bank. The macroeconomic variables are aggregated indicators that represent the state of the economy. *GDP* represents gross domestic production. It is transformed in real terms by deflating with the Consumer Price Index (CPI). *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 data represent end-period values. They are log-transformed, besides the *PSRISK* and *CRISIS*. Furthermore, the dataset developed for this paper has several sources. Data on *GDP* are taken from the Albanian Institute of Statistics. Data on domestic *T-Bills* rates are taken from the Ministry of Finance. Data on German 12 months' *T-Bills* rates and German *CPI* are taken from Bloomberg. The rest of the data are taken from the Bank of Albania.

Finally, prior to empirical estimation, all data were subjected to a unit root test procedure in an effort to understand their properties and also to ensure that their order of integration fulfils the criteria of our empirical estimation approach. The latter is a pre-required condition so as to generate 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 variables are stationary. Second, they are mostly used for unbalanced panel models, such as our sample.

---

10. The Albanian economy was not directly affected by the GFC, but the spill-over effects through financial and trade linkages were immediately transmitted from 2008 Q04, which, at the same time, provides a justification why we chose the empirical estimation from this period.

Results are presented in Table 2 in the Appendix. Findings imply that some of the variables included in our specified model are integrated of order zero I(0). This means that they are stationary. Therefore, they enter the model at level. This set of variables includes *EFFICIENCY* and *LEVERAGE*. The other variables, namely *CAELS*, *GDP, PSRISK* and *BOONE* are found to be integrated in 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[11].

4. Empirical Results

4.1 Main results

This section reports the main results from the model, as specified in Equation [10], which are reported in Table 4 in Appendix A. We estimate 6 regressions. In each regression we use the same measure of competition, but with 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 results with regards to a possible non-linearity relationship. Then, column [3] and column [4] show the results as presented previously, but with regards to a sample consisting of only large banks. Similarly, column [5] and [6] provide results with regards to only small banks. All these models are estimated yet again based on the AB-1-step GMM approach, as previously explained. At the bottom of the table, we report specification test results for the GMM estimation. First, AR(1) and AR(2) are the Arellano-Bond tests for first and second order autocorrelation of residuals. One should reject the null hypothesis of no first order serial correlation and not reject the null hypothesis of no second order serial correlation of residuals. Second, the Haussmann test of over-identifying restrictions indicates whether 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, since it accounts for heteroscedasticity Hall (2005). Results show that, in our case, requirements are met, as suggested by the p-values of AR(1) and AR(2) tests. In addition, the Sergan and Hansen test suggests that the instruments used in all specifications are appropriate. This means that all GMM equations are properly specified.

   Analyses of estimated coefficients, both external and internal variables, suggest that all explanatory variables have the expected signs and are statistically significant at conventional level. They are also compatible with previous studies, as reported

---

11. These results are robust also in other unit root test approaches, including the Im, Pesaran and Shin W-stat test and Fisher test. Data can be provided upon request.

by Shijaku [(2016a) and (2016b]. For example, the coefficients of the variables linked to macroeconomic patterns bear relatively the same level of significance on bank stability as in previous studies. 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 explanation for this is that small banks in Albania are more exposed to individuals and small and medium enterprises, which, in response, are the first to be affected by economic turmoil. The coefficient of primary sovereignty risk, presented by *PSRISK*, is statistically significant and negative in all regressions, as well as for small banks, suggesting that a higher spread ratio worsens bank stability. Evidence shows, however, that the effect is stronger for large banks. This can also be explained by the fact that this group of banks is the main one that finances any domestic government borrowing and holds the main stock of bank lending to the private sector. On the other hand, at the given magnitude of the coefficient, results suggest that the interest rate pass-through effect on bank stability is found to be relatively low. Second, bank-specific factors are also found to impact bank stability. Both *EFFICIENCY* and *LEVERAGE* coefficients are statistically significant, which implies that operational efficiency and capital structure have a crucial impact on bank stability. 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 bank stability increases through improving operational efficiency and better capital structure. By contrast, we found that capital is relatively more important for small banks when compared to the higher effect of operational efficiency found for large banks.

Table 4 also summarises the results of regressions when capturing the effects of competition through the Boone indicator. As mentioned before, it emphasises the effect of an increase in marginal cost on the decrease in market shares. Results indicate that the coefficient of Boone indicator is significantly positive. This means that increasing competition improves bank stability conditions, given that the higher value of the Boone indicator signifies a higher degree of competition. At the same time, since the Boone indicator is significant, changes of marginal cost have more impact on profits, which means that market share is subject to more competition. Similarly, as competition in the banking sector increases, it is likely to boost the franchise value and encourage banks to lower their overall risk exposure, thus confirming the competition-stability view in the case of Albania. These findings are consistent with the "competition-stability view" of other recent studies (Berger and Bouwman 2013, Fiordelisi and Mare 2014, Schaeck and Cihak 2014), i.e., that greater bank competition is associated with higher bank stability.

Finally, following Jimenez *et al.* (2013, Liu *et al.* (2013), Fu *et al.* (2014), Kasman and Kasman (2015), we also use 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 4 column [2] in Appendix A, reveal an important consideration, namely, that we did not find any evidence of non-linearity relationship between competition and stability, thus rejecting Martinez-Miera and Reputto (2010) assumption in the case of the Albanian banking system. We do not find such evidence even when we split the sample with regards to small and large banks, as reported in Table 4 column [4] and column [6] in Appendix A[12].

4.2 Robustness checks

In an attempt to further enrich our analysis, and as a complementary proof, we ran a number of robustness checks on our main model, as specified in Equation (10). This included the use of five different alternative measures as proxies for bank competition, which are also used as explanatory variables to get more robust results. For example, column [1] in Table 5 in Appendix A shows the impact of competition as measured by an alternative Boone indicator that also includes bank capital (Equity) in the estimation of the TCF model on bank stability [See also Equations (B.1 and B.2) in Appendix B]. Results are relatively similar to those in the previous sections, re-confirming that a greater degree of bank competition due to increasing operational efficiency would further improve bank stability conditions[13].

On the other hand, we also use as a robustness check the marginal cost estimated from Equation (8) 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]. These results are respectively reported in columns [2], [3] and [4]. They show that the *LERNER* and *LERNER** are negatively related to *CAELS*. The impact is also significant. As previously mentioned, since the Lerner index is inversely proportional to *CAELS*, 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. By contrast, the coefficient

---

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. However, one important consideration is that as our measures for competition mainly focus on the lending market, it should be kept in mind that these conclusions are quite subject to loan markets.
13. Results (Table 6 in Appendix) are also robust for methodological changes in 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, straightforward indicator that takes a value between 0 and 1, where lower value indicates a 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].

of *PROFITELASTICITY* exhibits a positive sign, suggesting that lower elasticity of profit would boost bank stability. These results provide yet again additional strong supportive evidence for the competition-stability view, re-confirming, as previously, that a greater degree of bank competition improves bank stability conditions.

Finally, we also examined 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 5 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 a lower bank concentration ratio leads to a decrease in bank insolvency risk, and, therefore, a higher degree of bank stability. In other words, the less concentrated the banking system is, the more stable the banks are. By contrast, based on the size of respective coefficients, we find that the impact of bank concentration is relatively higher that the extent to which competition affects bank stability. On the one hand, it is very clear that results remain similar to those analysed in previous sections, since in all regressions estimated we find that bank market power is negatively related to bank stability, i.e., there is a positive relationship between a higher degree of competition and stability. These results support both theories -the competition-stability view and the concentration-fragility view- in the case of Albania, showing that banks with lower market power are, on average, more stable. On the other hand, the use of the alternative competitiveness proxy should be treated as a robustness check of the results, which further strengthens our conclusions in terms of competitions.

5. Conclusions

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

This paper continues the series of studies performed using the sample data of the Albanian banking sector. The purpose is to fill in the information gap by analysing whether competition improves or reduces banking stability for banks operating in

---

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

the Albanian banking system during the period 2008–2015. Although there have been several similar articles published, we are improving on existing literature, while including 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, based on which we analyse the bank competition-stability nexus. Second, we deepen our empirical analysis by splitting the sample with regards to large and small banks. Finally, we also check for a non-linearity relationship between competition and stability in the case of the Albanian banking sector.

In summary, the main results of this paper are that competition improves 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 discovered that concentration is inversely correlated to bank stability, suggesting that a more concentrated banking system is more vulnerable to bank fragility. 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. Similarly, under a concentration-stability view, greater bank concentration eases market power. This would increase profit margins, and, therefore, would result in higher franchise value. At the same time, we found no evidence of non-linearity relationship between competition and stability in the case of the Albanian banking system. Furthermore, an interesting point is that we found that the relationship between bank competition and bank stability is stronger for small banks than for large banks. Similarly, we did not find any non-linearity relationship between competition and bank stability in the case of small banks or large banks. Finally, in regard to control variables, results confirm previous studies in the case of the Albanian banking sector. First, macroeconomic conditions are relatively important for bank stability. Similarly, bank stability is also conditional to improving the operational efficiency and capital structure of banks.

References

Agorakia, Maria-Eleni, Manthos Delisb, and Fotios Pasiourasc. (2011). "*Regulations, Competition and Bank Risk-Taking in Transition Countries.*" Journal of Financial Stability, 7(1): 38–48.

Ahmed, 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.

Anderson, Theodore, and Cheng Hsiao. (1981). "*Estimation of Dynamic Models with Error Components.*" Journal of American Statistical Association, 76(375): 598-606.

Ansari, J., and Goyal, A., (2014), "*Bank Competition, 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, Manuel, and Stephen Bond. (1991). "*Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations.*" The Review of Economic Studies, 58(2): 277-297.

Arellano, Manuel, and Oliver Bover. (1995). "*Another Look at the Instrumental Variables Estimation of Error Components Models.*" Journal of Econometrics 68(1): 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, Leora 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, Frank, Silviu Oprică, Tuomas Peltonen, and Peter Sarlin. (2014). "*Predicting Distress in European Banks.*" Journal of Banking and Finance, 45: 225-241.

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

Bond, Stephen, and Frank Windmeijer. (2002). "*Finite Sample Inteference for GMM Estimators in Linear Panel Data Models.*" Institute of Fiscal Studies, London, January (2002).

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

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

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

Boyd, John, 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, Timothy. (1982). "*The Oligopoly Solution Concept is Identify.*" Economics Letters, 10(1-2): 87-92.

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

Câpraru, Bogdon, and Alin 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.

Cartletti, Elena, and Philipp Hartman. (2002). "*Competition and Stability: What's special about banking?*" European Central Bank Working Paper Series No. 146, May (2002).

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

Clerides, Sofronis, Manthos Delis, and 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.

Dushku, Elona. (2015). "*Lerner Index-Indicator of Bank Market Power in Albania.*" Bank of Albania, Economic Review 2015 H1: 4-12.

Dushku, Elona. (2016). "*Bank Risk-Taking and Competition in the Albanian banking sector*", South-Eastern Europe Journal of Economics 2: 187-203.

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. (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, and 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.

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

Han, Chirok, and Peter Phillips. (2010). "*GMM Estimation for Dynamic Panels with Fixed Effects and Strong Instruments at Unity.*" Econometric Theory, 26: 119-151.

Hay, Donald, and Guy Liu. (1997). "*The Efficiency of firms: What Difference Does Competition Make?.*" Economic Journal 107: 597-617.

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

Iwata, Gyoichi. (1974). "Measurement of Conjectural Variations in Oligopoly." Econometrica 42(5): 947-966.

Jeona, Jin, and Kwang 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 Lopez, and Jesús Saurina. (2013). "*How does competition affect bank risk-taking?.*" Journal of Financial Stability, 9(2): 185-195.

Judson, Ruth, and, Ann Owen. (1999). "Estimating Dynamic Panel Data Models: A Guide for Macroeconomist." Economics Letters, 65: 9-15.

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. (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 Competition in Banking: A Critical Review of Methods.*" CERDI, January (2014).

Lerner, 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, and Philip Molyneux. (2012). "*Competition and Risk in South East Asian Commercial Banking.*" Applied Economics 44(28): 3627-3644.

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

Marques-Ibanez, David, Yener Altunbas, and Michiel Leuvensteijn. (2014), "*Competition and bank risk: the effect of securitization and bank capital.*" European Central Bank Working paper series, No. 1678, May.

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.

OECD. (2010). "*Competition, Concentration and Stability in the Banking Sector.*" Competition Law & Policy OECD, Policy Roundtables, (2010).

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 Asymmetries.

Rochet, Jean-Charles, and Xavier Vives. (2004) "*Coordination Failures and the Lender of Last Resort: Was Bagehot Right After All?*" Journal of the European Economic Association 2(6): 1116-1147.

Roodman, David. (2009). "*A Note on the Theme of Too Many Instruments.*" Oxford Bulletin of Economics and Statistics, 71(1): 135-158.

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, Angela, Ini Udom, Audu Salihu, Ngozi Atoi and Baba Yaaba. (2014). "*Developing Banking System Stability Index for Nigeria.*" CBN Journal of Applied Statistics, 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, Benjamin, Dimas Fazio, and Daniel 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 Bikker, Adrian 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 Bikker, Adrian Van Rixtel and Christoffer Kok Sørensen. (2013). "*Impact of Bank Competition on the Interest 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
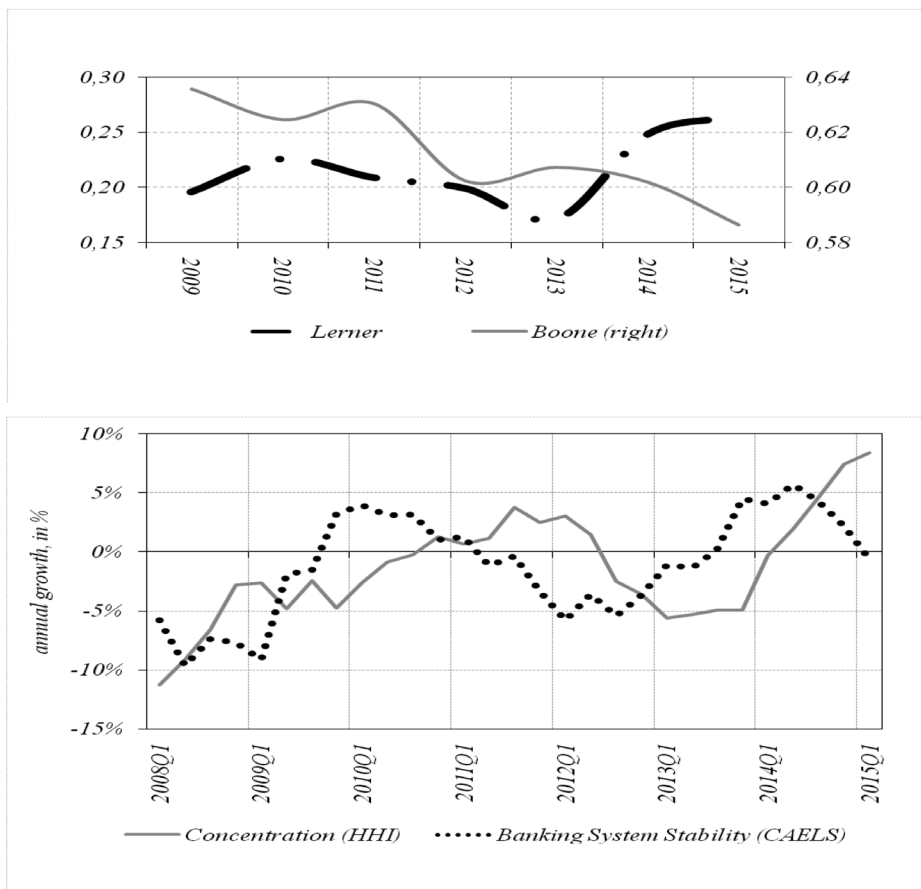
Source: Bank of Albania, Author's calculations.

Table 1. Summary of literature review

Authors (year)	Geographical coverage (Sample time)	Methodology	Main variables		Main results
			Stability	Competition	
Boyd et al. (2006)	US bank and 134 non-industrial economies (1993-2004)	OLS with fixed effects, GMM approach	Z-score,	HHI	Banks probability of failure is positively and significantly related to concentration, *ceteris paribus*, loan to asset ratios are negatively and significantly related to concentration, and banks' profits are positively and significantly related to concentration.
Berger et al. (2009)	8235 banks in 23 developed countries	GMM approach	Z-score, NPL, ROA	H-Statistics, Lerner, HHI	Consistent with the "competition-fragility" view—banks with a higher degree of market power also have less overall risk exposure. The data also provide some support for one element of the "competition-stability" view—that market power increases loan portfolio risk.
Schaeck et al. (2009)	38 developing and developed countries (1980–2003)	Logit models	Duration models with time-varying, covariates and Logit probability model.	Panzar and Rosse H-Statistics, CR3	More competitive banking systems are less prone to systemic crises and time to crisis is longer in a competitive environment.
Jiménez at al. (2010)	107 unique banks (commercial and savings banks) in Spanish banking system (1988 to 2003)	GMM First Differences	NPL	C5 and HHI, Lerner	Market concentration does not affect bank risk. Non-linear relationship using standard measures of market concentration in both the loan and deposit markets. When direct measures of market power, such as Lerner indices, are used, empirical results are more supportive of the original franchise value hypothesis, but only in the loan market.
Cipollini and	180 commercial banks	A Probit model	A measure of	HHI	Positive effect of bank concentration on financial

Study	Sample	Method	Risk indicator	Competition measure	Findings
Fiordelisi. (2012)	(within EU-25) (2003-2007)	estimated by GMM	risk-adjusted bank performance as risk indicator		distress.
Liu and Molyneux (2012)	Commercial banks from four South East Asian countries: (1998-2008)	OLS with fixed effects, Dynamic panel GMM	Z-Score	H-Statistics,	Competition does not increase bank risk-taking behaviour. Concentration is inversely related to bank risk.
Amidu and Wolfe (2013)	978 banks in 55 emerging and developing countries (2000–2007)	Three-stage-least-squares (3SLS)	Z-score	H-statistics, Lerner index	Competition-stability view.
Fungacova and Weill (2013)	Russian banks (2001-2007)	Panel logit	Bank failures	Lerner	Competition-fragility view.
Soedarmonoa et al. (2013)	636 commercial banks in 11 Asia countries (1994-2009)	OLS with fixed effects, 2SLS	Z-score,	Lerner	Higher degree of competition is associated with higher insolvency risk of banks.
Ansari and Goyal (2014)	22 Sub-Saharan African country, 15 Eastern and Central Europe countries, and 11 Latin America countries, (2000-2007)	Three-stage-least-squares, GLS	Z-score, ROA (ROE)	Lerner, HHI	Increase in bank competition has a significant effect on the overall stability of banks in emerging and developing markets. This relationship holds when risk-adjusted profits are used as the dependent variable.
Fiordelisi et al. (2014)	Cooperative banks in Austria, France, Germany, Italy and Spain, (1998-2009)	Granger causality test	Z-score	Lerner index Adjusted-Lerner Index, HHI	Bank market power negatively Granger-causes banks stability. Higher competition increases bank stability. Concentration is negatively related to individual bank soundness.
Kasman and Carvallo. (2014)	272 commercial banks from fifteen Latin American countries (2001-2008)	Granger causality technique	Z-score	Lerner indexes, Boone indicators	More competition is conducive to greater financial stability.
Marques-Ibanez et al. (2014)	9 EU countries and US (2007-2009)	Probit Model	Binary variable for riskier banks	Boone indicator	More intense competition and greater use of securitisation is correlated with higher levels of realised risk

Schaeck and Cihak (2014)	3,325 European banks in Austria, Belgium, Denmark, France, Italy, Germany, Luxembourg, Netherlands, Switzerland, and the U.K, consisting of savings, cooperatives and commercial banks. (1995- 2005)	OLS with fixed effects, 2TLS	Z-score	Boone indicator, HHI	Boone indicator captures competition patterns. Competition is stability-enhancing, and the stability-enhancing effect of competition is greater for healthy banks than for fragile ones.
Căpraru and Andrieş (2015).	923 banks from 27 EU countries (2001-2009)	GMM	Z-Score	CR5, HHI	The results validate both stability and fragility views depending on the group of countries and the pre-crisis/crisis period.
Kasman and Kasman (2015)	Turkish banking industry (2002–2012)	GMM approach	Z-score, NPL ratio	HHI, Boone indicator	Competition is negatively related to the NPL ratio but positively related to the Z-score.
Kick and Prieto (2015)	5035 banks (1994-2010)	A two-step IV-probit model	Z-score	HHI Lerner Index Boone indicator	Using Lerner index as a competition measure indicates that market power tends to reduce default probability (riskiness of banks). The Boone indicator shows that increased competition lowers bank risk-taking.
Bushman *et al.* (2016)		OLS (Probit Model)	Text-based measure of competition, survey approach, Z-score	Lerner Index	Evidence that greater competition increases both individual bank risk and a bank's contribution to system-wide risk.
Dushku (2016)	Albanian banking system (2004-2014)	Robust Least Square (Panel)	NPL ratio, Z-Score	Lerner index	Higher market power associated with lower risk. After the crisis the relationship between total credit risk and competition is non-linear.
Pawlowska (2016)	EU-27 (2006-2010)	One Step GMM approach	NPL	CR5, HHI, Lerner	Absence of strong evidence for a relationship between competition and risk-taking behaviour by EU banks.

Table 2. Panel Unit Root Test

Variable	ADF - Fisher Chi-square			PP - Fisher Chi-square		
	Intercept	Intercept and Trend	None	Intercept	Intercept and Trend	None
$\varDelta$CAELS	[0.0000]	[0.0000]	[0.0000]	[0.0018]	[0.0000]	[0.0000]
$\varDelta$GDP	[0.0000]	[0.0000]	[0.0000]	[1.0000]	[0.0000]	[0.0000]
$\varDelta$PSRISK	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[1.0000]	[0.0000]
$\varDelta$BOONE	[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: $\varDelta$ 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 3. Correlation Analysis: Ordinary

Sample: 2008Q2 2015Q3
Included observations: 480
Balanced sample (list-wise 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 4. Empirical Results based on the 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

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

Source: Author's calculations.

Table 5. Empirical Results based on 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 6. Empirical Results based on 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

The Table shows bank-level GMM regression statistics on empirical results of estimations using, alternatively, the White Period 2nd Step Approach. Haussmann tests (J-Statistics and the Probability of J-Statistics) investigate the validity of the instruments used, and rejection of the null-hypothesis implies that instruments are valid, since 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[19] following Leon (2014), and re-specify Equation (3) to also include an additional control variable, namely, bank capital. The specified model is expressed as follows:

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

$$+ \sum_{j=1}^{3} \sum_{k=1}^{3} \delta_{jk} lnP_{it_j} * lnP_{it_k} + \sum_{j=1}^{3} \gamma_j lnQ_{it} * lnP_{it_j} \qquad (B.1)$$

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

$$\omega_1 lnE_{it} + 0.5\omega_2 (lnE_{it})^2 + \omega_3 lnE_{it} * lnQ + CRISIS + \varepsilon_{it}$$

where, E_{it} is total equity of bank i at time t. This model is estimated on the basis of the OLS approach. Then, assuming that input prices are still homogeneous, Equation (4) is re-expressed as follows:

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

The most important finding, as reported in Table 5 in Appendix, is that the correlation between marginal costs, calculated on the basis of different approaches, is of a relatively high level, which is also statistically significant. This means that changing methodology and augmenting the TCF model does not change the results and that the 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:

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

where, $\pi_{i,t}$ is the profit of bank *i* at time *t*, and the rest 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 profit elasticity, deriving from the efficiency adjusted Lerner index, by solving for π in equation (B.3) and differentiating with respect to MC, as follows:

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

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

---

18. Results are provided upon request.