

# Competition and stability in the banking sector of Kazakhstan

*Madina Turusbekova*<sup>1</sup>, *Kuandyk Dauylbaev*<sup>1</sup>, *Gulbakhyt Kaliyeva*<sup>2\*</sup>, *Jelena Titko*<sup>3</sup>, and *Konstantins Kozlovskis*<sup>3</sup>

<sup>1</sup>Almaty Technology University, 100 Tole bi str., 050000, Kazakhstan

<sup>2</sup>Eurasian Law Academy after named Kunaeva, 107 Kurmangazy str., 050000, Kazakhstan

<sup>3</sup>Riga Technical University, 6 Kalnciema str., LV-1048, Latvia

**Abstract.** This paper examines the relationship between competition and stability in the Kazakh banking sector using quarterly bank level data of private commercial banks. There have been many theories stand out on the relationship between competition and stability of the banking sector so far. But theories of the competition-fragility view and competition-stability view are widely accepted theories in the literature. The main method applied to achieve the established goal is a multiple regression analysis. Bank stability is used as a dependent variable and proxied by risk index. To measure the level of competition Lerner index and Boone indicator are calculated. Besides, the consistency between concentration and competition measures is tested applying a correlation analysis. Concentration in the banking sector is measured using Herfindahl-Hirschman Index (HHI) and concentration ratio CR5. The research revealed no statistically significant relationship between the values of Lerner index and Boone indicator estimated for Kazakh banking sector. The hypothesis about the consistency between different competition measures is rejected. In turn, the hypothesis about positive effect of competition on bank soundness is rejected only in the case when competition is proxied by Lerner index. Using Boone indicator as a competition measure, the results are doubtful.

## Introduction

It is well known that the banking system is the blood vessel of the economy. Competition in the banking sector can bring significant benefits to the market players, national economy and society, but also can be a source of a potential instability due to the fact that competition forces banks to take more risk. Recent studies support the positive relationship between the level of competition and overall stability in the banking sector [1][2][3][4]. The World Bank's view is that "competition in the banking system is desirable for efficiency and maximization of social welfare" [5]. In turn, OECD experts in the report "Bank competition and stability" examine the interrelationship between banking competition and financial

---

\* Corresponding author: [gulbakhyt\\_k@mail.ru](mailto:gulbakhyt_k@mail.ru)

stability, considering the experience from the recent global crisis. They conclude that “that competition can be both good and bad for stability” [6,7]. Considering that banks are the major players in the financial system of the Kazakhstan, the studying of competition-stability relationship in the Kazakh banking market can provide vitally important information to policy makers.

The goal of the paper is to investigate the relationship between bank stability and competition in the banking market. The following hypotheses are tested in the current study: H1: There is a statistically significant relationship between different competition measures. H2: Competition in the Kazakh banking sector has a positive impact on bank stability.

To test the first hypothesis the authors perform a correlation analysis to identify the statistical link between competition and concentration ratios. Concentration in the Kazakh banking sector is measured with Herfindahl-Hirschman Index (HHI) and concentration ratio (CR5). To measure competition Lerner index and Boone indicator are used. To test the second hypothesis the authors run a multiple regression analysis. Bank stability proxied by Risk index is used as a dependent variable. Explanatory variables include proxy for competition level in the banking sector, bank size, profitability, productivity and liquidity.

Competition in the banking sector is frequently measured by concentration ratios, such as market share of the largest banks (CR3, CR5, CR10) or Herfindahl-Hirschman Index (HHI). However, many researchers insist on distinguishing between concentration and competition. In 2010, the OECD Competition Committee organized a roundtable discussion on competition, concentration and stability in the banking sector. One of the conclusions made through discussion was that “concentration, among other structural indicators, is not a good proxy for competition.” A set of other factors should be taken in consideration – for instance, market contestability, switching costs, size of competitors, customers, and etc.

The relationship between concentration and competition in the banking market has been investigated in the wide range of studies. [8][9][10][11][12] There is empirical evidence of the existence [12][13][14] and non-existence [10][15] of the relationship between bank competition and concentration.

The comprehensive overview of different ratios employed in measuring bank competition is provided by Bikker and Haaf [13], as well as by Leon [16].

Measuring of competition level is based on the structural and non-structural approaches. In structural models concentration ratios (CR5 and HHI) are used to describe the relationship between competitive performance and market structure. [11] Non-structural measures of competition are estimated, applying Iwata model [17], Bresnahan model [18] and Panzar and Rosse (PR) model [19]. Besides, the researchers use such competition measures, as Lerner index [20] and Boone indicator [21].

The results of studies can be largely influenced by the kind of measures used by the researchers. Carbo *et al.* [22] compared five indicators of banking market competition in their cross-country study over 1995-2001, based on data about 14 European countries. They concluded that “existing indicators of competition are found to give conflicting predictions of competitive behavior across countries, within countries, and over time.”

Competition in the banking market has been studied by many researchers not only as an individual issue, but also in the context of competition-stability relationship. The results confirm both negative [23] and positive [1],[3-4] trade-off between competition and bank soundness.

The evidence on positive link between competition and efficiency frequently is based on investigation of competition-efficiency relationship. Competition “helps make the financial sector more efficient”. [6] In turn, “more efficient banks have better screening and monitoring procedures in place, and are consequently less likely to suffer from non-performing loans”.

Akins *et al.* [4] found that “banks facing greater competition earn lower interest margins and make investments with lower risks”. Amidu and Wolfe [3] supported positive effect of competition on bank soundness, because “diversification across and within both interest and non-interest income generating activities of banks increases”. In turn, Beck *et al.* [28] empirically confirmed competition-fragility hypothesis, analyzing data of 17055 banks in 79 countries. They state that competition “erodes banks’ pricing power, increases banks’ risk taking behavior and is hence detrimental for financial stability.” OECD experts point to the controversy in results while studying competition-stability relationship in banking. In OECD report “Bank Competition and Financial Stability” it was stated that “structural and non-structural measures of competition are found to be both positively and negatively associated with financial stability, depending on the country analyzed and the measure of financial stability used.” [6]

The investigation of competition-stability link is frequently performed applying the regression analysis. Bank stability is associated with the level of bank risk that, in turn, is proxied by risk index (Z-score). [23-24] Z-score usually has been regressed against Lerner index or Boone indicator [1],[3][25]. Liu *et al.* [24] in their comprehensive study of 11 European banking markets over 1997-2008 found that banking sector risk measures (including Z-score) are “unrelated to the various competition measures.” The researchers concluded that “this raises doubts about the generality of the findings of previous empirical studies that investigate competition-stability and competition-fragility issues.” Considering the lack of the topic-related papers published by the local researchers, the authors of the present paper make an attempt to fill the gap in the literature on competition-stability issues in the Baltic banking sector. The current research contributes to the data set on competition in banking.

Concentration is measured with Herfindahl-Hirschman Index (HHI) and the concentration ratio CR5. The HHI is calculated by summing up the squared market shares of all companies competing in the market. CR5 is the market share of five largest banks in the market in terms of assets.

To measure competition in the banking sector, the authors used two indices: Lerner index and Boone indicator.

Lerner index is estimated using the formula (1):

$$L_{it} = \frac{P_{it} - MC_{it}}{P_{it}} \quad (1)$$

where  $P_{it}$  is the price of banking outputs for the  $i$ -th bank at time  $t$ ,  
 $MC_{it}$  is the marginal costs for the  $i$ -th bank at time  $t$ .

Lerner index estimated for each individual bank denotes its pricing power. Based on the theory, Lerner can range between 0 and 1. However, in the real market situation its value can exceed 1 (in case of positive marginal costs) or it can be negative [26]. The alternative measure of competition proposed by Boone (2000) is based on the idea that „in a more competitive industry firms are punished more harshly in terms of profits for cost inefficiency”. [32] Profit-elasticity index that is usually referred to as Boone indicator is estimated from the formula (2):

$$\ln \pi_{it} = \alpha + \beta \ln MC_{it} \quad (2)$$

where  $\pi_i$  is the profit of the  $i$ -th bank at time  $t$ ,  
 $MC$  it is the marginal costs for the  $i$ -th bank at time  $t$ .

According to Griffith *et al.* [32] „more efficient firms (those with lower marginal costs) have lower prices, higher market shares, higher price-cost margins and higher profits.”

Using this measure for analyzing competition in a banking sector, some researchers transform the formula of Boone indicator and replace the value of bank profit with a bank market share [1][33](formula (3)).

$$\ln MS_{it} = \alpha + \beta \ln MC_{it} \tag{3}$$

where  $MS_{it}$  is the market share of the  $i$ -th bank at time  $t$ .

However, the original formula is also applied in calculations [16][34][30][31]. In the Global Financial Development report [5] the World Bank’s experts offer to calculate Boone indicator by regressing „the log of a measure of profits (such as return on assets)” against a log measure of marginal costs.

According to the European Central Bank’s report [32] “banks with lower marginal costs expected to have larger market power, expressed in their market shares”. Thus,  $\beta$  is expected to be negative. The stronger competition is, the stronger this effect will be, and the larger, in absolute terms, this (negative) value of  $\beta$ .

Both indices – Lerner index and Boone indicator – require in their calculation an estimation of marginal costs. Marginal costs ( $MC_{it}$ ) are calculated from translog cost function (formula (4)) [21],[26].

$$\begin{aligned} \ln TC = & a_0 + a_1 \ln Y + 0.5a_2 (\ln Y)^2 + \sum_{j=1}^3 \beta_j \ln w_j \\ & + \sum_{j=1}^3 \sum_{k=1}^3 \beta_{jk} \ln w_j \ln w_k + \sum_{j=1}^3 \gamma_j \ln Y \ln w_j + \epsilon \end{aligned} \tag{4}$$

where  $TC$  – total costs,  $Y$  (output) – total assets,  
 $w_1$  (input 1)– labour price,  
 $w_2$  (input 2)– price of borrowed funds,  
 $w_3$  (input 3)– capital price;

The coefficients estimated from the cost function (formula (4)) are used to calculate marginal costs (MC) applying the formula

$$MC = \frac{TC}{Y} (\alpha_1 + \alpha_2 \ln Y + \sum_{j=1}^3 \gamma_j \ln w_j) \tag{5}$$

Following the experience of other researchers [18],[21],[28], the measures needed for the calculation purposes are estimated with the formulas from the Table 1.

**Table 1.** Calculation of Lerner index and Boone indicator: procedure.

Measure	Calculation
Pit	Total revenues (TR) / Total assets
TR	Interest revenues + non-interest revenues
TC	Interest expenses + Non-interest expenses
w <sub>1</sub>	Personnel expenses / Total assets
w <sub>2</sub>	Interest expenses / Deposits and short-term funding
w <sub>3</sub>	Other operating expenses / Fixed assets
MS <sub>it</sub>	Loans of the $i$ -th bank / Volume of loans in a banking sector

For the research purposes the authors estimate Boone indicator, using both formulas: formula (2) and formula (3). However, the application of the formula (2) in its original form is impossible due to the negative net income generated by Kazakh banks in 2013-2017. The value of operating profit in many cases also was negative. To overcome this problem the value of bank profit is replaced by the volume of “Gross interest income”. Applying the formula (3) for calculations bank market share is expressed in terms of total issued loans to public. Boone indicator is estimated both for individual banks and for the banking sector as a whole. Sector-level estimation is performed using the data on all banks’ financial results in a particular year.

To test the second hypothesis and to determine the relationship between competition in the market and bank stability in the Kazakh banking sector, we will run a multiple regression analysis. The analyzed functional relationship takes the following form:

$$Z_i = f(Comp, Size_i, Profit_i, Productivity_i, Liquidity_i) \quad (6)$$

- where  $Z_i$  is a soundness measure calculated for an individual bank;
- $Comp$  is a measure of competition level in the banking market;
- $Size_i$  is a bank size expressed by the volume of loans;
- $Profit_i$  is a profitability of an individual bank;
- $Productivity_i$  is a productivity of an individual bank;
- $Liquidity_i$  is a liquidity measure of an individual bank.

In measuring bank soundness the authors follow the experience of other researchers and use Z-score or Risk index as a stability indicator [1], [3], [23],[25]. Risk index measuring the probability of insolvency is based on the likelihood of return to assets being negative and larger than the capital-asset ratio [37] It incorporates data on the bank’s expected profits, the likelihood that these profits will be realized, and a bank’s capital base [38] Z-score is calculated from the formula (7):

$$z_{it} = \frac{E(ROA_{it}) - CAP}{StDev(ROA)} \quad (7)$$

- where  $Z_i$  is a probability of insolvency of the i-th bank at time t;
- $E(ROA)$  is the expected value of return on assets (can be equated to the most recent value of ROA);
- $CAP$  is a capital-to-asset ratio (equity ratio);  $StDev(ROA)$  is a standard deviation of ROA ( $\sigma$ ).

The explanatory variables are expressed by the ratios summarized in the Table 2.

**Table 2.**

Proxies for explanatory variables	
Variable	Measure
$Comp$	Lerner index Boone indicator (formula 3)
$Size_i$	Natural logarithm of the volume of total bank assets (lnA)
$Profit_i$	Net interest margin (NIM)
$Productivity_i$	Cost-to-income ratio (C/I)
$Liquidity_i$	Loans-to-deposits ratio (L/D)

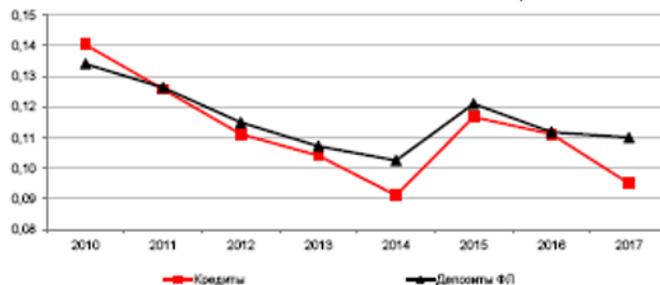
The regression analysis is performed, using data directly extracted from report of National Bank of Kazakhstan and local commercial banks or calculated for the year 2017. Thus, the database consists of seven indices: dependent variable is bank soundness proxied by Risk index (Z-score) and six independent variables (two proxies for competition in the sector and four bank-specific measures). Two regression models will be constructed: one containing Lerner index and another – with Boone indicator.

Testing of the first hypothesis (H1) about the consistency between different competition measures is based on an evaluation of correlation significance. Five measures are analyzed: B1 – Boone indicator from the formula (3), B2 – Boone indicator from the formula (2), L – Lerner index, CR5 – concentration ratio, HHI – Herfindahl-Hirschman Index. The most attention is paid to the link between Lerner index and Boone indicator.

Testing of the second hypothesis (H2) is based on the assessment of regression coefficients. Statistically significant positive or negative coefficients will point to the positive or negative effect of competition on bank soundness.

## Results

The Herfindahl-Hirschman Index (Figure 1) shows a similar picture, both in terms of concentration (middle to low) and its dynamics (decrease in concentration after 2008, interrupted by transactions between BTA Bank and KKB Bank).



**Fig 1.** The Herfindahl-Hirschman Index

Consolidation is usually achieved through mergers and acquisitions. Judging by the spread of concentration index in developed countries, there is an area for effective degree of consolidation. However, in order to ensure the priorities of financial stability and efficiency, each merger and acquisition transaction need to go through a thorough analysis of public costs and benefits, including the analysis of synergies, economies and diseconomies of scale at the corporate level. To achieve an effective balance of consolidation, it is necessary to exercise supervisory control over the consolidation process, including encouraging mergers that contribute to efficiency gains, as well as analyzing proposals for merger deals to identify mergers in which efficiency gains are insufficient to justify consolidation and other negative economies of scale effects, leading to the accumulation of fragility of the system. Applications for merger should be carefully checked for adequacy of regulatory and economic capital, adequacy of financial and regulatory reporting, and realism of the business model of the merged bank.

High market share could make banks more profitable and thus to increase their ability to rebuild capital. A competition that is too intense, and is steered in the wrong direction by poor corporate governance and misguided regulation, can weaken returns on equity, lower the value of franchise and increase the willingness to risk it all. Competition is also procyclical: in booms banks compete for borrowers, in busts – for funds. Competition rewards the riskiest bank as a lending leader in boom and as a price leader in the deposit

market in liquidity crunch. It promotes weaker lending standards, transmits the risks of the riskiest banks to the entire system, making them systemic.

Economy of scale allows large banks to use more advanced risk management systems and be more diversified. Fewer banks are easier to supervise well. But concentration also carries risks. Fewer banks are better at coordinating their positions and advancing against the best interest of the public. The public costs of resolving too big to fail banks are high precisely because the trade-off between bailing them out and liquidating shifts deeply in favor of a bail out. Accordingly, the resolve to bail in, let alone liquidate, is *ceteris paribus*, much weaker. Expectations of applying the "too big to fail" approach to the system bank create calmness of creditors, weaken the market discipline and increase the risks of insolvency.

Both concentration and competition can enhance and weaken the effectiveness and sustainability of individual institutions and the system. Only effective prudential regulation and independent and proactive supervision can make the trade-off between concentration and competition less moot, less unhealthy and antagonistic and more win-win.

The values of Lerner index and Boone indicator for the period of 2011-2017 estimated for Kazakh banking sector are presented in Table 3.

**Table 3**

Years	2011	2012	2013	2014	2015	2016	2017
BOONE1	0,026	0,077	- 0, 024	0,218	-0,178	0,188	0,061
BOONE1	0,003	0,037	-0,188	0,150	-0,102	0,128	0,048
LERNER	0,488	0,518	0,513	0,598	0,528	0,517	0,560

It is difficult to make any unambiguous conclusion about the consistency between the received results and findings of other researchers (see Table 3). The latest available data on competition in Kazakhstan is for 2010. In turn, mean values are estimated for much longer periods. Lerner index estimated for CIS countries by local researchers is much lower that the values of the present study.

The values of Boone indicator in most cases, excluded 2013 and 2015, are positive. This is, in turn, does not fit to the theory. However, positive values of Boone indicator are also possible, as described in other studies [1],[32]. According to Tabak *et al.* [28], there can be two explanations: "(i) the market has an extreme level of collusion or (ii) the banks are competing on quality."

The results of the correlation analysis that is aimed to test the first hypothesis are presented in the Table 4. Structural competition indices – CR5 and HHI – are extracted from the European Central Bank’s data warehouse for the period of 2007-2013 [40].

**Table 4.**

Results of the correlation analysis						
		B1	B2	L	CR5	HHI
B1	ρ	1	<b>0.988</b>	0.231	-0.202	-0.133
	Sig.		0.000	0.509	0.560	0.753
B2	ρ	<b>0.988</b>	1	0.318	-0.100	-0.030
	Sig.	0.000		0.481	0.822	0.934
L	ρ	0.234	0.418	1	0.718	0.688
	Sig.	0.709	0.484		0.069	0.094
CR5	ρ	-0.203	-0.100	0.826	1	<b>0.978</b>
	Sig.	0.668	0.883	0.076		0.000
HHI	ρ	-0.140	-0.034	0.777	<b>0.978</b>	1
	Sig.	0.773	0.958	0.092	.000	

The bolded values of the correlation coefficient point to the significant correlation with  $p\text{-value} \leq 0.01$ .

Two pairs of indices are highly correlated ones: (1) B1 and B2;

CR5 and HHI. Thus, there is no relationship between concentration and competition ratios estimated for the Kazakh banking sector. Besides, measuring competition level with two different indices (Lerner index and Boone indicator) it is difficult to find common interpretation of the received results.

The closer Lerner index is to 1, the closer is the market to a monopoly. Analyzing the values of Lerner index, it can be concluded that competition in the Kazakh banking sector is at “average level”. Low level of negative Boone indicator (in absolute terms) in 2013 and 2015 indicates the “low level” of competition. However, positive values in other years point to the necessity of in-deep performance investigation at the bank-level. It is worth analyzing the contribution of individual banks to get an insight into the studied issue.

At the current stage of the research the stated hypothesis about the consistency of different competition measures is rejected. In this regard, the unambiguous conclusion can be made about the invidiousness of measuring competition with concentration ratios. Performing the regression analysis with Z as a dependent variable, two regression models were created (Table5).

**Table 5. The results of the regression analysis: model summary**

Competition measure	R <sup>2</sup>	ADJ. R <sup>2</sup>	SIG.	DW
Boone indicator	0.688	0.602	0.000	1.720
Lerner index	0.688	0.602	0.000	1.720

R-squared in both cases is equal to 0.688, indicating that 69 per cent of the variation in the bank soundness is explained by these models. The models are statistically significant (Sig. = 0.000  $\leq$  0.01).

Both models involve only one explanatory variable – competition proxy. All bank-specific factors were excluded due to the low statistical significance (the results are identical in both cases):

Size: Sig. = 0.301 > 0.01

Profit: Sig. = 0.918 > 0.01

Productivity: Sig. = 0.788 > 0.01

Liquidity: Sig. = 0.714 > 0.01

In turn, for competition variable the regression coefficients are statistically significant and positive in both models (for Lerner: B = 0.146 (Sig. = 0.000), for Boone: B = 1.782 (Sig. = 0.000)).

Critical values for Durbin-Watson statistics are determined for  $p = 1$  (number of regressors) and the appropriate number of observations ( $n = 10$  banks for 2017). Durbin-Watson statistics indicates no autocorrelation in residuals (DW is greater than its upper critical value:  $DW = 1.720 > DU = 1.070$ ).

Despite the statistical significance of the models, the authors refrain from final comments on testing the stated hypothesis. Based on the model with Lerner index, the hypothesis is rejected (lower competition determines bank soundness). As for the model with Boone indicator, the question is about its value in each particular year – positive or negative.

## Conclusions

The overall goal of this study is to fill the information gap in the literature, considering the small number of papers on bank performance, efficiency and banking market structure, published by the local researchers.

Two research hypotheses are tested and the results are, as follows:

H1: There is a statistically significant relationship between different competition measures. – REJECTED

H2: Competition in the Kazakh banking sector has a positive impact on bank stability. – REJECTED

The relationship between competition level and stability in the banking sector should be a topic for further studies. The unambiguous conclusion should be made, based on the research results: it is not correct to use concentration ratios as proxies for competition. Concentration and competition should be analyzed as closely related, but nevertheless different concepts.

## References

1. K. Schaeck, M. Cihak, S. Wolfe, Are More Competitive Banking Systems More Stable?, IMF Working Paper, WP/06/143. IMF, (2006)
2. J. Boyd, G. De Nicolo, A. Jalal, Bank Risk-taking and Competition Revisited: New Theory and New Evidence, IMF Working Paper WP/06/297. IMF, (2006)
3. M. Amidu, S. Wolfe, "Does Bank Competition and Diversification Lead to Greater Stability? Evidence from Emerging Markets", Review of Development Finance, Vol. 3, pp. 152-166 (2012)
4. B. Akins, L. Li, J. Ng, T. O. Rusticus, "Bank Competition and Financial Stability: Evidence from the Financial Crisis", School of Accountancy Research Paper Series, Vol. 2, No 2, (2014)
5. The World Bank, Global Financial Development Report: Rethinking Role of the State in Finance. The World Bank, 2013. Available from: <http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTGLOBALFINREPORT/0,,contentMDK:23268795~pagePK:64168182~piPK:64168060~theSitePK:8816097,00.html> (2013)
6. OECD, Bank Competition and Financial Stability. OECD, Available from: <http://www.oecd.org/regreform/sectors/bankcompetitionandfinancialstability.htm>(2011)
7. A. Zhanbolatova, S. Ziyadin, K. Zhumanov, A. Jumabekova. "Relationship between bank competition and stability: the case of the UK". Journal "Banks and Bank Systems", Volume 13, Issue 1, pp. 98-114. (2018)
8. OECD, Competition, Concentration and Stability in the Banking Sector, DAF/COMP(2010)9. OECD, 2010
9. M. Bruhn, S. Farazi, M. Kanz, Bank competition, concentration, and credit reporting. World Bank Policy Research Working Paper 6442, (2013)
10. B. Casu, C. Girardone, "Bank Competition, Concentration and Efficiency in the Single European Market", The Manchester School, Vol. 74, No. 4, pp. 441-468 (2006)
11. M. Pawlowska, Competition, concentration and foreign capital in the Polish banking sector (prior and during the financial crisis). Warsaw: National Bank of Poland, (2012)
12. K. H. Park, "Testing for competition in the South Korean and Chinese commercial banking markets", Asia-Pacific Journal of Financial Studies, Vol. 42, No. 1, pp. 56-75 (2013)
13. J. A. Bikker, K. Haaf, "Competition, concentration and their relationship: An empirical analysis of the banking industry", Journal of Banking & Finance, Vol. 26, No. 11, pp. 2191-2214 (2002)
14. N. Mohammed, A. G. Ismail, J. Muhammad, "Evidence on Market Concentration in Malaysian Dual Banking System", Procedia-Social and Behavioral Sciences, Vol. 172, pp. 169-176 (2012)

15. O. F. Abbasoğlu, A. F. Aysan, A. Gunes, Concentration, Competition, Efficiency and Profitability of the Turkish Banking Sector in the Post-Crisis Period, MPRA Paper No. 5494. Istanbul: Boğaziçi University, (2007)
16. F. Leon, Measuring Competition in Banking: A Critical Review of Methods. Clermont-Ferrand: CERDI, (2014)
17. G. Iwata, „Measurement of Conjectural Variations in Ologopoly”, *Econometric*, Vol. 42, pp. 947-966 (1974)
18. T. F. Bresnahan, "Empirical studies of industries with market power", *Handbook of industrial organization*, Vol. 2, pp.: 1011-1057(1989)
19. J. C. Panzar, J. N. Rosse, „Testing for Monopoly Equilibrium”, *Journal of Industrial Economics*, Vol. 35, pp. 443-456 (1987)
20. A. P. Lerner, "The concept of monopoly and the measurement of monopoly power", *The Review of Economic Studies*, Vol. 1, No. 3, 1934, pp: 157-175 (1934)
21. J. Boone, "A New Way to Measure Competition", *The Economic Journal*, Vol. 118, No. 531, pp. 1245-1261(2008)
22. S. Carbo, D. Humphrey, J. Maudos, Ph. Molyneux, „Cross-Country Comparisons of Competition and Pricing in European Banking”, *Journal of International Money and Finance*, Vol. 28, pp. 115-134 (2009)
23. T. Beck, O. D. Jonghe, G. Schepens, „Bank Competition and Stability: Cross-Country Heterogeneity”, *Journal of Financial Intermediation*, Vol. 22, pp. 218-244 (2013)
24. L. Laeven, R. Levine, „Bank Governance, Regulation and Risk Taking”, *Journal of Financial Economics*, Vol. 93, pp. 259-275 (2009)
25. X. Fu, Y. Lin, Ph. Molyneux, „Bank Competition and Financial Stability in Asia Pacific”, *Journal of Banking & Finance*, Vol. 3, pp. 64-77 (2014)
26. A. Pruteanu-Podpiera, L. Weill, F. Schobert, Market Power and Efficiency in the Czech Banking Sector. WP CNB No. 6, (2007)
27. R. Griffith, J. Boone, R. Harrison, Measuring Competition. AIM Research WPS, August, (2005)
28. B. M. Tabak, D. M. Fazio, D. O. Cajueiro, The Relationship between Banking Market Competition and Risk-Taking: Do size and Capitalization Matter? WPS 261. Banco Central do Brazil, November (2011)  
Available from: <http://www.bcb.gov.br/pec/wps/ingl/wps261.pdf>
29. H. Koski, M. Pajarinen, Empirical Evaluation of the Effectiveness of Competition Policy. ETLA WP No. 15, 1 August (2013)
30. J. Amador, A. C. Soares, Measuring Competition in the Portuguese Economy Using Profit Elasticities. *Economic Bulletin*, autumn 2012, pp. 93-106. Banco de Portugal, (2012)
31. S. Clerides, M. D. Delis, S.Kokas, A New Data Set on Bank Competition. University of Cyprus Working Papers in Economics No. 08-2013, (2013)
32. European Central Bank, A New Approach to Measuring Competition in the Loan Markets of the Euro Area. WPS No. 768, June (2007)
33. Federal Reserve Bank of St. Louis. Lerner Index in Banking Market. Available from: [https://research.stlouisfed.org/fred2/series/DDOI04LVA0\\_66NWDB](https://research.stlouisfed.org/fred2/series/DDOI04LVA0_66NWDB)(2012)
34. Federal Reserve Bank of St. Louis. Boone Indicator in Banking Market. Available from: [https://research.stlouisfed.org/fred2/series/DDOI05LVA1\\_56NWDB](https://research.stlouisfed.org/fred2/series/DDOI05LVA1_56NWDB) (2012)
35. L. Weill, „Bank Competition in the EU: How Has It Evolved?” *Journal of International Financial Markets, Institutions and Money*, Vol. 26, October, pp. 100-112 (2013)  
K. Ahi, Banking Competition in Central and Eastern European Loan Markets: An Empirical Estimation Available from: <https://www.researchgate.net/publication/>
36. Insolvency Risk and the Market for Large Certificates of Deposit”, *Journal of Money, Credit and Banking*, Vol. 20, pp. 203-211 (1988)

37. P. Sinha, V.S. Taneja, V. Gothi, „Evaluation of Riskiness of Indian Banks and Probability of Book Value Insolvency”, *International Journal of Finance and Economics*, Issue 38, EuroJournals Publishing. (2010)
38. S. Rimavičiute, M. Vilys, „Assessment of Competition in the Banking Sector of Lithuania”, *Business in XXI Century*, Vol. 6, No. 1, pp. 56-63 (2014)
39. European Central Bank. *Structural Financial Indicators, 2007-2013*. Available from: [sdw.ecb.europa.eu](http://sdw.ecb.europa.eu) (2013)