

NBP Working Paper No. 272

The concentration and bank stability in Central and Eastern European countries

Renata Karkowska, Małgorzata Pawłowska



NBP Working Paper No. 272

The concentration and bank stability in Central and Eastern European countries

Renata Karkowska, Małgorzata Pawłowska

Renata Karkowska – Faculty of Management, University of Warsaw; rkarkowska@wz.uw.edu.pl
Małgorzata Pawłowska – Warsaw School of Economics; mpawlo1@sgh.waw.pl,
Narodowy Bank Polski; malgorzata.pawlowska@nbp.pl

This paper presents the personal opinions of the authors and does not necessarily reflect the official position of Narodowy Bank Polski.

Published by:
Narodowy Bank Polski
Education & Publishing Department
ul. Świętokrzyska 11/21
00-919 Warszawa, Poland
www.nbp.pl

ISSN 2084-624X

© Copyright Narodowy Bank Polski, 2017

Contents

Abstract	5
Introduction	6
1. Literature Review and Hypotheses	8
2. Research Design and Model Specification	11
3. Results	15
Conclusion	17
Statistical Appendix	18
References	25

List of tables and figures

Table 1. Summary Statistics	18
Table 2. Correlation Matrix	19
Table 3. Determinants of Banking Stability in Emerging Countries in Europe, in the period 1999-2015	20
Table 4. Mean of ZSCORE in Particular Countries, in the period 1999-2015	21
Figure 1. CR5 Ratios and Share of Foreign Banks in Central and Eastern European Countries in 2015	22
Figure 2. Total Assets of the Banking Sectors in Central and Eastern European Countries in 2015 (in billion euro)	22
Figure 3. Banking Sector's CR5 Indicators in Central and Eastern European Countries (%), 1999-2015	23
Figure 4. Banking Sector's HHI Indicators in Central and Eastern European Countries (%), 1999-2015	23
Figure 5. GDP growth (yoy) in Central and Eastern European Countries (%), 1999Q4-2015Q4	24
Figure 6. Size of the Central and Eastern European Countries Banking Sector in Relation to GDP in 2015	24

Abstract

The aim of this paper is to discuss changes in the banking sectors in Central and Eastern European countries, with particular emphasis on the change in market structure, the concentration and the share of foreign capital, in an attempt to determine the relationship between market structure and stability in the period 1999-2015. Using the methodology of panel regression, GMM estimator, we examine the implications of banks' concentration that manifest themselves as spreading and growing instability. The study contributes to the literature by focusing on a group of countries from Central and Eastern Europe, which are not explain in previous research and they are playing the role of a host country for banks from a number of countries in Europe. Finally, our results reveal that the persistence of risk is affected by the level of bank concentration and this effect is exacerbated during the downturn.

Keywords: banking, concentration, foreign ownership, stability, CEE countries.

JEL: F36; G2; G21; G34; L1.

Introduction

In this study, we investigate how the level of concentration affects stability in Central and Eastern European countries. The stability of the banking sector is a subject of great interest for bank supervision and academics, but it is also of the interest at a broader macroeconomic level. Banking sectors in Central and Eastern European countries are characterized by a high share of foreign banks and high concentration in terms of assets. This phenomenon may enhance the competitiveness of financial institutions, be an incentive to make more risky investment and make such institutions more fragile.

Since the late 1990s, Central and Eastern European countries have been playing the role of host countries for banks from a number of foreign countries. Parent financial institutions were located mostly in Western Europe (Austria, Belgium, Greece, Germany, France, Italy, the Netherlands, Portugal, and Spain) and in the United States. The inflow of foreign capital was connected with the privatization process of the banking sectors of Central and Eastern European countries and caused an increase in concentration. The current market structure of Central and Eastern European countries is a natural consequence of the earlier privatization of domestic banks, the attraction of strategic investors to those banks, and the M&As (mergers and acquisitions) processes between parent banks. An important feature of the banking sectors of Central and Eastern Europe (CEE) countries is that banks are relatively small in comparison to the rest of the EU and have relatively simple traditional business models.

This paper investigates how the level of concentration affects stability using a sample of 136 banks in 10 CEE countries (Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovenia, Slovakia), over the period 1999–2015. Having in mind the situation that the Central and Eastern European region includes countries with different development levels (transition countries which have already completed reform changes), we investigate how the stability of their banking sectors may be related to the level of concentration linked to the growth of international financial groups. In this paper, a dynamic panel regression model (the generalized method of moments (GMM)) was used. The GMM estimator was proposed by Arellano and Bond (1991) and generalized by Blundell and Bond (1998).

The major contribution of this study to the literature is to determine the relationship between the market structure and stability in the period 1999–2015 in 10 CEE countries. This research covers sixteen years: prior to the Global Financial Crisis, during the Global Financial Crisis and the period after the Global Financial Crisis. We shed light on the stability-

concentration nexus by estimating key variables: risk-taking, the degree of concentration and share of foreign capital.

This study consists of three parts and a summary. The first part is a broad literature review concerning the link between concentration and stability. The second part presents data and empirical models. The third part presents the results of the analysis based on the panel data. The summary provides an overview of the empirical results and the conclusions that we drew.

1. Literature Review and Hypotheses

The theoretical literature on the link between concentration and stability is indecisive, what would be the best of the prudent policies towards banks (Schaeck et al., 2006; Vives, 2010). It should be noted that there is no scientific consensus on whether bank concentration leads to greater or lesser stability in the banking sector (cf., Schaeck et al., 2006; Schaeck and Čihák, 2008; Vives, 2010). On the one hand, low concentration, which creates higher competition, may enhance financial stability by pushing unstable banks out of the market. On the other hand, competition can encourage banks to take greater risk in order to become more profitable (Bikker and Leuvenstein, 2014), and this excessive level of competition in the financial market caused the financial crisis. Also, an issue addressed in the literature is the relationship between the consolidation of the banking system and increasing concentration and competition. Although it seems that the general relationship here is obvious (i.e., a larger share in the market determines increased market power and decreased competition)¹, many empirical studies found that there is no clear relationship between an increase in the concentration of a system and the level of its competition (cf., Claessens and Laeven, 2003, Koutsomanoli-Fillipaki and Staikouras, 2006). On the one hand, Boot and Thakor (2000) emphasize that large banks tend to improve capital allocation and lead to fewer, but higher quality investments which enhance their soundness. On the other hand, Cetorelli and Peretto (2000) provide empirical evidence that that increased concentration in the banking sector gives banks the opportunity to screen the quality of borrowers. Keeley (1990) and Hellman et al. (2000) argue that banks with more market power generate higher profits and have more buffer to protect from bankruptcy.

Banking sectors in Central and Eastern European countries are characterized by a significant share of foreign capital and height level of concentration. Therefore, in these countries the high share of foreign capital and the concentration of the banking sector are highly correlated. The literature concerning foreign banks can be divided into two groups: concerning industrialized and emerging markets. Studies focusing on industrialized countries find that foreign owned banks perform significantly worse than domestic banks or not differently from domestic banks (see, among others, Claeys and Vander Vennet, 2008). When studying foreign banks in transition countries, foreign owners brought modern technology, market oriented decision making and competition (Haselmann et. al. 2016). Moreover, Vives (2010) demonstrated that low barriers to entry and openness to international capital in Central and

¹ This theory is based on traditional SCP model developed by Bain (1951) describing the relationship between the market structure, company conduct and performance. The SCP model assumed that in a more concentrated system leads to less competition and hence to higher profitability (see: Pawłowska 2016).

Eastern European countries are positively correlated with the level of stability. It should be noted that the impact of foreign bank is unambiguous. On the one hand, the pre-global financial crisis evidence suggests that foreign bank participation brought many benefits to developing countries including financial stability (Bonin, et al., 2005). On the other hand, the recent Global Financial Crisis highlights the role of multinational banks in the transmission of shocks across countries. In addition, foreign banks can be a channel through which shocks in one country are transmitted and affect the supply of credit in another country. Therefore, foreign banks can introduce financial instability (Claessens and Van Horen, 2013).

To sum up, there are two main hypotheses in the literature about the relationship between competition and stability in banking, which are seemingly contradictory: the competition-fragility and the competition-stability. The competition-fragility hypothesis argues that smaller banks in more competitive environments are more likely to take excessive risks and therefore competitive systems are more fragile than less competitive ones. In contrast, the competition-stability hypothesis suggests that monopoly rents (higher interest rates) in less competitive environments may encourage firms to take higher risks, which result in a higher probability of non-performing loan ratios (NPL), and therefore more competitive and less concentrated banking systems are considered to be more stable (Vives, 2016).

We divided the sample into two groups by bank's asset concentration, and examined the tree hypothesis based on the literature studies.

The question whether concentration structure influences the stability of firms is examined by a large literature and departures mixed results (Chen, Harford and Li, 2007; Greenaway, Guariglia and Yu, 2014). Bank concentration is important because it can influence bank managers' ability to diversify bank's risk. Ozili and Uadiale (2017) focus on bank concentration in Nigerian banking sector and find that banks in high concentrated sector have higher ROA ratio and net interest margin while banks with dispersed concentration have lower return on assets. Yeyati and Micco (2007) emphasized that from the 1990s, Latin American banking sectors experienced a growth of concentration and foreign penetration that prompted diverse implications for financial stability and the competitiveness of domestic banks. They find that increased concentration did not weaken banking competition, but foreign penetration led to lower competitiveness in banking sector in the region. But can we state the same about the relationship between concentration and stability in emerging Europe? Thus in our study we aim to check the hypothesis:

H1: The concentration and stability link is much stronger when concentration in the banking sector is lower.

Wu et al. (2017) investigate whether foreign bank presence affects the risk of domestic banks in emerging economies using annual data from 35 emerging economies located in Central and Eastern Europe, Latin America and Asia during the period of 2000–2014. They also adopt the Z-score indicator as the bank risk measure and the assets owned by foreign banks as a share of the banking sector total assets. They find evidence that the risk of domestic banks increases with the penetration of foreign banks in the host economy. It confirms there are both light and dark sides for the presence of foreign banks in developing economies. Haas and Horen (2012) documented that international banks that had to refinance long-term debt in an illiquid market and write down subprime assets, transmitted these shocks across borders by limiting lending in many countries in emerging Europe, that depend on cross-border credit from Western European banking groups. They focus on the 75 largest banks from high-income countries, which have a share of over 90 percent of the cross-border lending market in the pre-crisis period (July 2006–June 2007) and the crisis period (October 2008–September 2009). Our paper also contributes to a growing number of works on the impact of financial liberalization on the banking risk. A research of some positive and negative effects of financial openness, from the perspective of risk or efficiency (Cubillas and González, 2014; Luo et al., 2016). Considering this, we formulate the second hypothesis:

H2: The bank stability is determined by the share of foreign banks.

Anginer and Demircuc-Kunt (2014) find that greater competition (less concentration) encourages banks to take more diversified risks, making the banking system less fragile to shocks and making the banking system more stable, but they study international sample consists of 1872 banks in 63 countries from 1997 to 2009. These questions remain open. Also, Weis et al. (2014) analyze the systemic risk effects of bank mergers and found that bank mergers and greater concentration cause an increase in overall systemic risk from 1991 and 2009. Similar results found Uhde and Heimeshoff (2009) for banks across the EU-25 over the period from 1997 to 2005. Whether the relationship is similar after the crisis? How does it look in developing countries in Europe the crisis? According to macroprudential literature, reduced risk-taking should limit the procyclical behavior of banks. This argument leads us to prediction that:

H3: The bank concentration and stability relation is negative during economic slowdown.

2. Research Design and Model Specification

The aim of this paper is to find the relationship between market structure and stability in Central and Eastern European countries. We start our research in 1999 because, since 1 January 1999, the third stage of European Monetary Union (EMU) began and the international banks became involved in mergers and acquisitions of a cross-border character. M&As have been often initiated by foreign owners that merge in-a-country banking businesses in the aftermath of mergers of their parent companies abroad. Furthermore, in this period was also observed the increase in the share of foreign capital in banking sectors in Central and Eastern European countries.

As individual bank stability measure we use Z-score formula, proposed by Fu et al. 2014, pp. 64–77; Tabak et al. 2013, pp. 3855–3866):

$$ZSCORE_{n,i,t} = \frac{\left(\frac{E_{n,i,t}}{TA_{n,i,t}} + ROA_{n,i,t}\right)}{\sigma(ROA_{n,i,t})}. \quad \text{Eq. 1}$$

where:

- $ZSCORE_{n,i,t}$ - Z-score for individual n bank, in country i , in year t ;
- $E_{n,i,t}$ - equity in n bank, in country i , in year t ;
- $TA_{n,i,t}$ - assets of bank n , in country i , in year t ;
- $\frac{E_{n,i,t}}{TA_{n,i,t}}$ - capital ratio of bank n , in country i , in year t ;
- $ROA_{n,i,t}$ -profitability to assets ratio of bank n , in country i , in year t ;
- $\sigma(ROA_{n,i,t})$ – standard deviation of ROA of bank n , in country i , in the period 1999-2015.

The Z-Score is interpreted as a measure of bank instability (the number of standard deviations of a bank's profitability, which will cause a complete absorption of the bank's equity and lead to bankruptcy). Z-score ratio allows us to have a time-varying measure of bank instability, which overcomes endogeneity problems. The index estimates the volatility of bank results on the assumption that bankruptcies are the result of bank losses not covered by capital (Bessis, 2002). In the literature there are various approaches to calculations of Z-score measures. The comprehensive review of the Z-score measures was collected and presented by Lepetit and Stroebel (2013). For example Boyd et al. (2006) calculated moving mean for capital ratio and ROA and standard deviation of ROA with 3-periods window for each time. On the other hand Yeyati and Micco (2007) used moving mean and standard deviation of ROA with

3-periods window and combine these with current time capital ratio. There is no proven method, however, our experience in measuring Z-score led us to choose the method, where results are the most stable (standard deviation of the ROA are calculated over the full sample and combines these with current values of the CAR ratio). We use the Z-score as bank instability measure, because of its simplicity in combining bank risk, financial performance and capitalization, which is the basis for a well-functioning institution.

The general model estimating the stability and concentration nexus is:

$$ZSCORE_{n,i,t} = \beta_1 ZSCORE_{n,i,t-q} + \beta_2 CR5_{i,t} + \beta_3 CR5xPROCYCL_{i,t} + \beta_4 PROCYCL_{i,t} + \beta_5 FOREIGNBANK_{i,t} + \beta_6 SIZE_{i,t} + \beta_7 GDP_GROWTH_{i,t} + \varepsilon_{i,t}. \quad Eq. 2$$

where $ZSCORE_{n,i,t}$ denotes the *Z-score* for individual n bank, in country i , in year t .

The independent variables in the baseline model are as follows:

- $CR5_{i,t}$ - bank asset concentration in country i in year t determined by the concentration ratio: the share of the five largest banks' total assets CR5; also for robustness check, by the Herfindahl-Hirschman index for assets (the sum of the squares of the market share of individual banks $HHI_{i,t}$) for each country i for each year t^2 ;
- $PROCYCL_{i,t}$ – country crisis yearly dummy (1= economic downturns, 0= economic growth); we defined economic downturn periods ($PROCYCL$ equals 1) when the GDP growth in the country was characterized by a slowdown based on ECB Statistical Data. In opposite we marked $PROCYCL$ equals 0.
- $CR5xPROCYCL_{i,t}$ - the impact of concentration on bank's stability during economic downturns are determined by taking the concentration ratio multiplied by country crisis dummy. The coefficient on the interaction between CR5 and crisis indicates the presence of concentration crunch effect; a positive coefficient indicates that bank's stability may be constrained by concentration during crisis period, a negative coefficient would imply that banking concentration may be exert significant impact on stability during downturns;

² Concentration ratios: the k bank concentration ratios (CRk) and Herfindahl-Hirschman indices (HHI) are often used in structural models explaining competitive performance in the banking industry as the result of market structure (Bikker 2004, pp. 63–64).

- $SIZE_{n,i,t}$ – determined by logarithm of total banks assets, for individual n bank, in country i , in year t .
- $FOREIGNBANK_{i,t}$ – determined by foreign ownership for country i in year t , foreign ownership is defined as the percentage of foreign bank assets among total bank assets (*foreign presence in terms of assets*). A foreign bank is a bank where 50 percent or more of its shares are owned by foreigners, (Claessens, S. Van Horen, 2014).
- $GDP_GROWTH_{i,t}$ – determined by the real annual rate of GDP growth in country i , in year t .

Finally, we included the random effect - $\varepsilon_{i,t}$.

Through a dataset that covers 136 European banks spanning the period 1999–2015 and the methodology of panel regression, the empirical findings document the determinants of banking risk-taking. The full range of banks come from 10 CEE countries (Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovenia, and Slovakia). We try to identify the sensitivity of stability risk indicator to a number of market structure variables.

We have compiled an unbalanced annual dataset encompassing bank-level, market structure and macroeconomic variables. We compute the measure of bank's stability using the Bankscope database, which reports bank balance sheet data. We use unconsolidated statements since they are preferred to avoid differences in balance sheets of headquarters and subsidiaries. Macroeconomic variables are obtained from the database: OECD Statistics, ECB (Statistical Data Warehouse) and the World Bank. We relate the data to descriptive statistics of the selected variables (Table 1 in the Statistical Appendix) and mean of Z-score for particular countries (Table 4).

A recent stream of studies estimate the effects of competition and market power on stability in mature economy, but our survey provided new evidence on the relationship between competitiveness and stability in the less recognized markets, that may be an indication of other emerging countries. In our research we are based on traditional SCP model assumed that in a more concentrated system leads to less competition (Pawłowska, 2016).

In our estimations we used dynamic panel data analysis and the generalized method of moments (GMM) proposed by Arellano and Bond (1991). This paper used a system GMM which was fully developed in Blundell and Bond (1998). Being GMM estimators, the Arellano-Bond estimators include one- and two-step variants (Arellano and Bond, 1991; Blundell and

Bond, 1998). However, using the two-step GMM estimator may impose a downward (or upward) bias in standard errors (t -statistics) due to its dependence on the estimated residuals. This may lead to unreliable, asymptotic statistical inference (Bond, 2002; Bond and Windmeijer, 2002; Windmeijer, 2005), especially in data samples with a relatively small cross-section dimension (Arellano and Bond, 1991; Blundell and Bond, 1998). However, system GMM procedure allows for a finite-sample correction to the two-step covariance matrix derived by Windmeijer (2005). Taking into account the above factors, this paper used a *two-step robust* estimator for the baseline model. Furthermore, we used several tests proposed by Arellano and Bond (1991) and Arellano and Bover (1995). The first is the Hansen test of over-identifying restrictions, which tests the overall strength of the instruments for a two-step estimator (Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998). We then used the Arellano-Bond tests for AR(1) and AR(2) in first differences.

3. Results

In order to carry out a quantitative assessment of relationship between market structure and stability in Central and Eastern European countries we provided panel data estimations. This research cover sixteen years: prior to the Global Financial Crisis, during the Global Financial Crisis and after the crisis. ZSCORE ratio is used as dependent variable to proxy for bank stability. CR5 is used as bank concentration, and percentage of the total banking assets that are held by foreign banks as foreign ownership.

Table 2 of the statistical Appendix presents correlation coefficients between key selected variables. The correlation coefficients are estimated for a sample of 136 banks across 10 countries from Central and Eastern Europe across the period 1999–2015. ZSCORE is negatively correlated with bank concentration and foreign ownership.

Table 3 presents the results of three regressions using a two-step robust GMM estimator. For each of the estimations, we also reported the Hansen test results at the bottom of the table as well as the Arellano-Bond tests (AR(1) and AR(2)). The model seemed to fit the panel data reasonably well, as the Hansen-test showed no evidence of over-identifying restrictions.

Banking sectors in Central and Eastern European countries characterized with high share of foreign banks and high concentration in terms of assets (see Figure 1 in Statistical Appendix). However, the banking sectors within Central and Eastern European countries are not homogeneous (Efthyvoulou, G., Yildirim C., 2013). Therefore, we split our sample into three groups and estimated three models: (1) Model 1 the full sample, (2) Model 2 with $CR5 > 58$, and (3) Model 3 with $CR5 \leq 58$ ³. The consolidation in the Central and Eastern European countries banking sectors led to changes in concentration measured with CR5 ratios. The increase in concentration ratios was enhanced by mergers and acquisitions conducted by large banks. However, between 1999 and 2015 concentration measures were quite stable (see Figures 3 and 4 in Statistical Appendix).

In case to investigate the relationship between bank stability (measured via the Z-score) and bank concentration (measured via CR5 ratio), we first employ GMM model for full sample of data (Model 1). In Table 3 of the Appendix a negative and significant coefficient (β_2) was found for bank asset concentration in all models. It means that concentration—measured in terms of the share of the five largest banks' total assets (CR5)—had a negative and significant influence on the stability in 10 CEE countries. The negative relationship between concentration

³ Due to that there are some countries with lower and some with higher levels of concentration in CEE-10 (58% means the average concentration for all EU-27 countries in the period 1999-2015).

and bank stability remains the same even when we conduct a robustness check using HHI index as an alternative proxy for bank concentration. This results may confirm that concentration is important for financial stability. A high concentration may be a source of systemic risk in CEE countries. This is a problem in particular that among these 5 largest banks in the country very often are banks with a significant share of foreign capital. The experience of the recent financial crisis shows that its source was in the developed world and spread to developing countries.

In the next step we measured, whether the stability-concentration link is similar in downturn (PROCYCL*CR5) and upturn (GDP_GROWTH) periods in economy. The interaction is negative during economic decline and positive during economic growth, but not statistically significant. In analysis, we also added foreign ownership, as percentage of the total banking assets that are held by foreign banks (FOREIGNBANK) and the results show an insignificant influence on bank stability. Finally, the bank size — measured in terms of the individual institution's the log of total assets of (SIZE) — influenced positively and significantly on its stability. This results may confirm the size of individual banks is important for financial stability.

In the next two steps we estimated two samples, where $CR5 > 58\%$ (Model 2) and $CR5 < 58\%$ (Model 3). In all the regressions, we find that bank concentration is negatively related to bank stability, meaning that: when concentration is low (Model 3), instability is stronger (-0.52), and on the other hand, when concentration is high (Model 2), instability is lower (-0.15).

The above results gave a positive verification of hypothesizes: *H1* and *H3*. Also, Weis et al. (2014) tested the impact of concentration on stability and found that bank mergers and greater concentration cause an increase in overall systemic risk. Similar results found Uhde and Heimeshoff (2009) for banks across the EU-25 over the period from 1997 to 2005. However, this study also concerning the periods of crisis and after crisis what constitutes a contribution to the literature.

Conclusions

This paper contributes to the literature by analyzing how concentration and foreign ownership in the banking sectors in developing and emerging economies in Europe (CEE) affected bank stability in the period 1999–2015. It should be noted that the banking sectors in Central and Eastern European countries are characterized by a high share of foreign banks and high concentration. However, these measures are also differentiated, e.g. the Polish banking sector is characterized by a relatively low level of concentration and a low level of foreign capital, while in Estonia and Lithuania both ratios are very high.

An important issue for our analysis is that the economic crisis affected the relationship between stability and concentration in commercial banks in Central and Eastern Europe. We investigate the assumption that concentration will have a stronger impact on bank stability in more a homogeneous banking system where the herding behavior is stronger. Even when financial reforms and supervisory power are increased, the results suggest that concentration remains negatively associated with bank stability. The results are also compatible with the concentration-stability link in the theoretical literature and confirmed the results reported by Weis et al. (2014) and Uhde and Heimeshoff (2009), confirming that consolidation in banking (greater concentration) may lead to a considerable destabilization of the financial system.

This paper provides valuable insights for banking supervisors about the role of market structure in stability risk. Creating the policy of international openness, decision makers should take into account the possible negative influence of high concentration on the stability of the banking sector in the host economies. Also, supervisors should consider encouraging the activity and efficiency of domestic banks. Finally, regulatory authorities need be aware that the concentration and stability link is much stronger when concentration in the banking sector is lower.

Statistical Appendix

Table 1 Summary Statistics

	ZSCORE	CR5	CR5* PROCYCL	HHI	HHI* PROCYCL	FOREIGN BANK	SIZE	GDP_ GROW TH
mean	13.47	62.13	11.99	0.09	0.02	63.43	14.39	3.55
standard dev.	30.32	11.52	28.62	0.04	0.04	17.90	1.72	4.42
max	76.35	100.00	100.00	0.27	0.21	88.00	17.78	13.08
min	-13.82	43.81	0.00	0.00	0.00	0.00	4.06	-13.86
N	1440							

Source: Author's own study.

Note 1: The sample includes observations from 10 Central and Eastern European countries, spanning the period 1999–2015.

Note 2: *ZSCORE* (Eq. 1) – individual bank stability measure, *CR5* - bank asset concentration in country level, *PROCYCL* – country crisis dummy (1= economic downturns, 0= economic growth, *CR5*PROCYCL* - are determined by taking the concentration ratio and country crisis dummy, *HHI* – the Herfindahl-Hirschman index for assets for each country, *HHI*PROCYCL* - are determined by taking the *HHI* index and country crisis dummy, *SIZE* – logarithm of total banks assets, *FOREIGNBANK*– foreign ownership, as percentage of the total banking assets that are held by foreign banks, *GDP_growth* – annual rate of real GDP growth (%).

Table 2 Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ZSCORE (1)	1.00								
CR5 (2)	-0.07** (0.01)	1.00							
CR5*PROCYCL (3)	0.01 (0.70)	0.23*** (0.00)	1.00						
PROCYCL (4)	-0.01 (0.65)	0.17*** (0.00)	0.98*** (0.00)	1.00					
HHI (5)	-0.09*** (0.00)	0.73*** (0.00)	0.01 (0.65)	-0.00 (0.87)	1.00				
HHI*PROCYCL (6)	0.02 (0.49)	0.17 (0.35)	0.87*** (0.00)	0.89*** (0.00)	0.17*** (0.00)	1.00			
FOREIGNBANK (7)	-0.09*** (0.00)	0.16*** (0.00)	0.08*** (0.00)	-0.04* (0.05)	0.061*** (0.00)	-0.07** (0.00)	1.00		
SIZE (8)	0.06* (0.02)	-0.10*** (0.00)	0.03 (0.18)	0.01 (0.54)	-0.07** (0.01)	0.02 (0.40)	0.30*** (0.00)	1.00	
GDP_growth (9)	-0.02 (0.44)	0.01 (0.67)	-0.71*** (0.00)	0.71*** (0.00)	0.08*** (0.00)	-0.66*** (0.00)	-0.11*** (0.00)	-0.16*** (0.00)	1.00

Note: p-values in parentheses. ZSCORE is a measure of bank's instability risk. CR5 represents bank asset concentration in the country. Country crisis dummy is proxied by PROCYCL variable, HHI – the Herfindahl-Hirschman index for assets for each country, HHI*PROCYCL - are determined by taking the HHI ratio and country crisis dummy, SIZE (log) accounts for total banks assets. FOREIGNBANK is the foreign ownership, as percentage of the total banking assets that are held by foreign banks. The GDP_growth is the rate of GDP growth.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 3 Determinants of Banking Stability in Emerging Countries in Europe, in the period 1999-2015

	Model 1 (full sample) b/se	Model 2 (CR5 >58%) b/se	Model 3 (CR5 ≤58%) b/se
ZSCORE(-1)	0.034* (0.12)	-0.912*** (0.15)	-0.108* (0.29)
ZSCORE(-2)	-0.252** (0.37)	-0.635** (0.19)	-0.186* (0.28)
CR5	-0.242* (0.14)	-0.159*** (0.06)	-0.522** (0.17)
CR5*PROCYCL	-0.231 (0.21)	-0.074 (0.07)	-0.052 (0.36)
PROCYCL	-6.723 (11.46)	1.260 (5.71)	1.078 (29.65)
FOREIGNBANK	-0.082 (0.14)	-0.157 (0.10)	0.448 (0.29)
SIZE	3.639* (2.94)	1.449* (0.96)	2.410* (2.01)
GDP_GROWTH	0.256 (0.98)	0.002 (0.45)	0.562 (1.34)
No observations	616	311	305
AR1	-1.3	1.4	-0.9
p value	0.2	0.2	0.3
AR2	0.6	-0.9	0.1
p value	0.6	0.4	0.9
Hansen test	11.3	11.6	7.9
p value	1.0	1.0	1.0

Source: Authors own study.

Note 1: The sample of all banks from 10 European countries (Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovenia, Slovakia). Data range 1999-2015.

Note 2: The model is given by Eq. (2). The symbols have the following meaning: ZSCORE (Eq. 1) – individual bank stability measure, $CR5_{i,t}$ - bank asset concentration in country I in year t, PROCYCL – country crisis dummy (1= economic downturns, 0= economic growth, $CR5*PROCYCL_{i,t}$ - are determined by taking the concentration ratio and country crisis dummy, $SIZE_{n,i,t}$ – logarithm of total banks assets, $FOREIGNBANK_{i,t}$ – foreign ownership, as percentage of the total banking assets that are held by foreign banks, $GDP_{i,t}$ – annual rate of real GDP growth (%). The models have been estimated using the GMM estimator with robust standard errors. Standard Error (se) are given in parentheses. The p-value denotes significance levels at * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, respectively.

Table 4 Mean of ZSCORE in Particular Countries, in the period 1999-2015

	Bulgaria	the Czech Republic	Estonia	Hungary	Lithuania
1999	19.00	22.27	8.87	5.98	7.21
2000	19.80	17.25	7.65	7.72	6.21
2001	15.47	17.49	7.59	8.87	5.76
2002	15.74	14.63	7.48	9.25	6.06
2003	16.67	12.77	7.10	8.69	11.06
2004	14.97	22.89	6.96	9.22	8.60
2005	13.07	21.05	6.36	9.15	10.51
2006	12.96	21.06	7.43	8.51	9.49
2007	12.63	18.96	6.55	8.28	9.01
2008	12.40	20.46	6.52	7.00	8.60
2009	12.98	23.64	4.49	8.36	10.08
2010	13.27	23.62	6.80	8.59	8.92
2011	13.27	23.32	8.13	7.35	8.32
2012	13.89	25.37	13.58	70.50	10.09
2013	34.05	23.30	13.30	71.73	10.06
2014	44.07	36.53	12.78	107.44	8.35
2015	14.12	36.74	7.97	7.03	8.56
Total	18.75	23.16	8.71	24.76	9.04

Table 4 (cont'd)

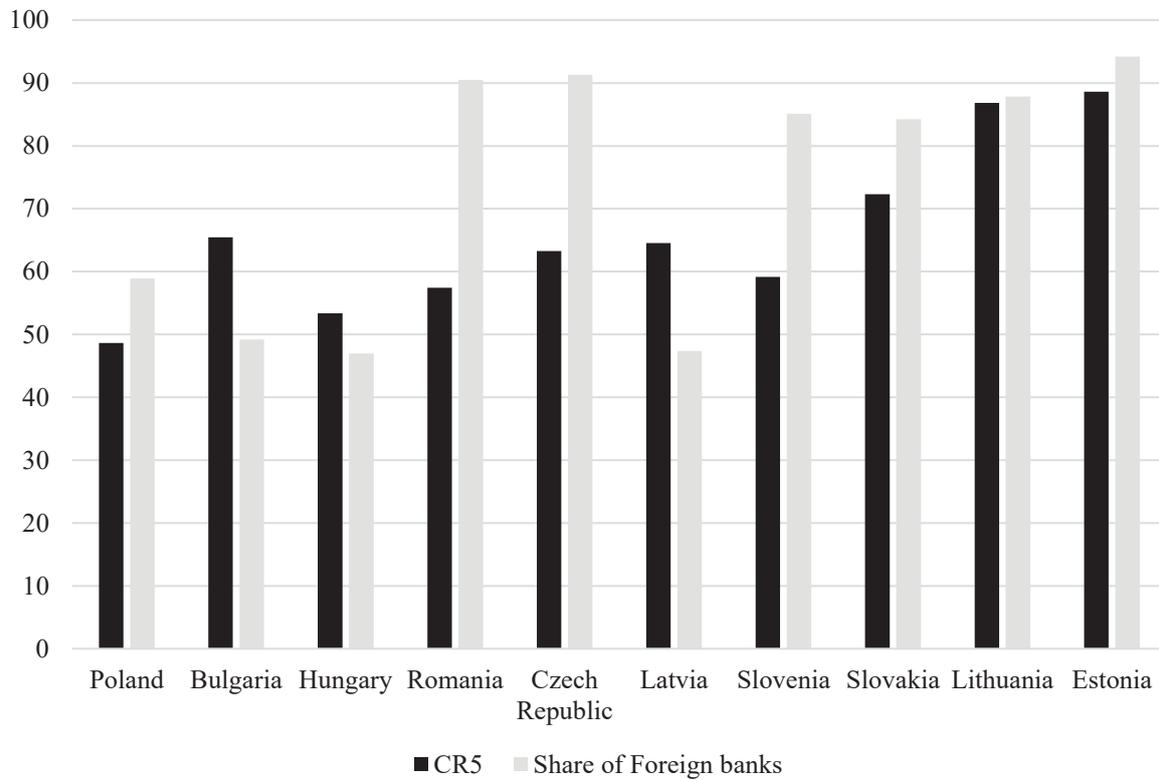
	Latvia	Poland	Romania	Slovakia	Slovenia
1999	11.30	7.12	9.53	7.71	5.69
2000	10.28	11.09	11.95	7.85	11.40
2001	8.93	10.47	9.94	7.77	13.33
2002	8.05	13.71	12.83	7.97	13.50
2003	7.48	11.16	7.36	7.52	13.38
2004	7.16	26.98	7.22	7.04	11.60
2005	6.73	25.23	6.31	5.81	10.81
2006	6.35	26.17	4.89	6.06	10.28
2007	6.05	24.96	4.90	5.54	9.98
2008	5.74	20.07	5.73	5.40	7.79
2009	2.92	19.54	5.64	5.45	10.33
2010	4.69	21.18	6.04	5.52	11.81
2011	6.42	23.98	6.56	5.14	12.61
2012	6.97	25.49	5.71	4.69	12.68
2013	6.46	24.64	7.14	2.81	12.96
2014	5.80	25.38	5.75	10.37	13.11
2015	7.70	28.92	11.82	11.90	12.17
Total	6.79	23.60	7.09	6.55	11.56

Source: Authors own study.

Note 1: The sample of all banks from 10 European countries (Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovenia, Slovakia). Data ranged 1999-2015.

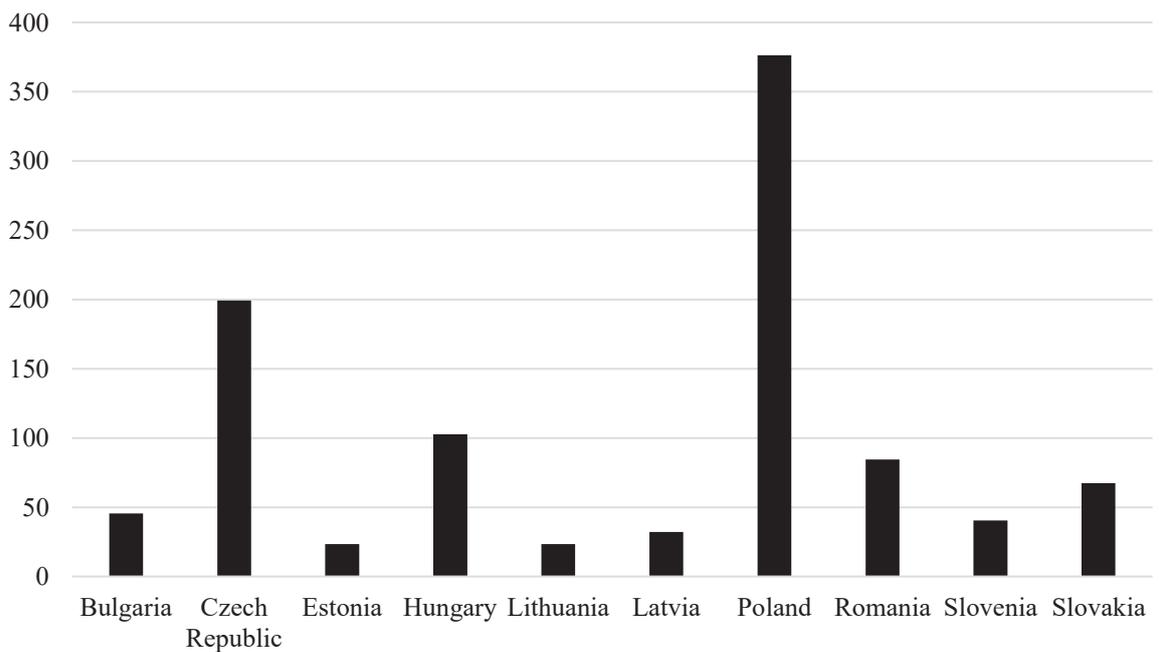
Note 2: ZSCORE (Eq. 1) – mean of individual bank stability measure.

Figure 1. CR5 Ratios and Share of Foreign Banks in Central and Eastern European Countries in 2015 (%)



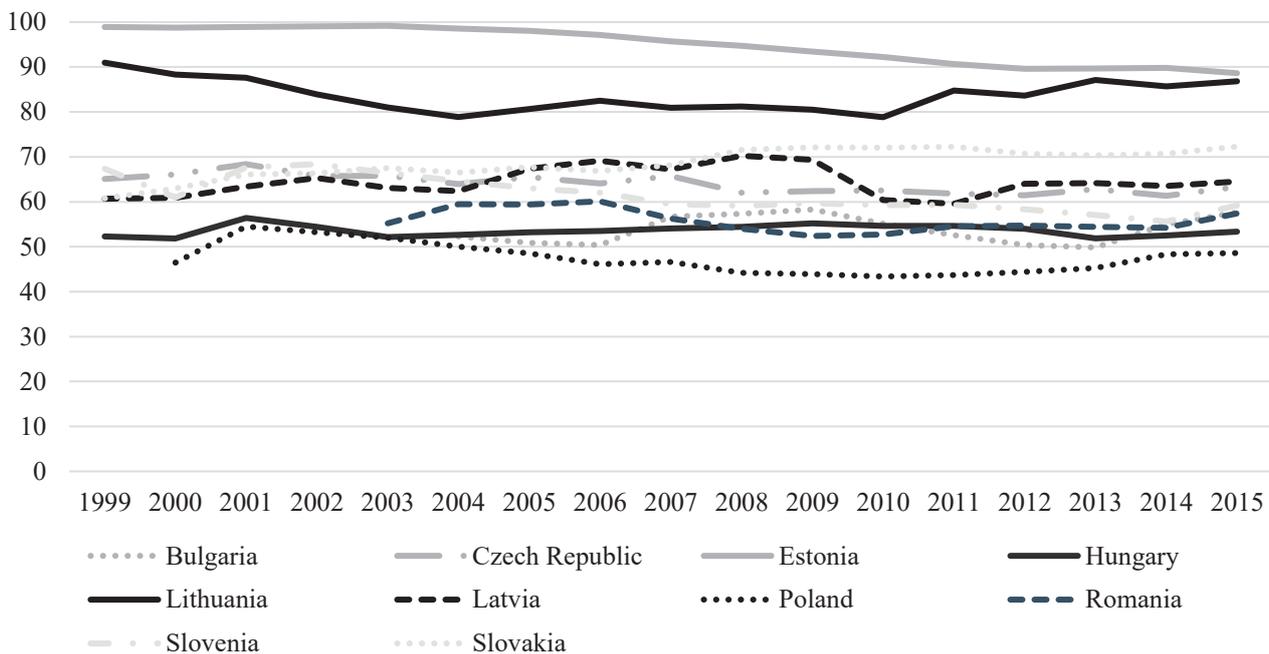
Source: Authors own calculation based on ECB Statistical Data.

Figure 2. Total Assets of the Banking Sectors in Central and Eastern European Countries in 2015 (in billion euro)



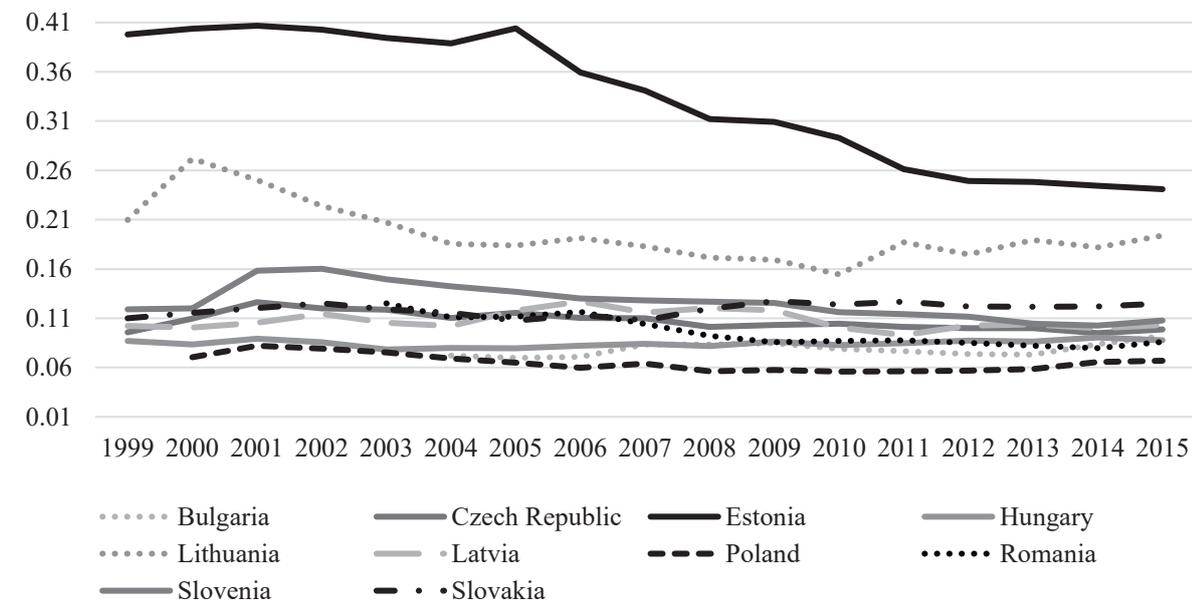
Source: ECB Statistical Data.

Figure 3. Banking Sector’s CR5 Indicators in Central and Eastern European Countries (%), in the period 1999-2015



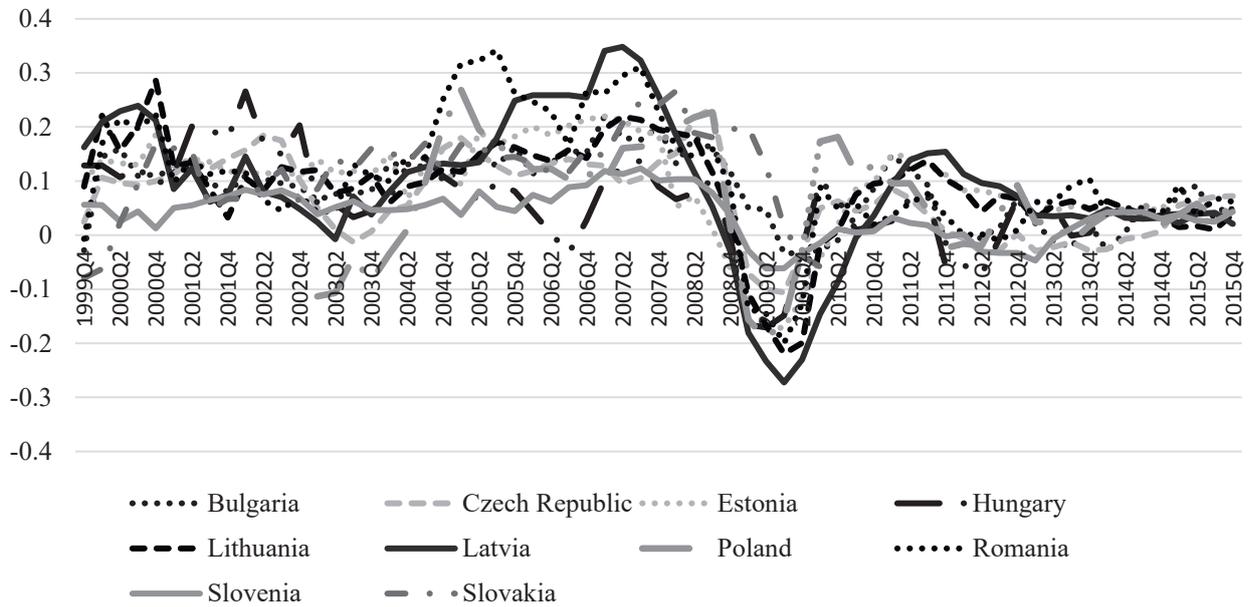
Source: ECB Statistical Data.

Figure 4. Banking Sector’s HHI Indicators in Central and Eastern European Countries (%), in the period 1999-2015



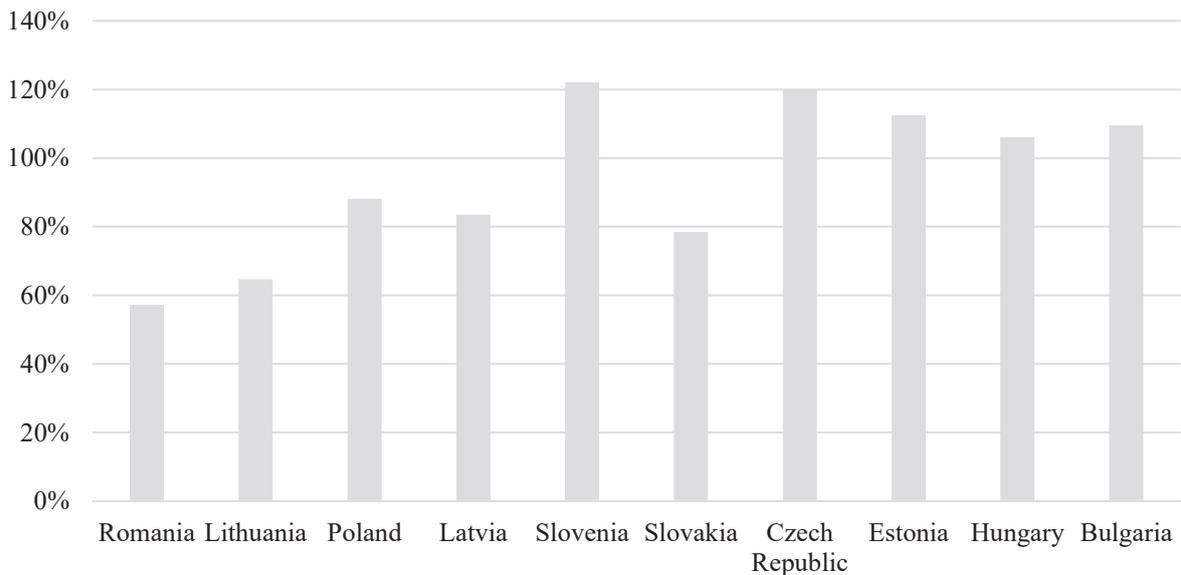
Source: ECB Statistical Data.

Figure 5. GDP growth (yoy) in Central and Eastern European Countries (%), 1999Q4-2015Q4



Source: Authors own calculation based on ECB Statistical Data.

Figure 6. Size of the Central and Eastern European Countries Banking Sector in Relation to GDP in 2015 (%)



Source: Authors own calculation based on ECB Statistical Data and Eurostat.

References

- Anginer D., Demirguc-Kunt A., Zhu M., (2014). How does competition affect bank systemic risk? *Journal of Financial Intermediation* 23, 1–26.
- Arellano, M., Bond, S. R. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies*, 58, 277–297.
- Bain J.P. (1951). Relation of profit rate to industry concentration: American manufacturing 1936-40, *Quarterly Journal of Economics* 65, 293-324.
- Bessis J. (2002). *Risk Management in Banking*, Wiley, Chichester.
- Bikker J.A., (2004). *Competition and Efficiency in a Unified European Banking Market*, Edward Elgar, Cheltenham.
- Bikker J.A., Leuvensteijn M. (2014). *A new measure of competition in the financial industry*, Routledge.
- Blundell, R., Bond, S. (1998). Initial conditions and moment conditions in dynamic panel data models. *Journal of Econometrics*, 87, 115–143.
- Bond, S. (2002). Dynamic panel data models: A guide to micro data methods and practice. *Portuguese Economic Review*, 1, 141–162.
- Bond, S., Windmeijer, F. (2002). Finite sample inference for GMM estimators in linear panel data models: A comparison of alternative tests. London: Mimeo, *Institute for fiscal studies*.
- Bonin, J. P., Hasan, I., and Wachtel, P. (2005). Privatization matters: Bank efficiency in transition countries. *Journal of Banking and Finance*, 29(8-9), 2155–2178.
- Boot, A., Thakor, A., (2000). Can relationship lending survive competition? *Journal of Finance* 55, 679–713.
- Boyd, J., De Nicolo, G., Jalal, A., (2006). Bank risk-taking and competition revisited: new theory and new evidence. *IMF Working Paper* 06/297. International Monetary Fund, Washington, DC.
- Cetorelli, N., Peretto, P.F., (2000). Oligopolopoly Banking and Capital Accumulation. Federal Reserve Bank of Chicago, Working paper, No. 2000-2.

-
- Chen X., Harford J., Li K. (2007). Monitoring: Which institutions matter? *Journal of Financial Economics*, 86(2), 279–305.
- Claessens, S. Laeven L. (2003). What Drives Bank Competition? Some International Evidence, *Journal of Money, Credit and Banking*, Vol. 36, No. 3, Part 2: Bank Concentration and Competition: An Evolution in the Making A Conference Sponsored by the Federal Reserve Bank of Cleveland May 21-23, 2003. (Jun., 2004), 563-583.
- Claessens, S., N. Van Horen, (2013). Impact of Foreign Banks, *The Journal of Financial Perspectives*, Volume 1 – Issue 1.
- Claeys, S., Vander Venet, R. (2008). Determinants of bank interest margins in Central and Eastern Europe: A comparison with the West. *Economic Systems*, 32(2), 197–216.
- Cubillas, E., González, F., (2014). Financial liberalization and bank risk-taking: international evidence. *Journal of Financial Stability* 11, 32–48.
- De Haas, R., Van Horen, N., (2012). International shock transmission after the Lehman Brothers collapse: evidence from syndicated lending, *American Economic Review: Papers & Proceedings* 2012, 102(3), 231–237.
- Efthyvoulou, G., Yildirim C. (2013). Market Power in CEE Banking Sectors and the Impact of the Global Financial Crises, *Case Network Studies & Analysis*, No 452.
- Fu, Xiaoqing & Lin, Yongjia & Molyneux, Philip. (2014). Bank competition and financial stability in Asia Pacific. *Journal of Banking & Finance*. 38, 64–77. 10.1016/j.jbankfin.2013.09.012, 64–77.
- Greenaway D., Guariglia A., & Yu Z. (2014). The more the better? Foreign ownership and corporate performance in China. *The European Journal of Finance*, 20(7–9), 681–702.
- Haselmann R., Wachtel P., Sabott J. (2016). *Credit Institutions, Ownership and Bank Lending, in Transition Countries*, The Palgrave Handbook of European Banking.
- Hellman, T.F., Murdoch, K.C., Stiglitz, J.E., (2000). Liberalization, moral hazard in banking and prudential regulation: are capital requirement enough? *American Economic Review* 90, 147–165.

- Keeley, M.C., (1990). Deposit insurance, risk and market power in banking. *American Economic Review*, 80, 1183–1200.
- Koutsomanoli-Fillipaki N., Staikouras K.Ch. (2006). Competition and concentration in the New European banking Landscape, *European Financial Management Association*, 12 (3), 443-482.
- Lepetit L., Frank Strobel F., (2013). Bank insolvency risk and time-varying Z-score measures, *Journal of International Financial Markets, Institutions & Money* 25 (2013) 73– 87.
- Luo, Y., Tanna, S., De Vita, G., (2016). Financial openness: risk and bank efficiency: cross-country evidence. *Journal of Financial Stability* 24, 132–148.
- Ozili P. K., Uadiale O., (2017). Ownership concentration and bank profitability, *Future Business Journal* 3, 159–171.
- Pawłowska M. (2016). Market Structure, Business Cycle and Bank Profitability: Evidence on Polish banks, *Bank i Kredyt* 4, Narodowy Bank Polski, 341-364.
- Schaeck K., Čihák M., Wolfe S. (2006). Are More Competitive Banking Systems More Stable, IMF Working Paper, WP/06/143, Washington, D.C.
- Schaeck K., Čihák, M. (2008). How Does Competition Affect Efficiency and Soundness in Banking? *ECB Working Paper*, No. 932.
- Tabak B. M., Fazio D. Cajueiro D. O., (2013). Systemically important banks and financial stability: The case of Latin America ? *Journal of Banking and Finance* 37.
- Uhde, A., Heimeshoff, U., (2009). Consolidation in banking and financial stability in Europe: further evidence. *Journal of Banking and Finance* 33, 1299-1311.
- Vives X., (2016). *Competition and Stability in Banking, the Role of Regulation and Competition Policy*, Princeton University Press Princeton and Oxford.
- Vives X., (2010). *Competition and Stability in Banking*, *Policy Insight* No. 50.
- Windmeijer, F., (2005). A finite sample correction for the variance of linear efficient two-step GMM estimators, *Journal of Econometrics*, 126, 25–51.

-
- Weis G.N.F., Neumann S., Bostandzic D., (2014). Systemic risk and bank consolidation: International evidence, *Journal of Banking & Finance*, 40, 165-181.
- Wu J., Chen M., Jeon B.N., Wang R., (2017). Does foreign bank penetration affect the risk of domestic banks? Evidence from emerging economies, *Journal of Financial Stability* 31, 45–61, DOI: 10.1016/j.jfs.2017.06.004.
- Yeyati E. L., Micco A. (2007). Concentration and foreign penetration in Latin American banking sectors: Impact on competition and risk, *Journal of Banking & Finance* 31 (6), 1633–1647. DOI: 10.1016/j.jbankfin.2006.11.003.

www.nbp.pl

