Ewa MIKLASZEWSKA[*],
Katarzyna MIKOŁAJCZYK[**],
Małgorzata PAWŁOWSKA[***]

Post-crisis Regulatory Architecture and Central and East European Banks

Summary: The article aims to contribute to the debate on the implications of changes in the regulatory architecture for banks in the wake of the global financial crisis. The main research question is whether the post-crisis regulatory architecture will have a positive or negative long-term impact on bank stability and efficiency, with a focus on Central and Eastern European (CEE) banks. To answer these questions, the article analyzes how CEE banks reacted to two different periods: the pre-crisis period of dynamic credit market expansion and the period of the global economic slowdown after the 2008 crisis. Efficiency is analyzed using the Data Envelopment Analysis (DEA) method, in addition to competitive conditions measures (H-statistics), and the Z-score index. The empirical part of the article supports the assertion that safe and efficient banks in CEE create sound systems and have survived the global financial crisis in better condition than their counterparts in Western Europe. However, post-crisis regulatory restructuring will likely have a negative impact on their long-term growth, the authors say.

Keywords: banking regulation, bank efficiency and stability, CEE banks

JEL classification codes: G21, G28

[*] Cracow University of Economics, Dept. of Finance, e-mail: uumiklas@cyf-kr.edu.pl
[**] Cracow University of Economics, Dept. of Finance, e-mail: efmikola@cyf-kr.edu.pl
[***] National Bank of Poland, Economic Institute, e-mail: malgorzata.pawlowska@nbp.pl

Introduction

Although the 2008 financial crisis affected the entire world, for the first time it was the leading industrialized nations which were more affected than the emerging countries, for whom the crisis was largely secondary in nature, in this respect making the crisis unique [IMF, 2010]. However, its long term consequences, both direct in terms of changing strategies of foreign owned banks, and indirect in the form of a necessary adaptation to new global and European regulations, are borne by all countries.

This paper concentrates on the long-term impact of new, post-crisis regulatory architecture, on a relatively homogeneous group of Central East European Countries (CEE-5): Poland, Hungary, Czech Republic, Slovakia and Slovenia. These countries have been EU members since 2004, with two of them, Slovenia (2007) and Slovakia (2009), also in the Eurozone. They are at a similar stage of institutional development, financial and macroeconomic reform, and banking sector depth. Before the global crisis of 2008, they enjoyed rapid growth in the banking sector, largely due to the increased presence of foreign banks and the adaptation to the EU legal and institutional framework. However, the global financial crisis has hampered the dynamics of CEE banking sectors' growth. Thus the aim of the paper is to contribute to the discussion on the anticipated long-term impact of post-crisis regulatory and supervisory architecture, focusing on banks operating in CEE. We pose the following questions: what were the factors contributing to the efficiency of CEE banks before the crisis, and consequently, what will be the long-term impact of the post crisis architecture for for bank stability and efficiency in CEE countries? In particular, we concentrate on the impact of post-crisis European supervisory structure, the role played by European Banking Authority (EBA) and possible consequences of the Banking Union, which will start in 2014. The empirical part of the paper is based on the non parametric Data Envelopment Analysis (DEA) technique, measures of market competition and bank stability indicator Z-score. The data used were from the Bankscope Database.

The paper is organised as follows: the first part describes the foundation of post-crisis European regulatory architecture. Following this, it discusses its possible consequences on banks in CEE. Analyzing the impact of the financial crisis on CEE banks, we present an empirical analysis of CEE bank efficiency before and after the crisis, using DEA methodology, market competition measure (H-statistics) and Z-score calculations. In the concluding section the anticipated long-term consequences of the post-crisis regulatory and supervisory arrangements on CEE banks are analyzed.

Building post-crisis regulatory architecture

The period of liberalisation and deregulation from the 1980s aimed at restoring bank profitability and facilitating expansion and, in consequence,

dramatically influenced the scale and complexity of banking firms. Table 1 demonstrates how dramatically the biggest banks' assets have expanded in the deregulation period.

T a b l e   1

The largest global banks by assets, $ billions, in selected years

1985		1995		2004		2011	
Top banks	Assets	Top banks	Assets	Top banks	Assets	Top banks	Assets
Citicorp	167	Deutsche Bank	503	UBS	1 533	Deutsche Bank	2 803
Dai-Ichi Kangyo B.	158	Sanwa Bank	501	Citigroup	1 484	Mitsubishi UFJ	2 741
Fuji Bank	142	Sumitomo Bank	500	Mizuho FG	1 296	HSBC	2 555
Sumitomo Bank	135	Dai-Ichi Kangyo	499	HSBC	1 277	BNP Paribas	2 545
Mitsubishi Bank	133	Fuji Bank	487	Cr. Agricole	1 243	Japan Post B.	2 543
BNP	123	Sakura Bank	478	BNP Paribas	1 234	Credit Agricole	2 449
Sanwa Bank	123	Mitsubishi Bank	475	JP Morgan	1 157	Barclays	2 431
Credit Agricole	123	Norinchukin Bank	430	Deutsche B.	1 144	ICBC	2 400
Bank of America	115	Credit Agricole	386	RBS	1 119	RBS	2 343
Credit Lyonnais	111	Ind. Comm. Bank of China	374	Bank of America	1 110	JP Morgan	2 266

Source: Data for 1985-2004: The Economist, 2006; for 2011: The Banker, 2011

The global financial crisis of 2008 forced banks and regulators to rethink strategic and competitive issues in banking. Banks, which for decades had been leaders in global efficiency or expansion, turned out to be most affected, requiring massive public stabilization funds and in some cases rescue by direct government intervention [Demirgüç-Kunt and Huizinga, 2011]. The scale of the banking crisis was such that the most frequent restructuring pattern for global banks turned out to be partial or total nationalization [The World Economic Forum, 2010]. As a result, rescue and resolution programmes for large global banks contributed to inflated budget deficits and dramatically growing public debts in major countries, posing the danger of systemic risk [Allen et al., 2011].

However, figure 1 illustrates that the problem of systemic risk is not equally dangerous for all countries: for example, in CEE relatively small banks operate in relatively safe macroeconomic environment with moderately indebted governments. On the contrary, the situation in well advanced European countries is grave: they have inflated banking sectors' assets, and a limited possibility of further government stabilizing intervention, due to large budget deficits. This calls for Pan-European (or global) or solution to the problem of large banks.
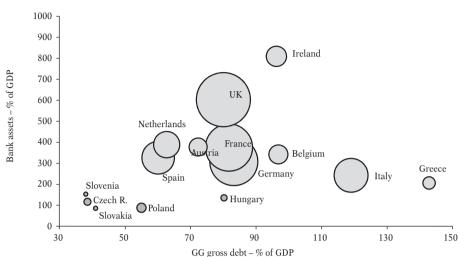
The size of banking sector (2009) vs. general government debt (2010) in selected EU and CEE countries

Source: Based on data from Eurostat and ECB, 2010

Rationale for regulatory reform

Financial supervision should ensure systemic stability, safety and soundness of financial institutions, an efficient and transparent way of conducting transactions and financial consumer protection [Kuppens et al., 2003]. To carry out these functions effectively, its organizational structure must evolve, so that just as in real life, form follows function [Acharya et al., 2009]. Historically, banks have accepted tight regulations in exchange for market stability and strong protection, and as a result there were almost no OECD banking crises till the 1970s [Nier, 2010]. Banks were safe, but inefficient, and losing market share to non-banking firms. The deregulation period from the 1980s aimed at restoring bank profitability and enhancing bank efficiency, facilitating global strategies and risky business models.

In the pre 2008 crisis period, the dominant source of bank efficiency stemmed from expansion into new markets, non depository funding and non interest-based sources of profits [Demirguc-Kunt, Huizinga, 2009], and the adoption of new models for conducting banking activities, based on product synergies, scale and scope benefits and global coverage [Acharya et al., 2011]. The changes in bank scale and scope of activities were facilitated by new regulatory philosophy, exemplified by moving from the Basel 1 to Basel 2 regulatory framework, where market discipline and bank self-regulation were to replace tight supervision. The increasing complexity of banks and the expansion

of conglomerate structures generated synergies between banking (regulated) business and relatively unregulated investment activities and offered both new sources of income and new areas of risk.

However, the 2008 crisis demonstrated that Basel 2 was built on many optimistic assumptions and incorrect trade-offs, namely that regulators do not understand the complexity of banking activities and that tight supervision should be replaced by market discipline. Moreover, Basel 2 facilitated bank cooperation with, and the growth of, the so called shadow banking system [Masera, 2010]. Consequently, Basel 2, which looked at isolated areas of risk and focused on partially recognized threats to financial stability, turned out to be an inadequate regulatory regime and was largely responsible for the subsequent bank systemic failures in major countries. From today's perspective, it was an over-optimistic and ill-thought regulatory solution, as illustrated also by an opinion survey, presented in table 2. By raising new issues, such as systemic risk and the failure of market discipline, the 2008 crisis resulted in the adoption of a new regulatory philosophy: that of strengthening and tightening regulatory supervision [Beck, 2010]. Consequently, after numerous consultations, the Basel Committee on Banking Supervision prepared a new agreement, so called Basel 3, which was approved by political leaders attending the G-20 meeting in Seoul in October 2010. Basel 3 focused on strengthening prudential regulations; its measures included raising the minimum level of capital to 7% (equity) and 10.5% (total) of risk-weighted assets in the period 2013-2019, and a more restrictive definition of capital [BIS, 2010]. Macro-prudential regulations, particularly the question of how to deal with systemic risk and Systemically Important Financial Institutions (SIFIs), were left for further regulatory proposals by the Financial Stability Board.

Not only regulators, but also a broadly defined financial community (respondents to a Centralbanking.com poll, tab. 2) support the Basel 3 capital accord, although many want to see a higher leverage ratio than the minimum of 3% it prescribes (the leverage ratio was defined as a result of dividing Tier 1 capital by the bank's average total consolidated assets). Almost one-fifth (19%) of the poll respondents voted for a return to the simplicity of Basel 1.

T a b l e 2

Basel agreements and financial stability

Question: how would stability be best served?	Survey results (% of answers)
• Implementing Basel 3	34
• Implementing Basel 3, with a higher leverage ratio	27
• Scrapping Basel 3 – just raise the leverage ratio	12
• Keeping Basel 2, but enforcing it more effectively	8
• They got it right the first time – go back to Basel 1	19

Source: Centralbanking.com: 28 Jan 2013 (accessed 10.03.2013).

The foundations of new European supervisory framework

Supplementing Basel 3 regulatory framework, the EU and US authorities have created a complex regulatory infrastructure, based on a number of newly created institutions [Masciandaro et al. 2011] and in the US new Dodd-Frank Act of 2010.

The New European Supervisory Architecture was constructed upon three pillars [Masera, 2010 and Masciandaro, 2011]:
– Macro-prudential supervision, which focused on the prevention of systemic risk, assured by the European Systemic Risk Board (ESRB), chaired by the President of the ECB. It has no legal personality and is operationally supported by the European Central Bank,
– Micro-prudential supervision, based on three sectional authorities: the European Banking Authority (EBA), European Insurance and Occupational Pension Authority (EIOPA) and European Securities and Market Authority (ESMA),
– National supervisors.

The ESRB was designed to ensure that macro-prudential and macro-economic risks are detected and dealt with. Risks to the financial system can arise from the failure of one SIFI, but also from the common exposure of large financial institutions to the same risk factors. The ESRB also had a duty to identify any serious problems arising in a member state which could endanger EU financial stability. The main tasks of the ESRB were [Giovanini, 2010]:
• to establish adequate procedures to obtain information about macro-economic risks for financial stability,
• to identify macro-prudential risks in Europe,
• to decide on macro-prudential policy,
• to provide early risk warnings to EU supervisors and other relevant actors,
• to compare observations on macro-economic and prudential developments,
• to determine how to achieve effective follow-up to warnings/recommendations.

An even more challenging task was to establish a pan-European micro-prudential supervisory structure, as the convergence of supervisory architecture among European countries is very low [Masciandaro et al., 2009]. The national supervisors in the EU follow very diverse models: independent integrated institution, supervision centralized in the central bank, or the so called "twin peaks" model with partial centralization in two independent authorities. Out of a total of 27 EBA supervisory board members, roughly half (14) were national central banks and 13 were independent authorities [EBA, 2011].

The new micro-prudential bank regulator – The European Banking Authority – had to reconcile with different national objectives and institutional arrangements [Masciandaro and Quintyn, 2008]. However, it received much stronger prerogatives than that of its predecessor CEBS [Committee of European Banking Supervisors], which operated in the period 2004-2010. The aim of EBA

is to *"safeguard public values, such as the stability of the financial system, the transparency of markets and financial products and the protection of depositors and investors"* [CEBS, 2010]. The EBA has broad competencies, including preventing regulatory arbitrage, guaranteeing a level playing field, strengthening international supervisory coordination, promoting supervisory convergence and providing advice to the EU institutions in the areas of banking, payments and e-money regulation as well as on issues related to corporate governance, auditing and financial reporting.

The main tasks of the EBA were:
- to provide opinions and develop guidelines, recommendations, and draft regulatory standards,
- to contribute to a common supervisory culture, ensuring consistent and effective application of the EU Acts,
- to develop common reporting standards (COREP), including credit, market, operational, and equity capital adequacy ratios,
- to prevent regulatory arbitrage, mediating and settling disagreements between competent authorities and taking actions, in emergency situations,
- to improve the cooperation of supervisory authorities and to conduct peer review analyses,
- to cooperate with the ESRB,
- to foster depositor and investor protection, improve transparency and disclosure of information.

An even more complex regulatory reorganisation has been carried out in the US. The Dodd-Frank Act (2010) impacts all federal regulatory agencies and affects many aspects of the financial services industry. The Financial Stability Oversight Council (FSOC) is tasked with identifying risks to financial stability, promoting market discipline and information by eliminating expectations that financial and non-financial organizations will be shielded from losses in the event of failure, and responding to emerging systemic threats to financial stability. It is supplemented by a number of new regulatory institutions and redefinition of powers of the existing ones. The emerging complex regulatory structure in the US, based on a number of regulatory agencies, may or may not produce a more efficient and stable financial system, while being costly and opaque. It reflects the new regulatory philosophy of "holistic vision" and a diamond regulatory structure, rather than of the ladder [Masera, 2009].

The creation of Banking Union (2014)

Discussing the post-crisis restructuring, there was a discussion as to whether banking supervision in the EU should be centralized in the ECB, as there were no responsibility for financial stability at euro area level and contagion channels were not adequately understood [EU Commission 2012]. After the crisis, one of the arguments for placing it initially within an independent external institution (EBA) was a diverse supervisory structures in the EU. Initially this

solution looked satisfactory. However, EBA turned out to be week in numerous clashes with national banking regulators. Banking stress tests conducted by EBA were also universally criticized. Moreover, there was a growing consensus that global financial stability and cross-border banking cannot be supported by nationally based supervision. The financial trilema stated that financial stability, financial integration and national financial policies are incompatible [Schoenmaker 2011], and hence the single supervisory power and lender of last resort function should be centralised in ECB.

Finally, there was a growing recognition that safe financial systems may produce less economic growth. Basel 3 requirements for more and better-quality capital and liquidity buffers have imposed higher costs on banks, and the initial response on the part of large European banking group was to sell some assets, particularly in "peripheral countries", such as CEE. Global Financial Stability Report [IMF, 2012] estimated that the UE large banks would reduce assets by $2.2 trillion (7.3% of their assets) over the period from 2011:Q3 to 2013:Q4. Based on OECD estimates, the new financial regulatory framework permanently reduces annual GDP by 0.15% [de Larosière, 2013]. Consequently, there was growing consensus that there is a need to change the recessionary trend with cheaper loans and investment programmes to generate growth, otherwise the breakup of the Eurozone is likely, followed by defaults on sovereign debt and possible bank runs. This scenario could be stopped only by empowering the ECB with new instruments and responsibilities. ECB had already been instrumental in slowing down bank deleveraging, by relieving funding pressures on euro area banks [EU Commission, 2012].

The above rationales were crucial for decision of the European Council and the Euro area summit in June 2012 to move from coordination of national banking supervision to an integrated system, where the EU countries within the euro zone will start to come under the direct supervision of the ECB, planed initially on January 2014, later moved to march 2014 [EU Commission 2012]. The Banking Union will consists of three parts:
- a common banking supervisor (Single Supervisory Mechanism, SSM),
- a common resolution framework and a common deposit guarantee scheme, which will be constructed at a later date.

The ECB will become responsible for tasks such as authorizing credit institutions, compliance with capital, leverage and liquidity requirements and conducting supervision of financial conglomerates. The ECB will be able to carry out early intervention measures when a bank breaches or risks breaching regulatory capital requirements by requiring banks to take remedial action. Initially there was a proposal that the ECB should be directly responsible for all 6,000 eurozone banks, arguing that during the financial crisis, even relatively small banks can threatened the entire financial system. The German government wanted the ECB to have a more limited role. Under the compromise, the ECB will oversee large banks with more than 30 bn euros in assets or with 20% of national GDP (around 200 of the biggest European banks). Single Supervisory Mechanism is also a precondition for the possibility of direct

recapitalization of banks by the European Stability Mechanism (ESM) – the eurozone's permanent bailout fund.

Banking Union confers strong powers on the ECB, with an option for non-euro countries to join on a voluntary basis. In contrast to the European Banking Authority, which sets the rules under which all banks in the EU must work within, the ECB would be able to impose its will on the national banking regulators. The ECB will be able to carry out early intervention measures when a bank breaches or risks breaching regulatory capital requirements by requiring banks to take remedial action. National supervisors outside the euro zone will continue to behave as before and the European Banking Authority will remain the common banking regulator for them [The Economist, 2012]. The ECB will cooperate with the EBA within the framework of the European System of Financial Supervision. EBA will continue developing the single rulebook applicable to all 27 Member States and make sure that supervisory practices are consistent across the whole Union.

New European supervisory architecture and the CEE

The creation of new European supervisory architecture has been the result of a negative assessment of pre-crisis supervisory structures in highly developed countries. However, the emerging complex structure, based on a number of new regulatory agencies with overlapping prerogatives, may not produce the desired more efficient and stable European financial system. CEE countries are host markets for global banks, hence national regulators are afraid of further diminishing of their powers. As was noted by the member of the Czech NCB Board, „there is no one-size-fits-all solution available for all countries". In his view, the stability of the financial sector depends on the ability to establish independent, strong and respected supervision, which constitutes an important argument for carrying out banking supervision at a national level [Lizal, 2011]. Shifting decision-making powers to global or regional financial centres may mean further marginalization for CEE countries. As CEE countries are relatively new to EU decision-making processes, they tend to be rule-takers rather than rule-makers, and the new European financial architecture will only reinforce this.
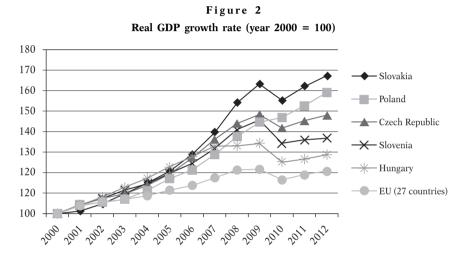
Moreover, the EU and US new institutional regulatory structures were based on the perceived necessity to deal with systemic risk. There were many discussion about the merits of the new micro-prudential regulations, while macro-prudential solutions were considered less controversial, which may not necessarily be the case for CEE countries. Macro-prudential regulations entail considerable costs and regulatory burdens, particularly for countries for which systemic risk is not a major priority, such as CEE. Moreover, strong macro-prudential regulations are needed if we do not believe that "strong banks create a strong system", because of linkages and global interdependence. However, this view is not universally accepted, as crisis might be attributed rather to the problems with bank business models and lack of proper micro-prudential supervision of large banks [Nier, 2010].

Before the crisis, many countries had carried out a reform of national supervisory systems, in many cases towards a supervisory integration, according to a notion that the structure of supervision should reflect the structure of the market (i.e. integrated, synergy-based). Many countries modelled their supervision on the British FSA. However, the UK was among countries which suffered most from the crisis and consequently has reformed again the supervisory regime, featuring a tripartite model with two supervisory authorities under the authority of the Bank of England: the Prudential Regulation Authority (PRA) in charge of the prudential regulation of individual firms, the Consumer Protection and Markets Authority (CPMA) responsible for consumer protection and the conduct of financial markets; and the Financial Policy Committee (FPC) responsible for maintaining financial stability by monitoring and addressing systemic risk that threaten the financial sector as a whole.

All CEE-5 countries have adopted an integrated supervisory regime, although differently placed. In the Czech Republic, financial market supervision has been integrated into the central bank (NCB), since 2006. While the NCB has traditionally been involved in banking supervision since its establishment in 1993, the supervision of other financial market sectors (capital markets, insurance and cooperative banking) was initially carried out by separate supervisors. In order to provide synergies, the Czech Government carried out a supervisory reform which resulted in the institutional integration of the financial market supervision authorities from 2006. Further internal reorganization of supervisory departments took effect on 1 January 2008, when sector supervision was abandoned and replaced with the functional model, with a Financial Market Committee (FMC) being establish as a new advisory body in matters of financial market supervision. Also in Slovakia on the 1st January 2006 the Financial Market Authority was dissolved and its powers and responsibilities were transferred to the National Bank of Slovakia. The NBS thus conducts the entire financial market supervision covering banking, capital market, insurance and pension saving.

Integrated supervision took effect in Hungary in 2000, when the Hungarian Banking and Capital Market Supervisory Authority and the Supervisory Authority responsible for the Supervision of Insurance Companies were merged and the Hungarian Financial Supervisory Authority (HU-FSA) was created. Similarly, in Poland since 2006 the Polish FSA has been the single body responsible for matters related to the supervision of the financial market (pension funds, capital market, insurance institutions and electronic money institutions, as well as the supplementary supervision of financial conglomerates) and from 2008 also encompassed the banking market.

Banking sector in CEE-5 countries: main characteristics

CEE-5 countries are at a similar stage of institutional development, financial and macroeconomic reform, and banking sector depth. They share a number of common characteristics: they are open economies, they have already well

established EU legal rules and standards, low wages and educated workforce and relatively fast economic growth, particularly in the pre-crisis period. The gap between these countries and developed European economies is narrowing. CEE countries were before the crisis among the top most attractive regions for foreign investment, with the share of foreign investors in the banking sector exceeding on average 80%, with the exception of Slovenia. The process of fundamental bank reforms, economic restructuring and privatization has now largely been completed in these countries.

Figure 2
Real GDP growth rate (year 2000 = 100)

Source: Eurostat

After EU accession in 2004, CEE countries enjoyed rapid economic and banking sector growth and high bank profitability: average ROE (Return on Equity) above 20% till 2007. The global crisis of 2008 had initially a negative effect on the assessment of this region, as economic growth collapsed (fig. 2). The first and the most seriously affected country was Hungary; the sharpest decline in output was in Slovenia and Slovakia, while Poland managed to keep in positive GDP growth and credit growth throughout the crisis. Despite numerous gloomy projections, the macro-economic and profitability figures remained good throughout the crisis: average CEE-5 ROE dropped to 15% in 2008 and 13% in 2009, but the C/I (Cost to Income) ratio also fell to 51% in 2009. Neither was the increase in non-performing loans (NPL)[1] dramatic: from 3.9% to 5% on average in the same period [ECB, 2009 and IMF, 2010].

A relatively liberal financial sector combined with large foreign ownership has been another distinguishing feature. Poland has the largest and relatively low concentrated banking sector and a sound financial system, with low dependence

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[1] The share of loans which are classified as: substandard, doubtful and loss, in total assets.

on sophisticated financial instruments and relatively low leverage: total loans to total deposits around 100%. (tab. 3). Also in the Czech Republic banks are characterized by a very conservative funding structure, based on domestic deposits. On the other spectrum, Hungarian banks display the highest degree of risk, stemming not only from high non-depository financing, but also from high dependence on foreign currency loans: 70% of banking sector loans to the private sector in Hungary has been denominated in foreign currencies [EBRD, 2010]. Foreign currency borrowing constitutes a significant risk in all East European countries. Before the crisis, many foreign-owned CEE banks refinanced themselves abroad and then passed on the currency risk to their clients. Macro-economic stability and expectation of currency appreciation after EU accession stimulated demand for such loans. However, FX exposure differs among CEE countries: in 2007, un-hedged foreign currency borrowing constituted more than 70% of all private sector loans in Estonia, Latvia, and Serbia; it exceeded domestic borrowing in Bulgaria, Hungary, and Romania, but was relatively low in comparison to GDP in Poland, the Czech Republic and Slovakia. Bank lending to un-hedged borrowers exposed CEE economies to systemic risk, but at the same time functioned as an engine for dynamic growth [Brown and De Haas, 2012].

Table 3

CEE-5: Macroeconomic and banking key figure

	Total Loans as % of GDP			Total Loans as % of Total Deposits			Growth rate of Total Loans			Bank Assets (bil. EUR)	% Share of Foreign Banks in TA
	2007	2009	2011	2007	2009	2011	2007	2009	2011	2011	2011
Czech R.	48.8	56.2	59.3	75.4	77.9	79.1	30.3	3.1	2.9	178.7	86.5
Hungary	53.0	62.4	59.3	126.3	133.2	132.7	16.9	-4.4	-10.5	111.9	89.3
Poland	37.7	50.1	52.5	103.4	113.1	116.1	41.3	11.6	2.5	312.7	63.0
Slovakia	68.8	84.1	80.8	76.4	84.9	90.6	16.5	-15.6	2.0	55.8	88.8
Slovenia	124.9	152.0	147.2	91.8	96.3	101.1	26.2	8.1	-1.6	52.4	37.1 (2010)

Source: Raiffeisen Research [2012]

Foreign banks invested heavily in the CEE region right from the beginning of the transition period. Only in Poland and Slovenia some large banks are still controlled by the state or domestic private capital. The investment in CEE-5 banks turned out to be very profitable for foreign capital, not only form pre-crisis, but also from the post-crisis perspective, and allowed mother companies to regain much of their initial investments. However, investment in CEE carried also potential risks, mainly connected with macroeconomic imbalances, exchange rate volatility and credit risk. As a result, major global players, such as Citigroup or HSBC, had a much lower level of involvement in the region than banks from neighbouring countries.

DEA results on bank efficiency in CEE-5

Efficiency is a broad concept which can be applied to many dimensions of bank activities. To analyse how the efficiency of CEE banks was affected by the pre- and post-crisis environment, in this paper we have investigated technical and scale efficiency of commercial banks in the period 2002-09 using DEA technique, based on the Bankscope database. DEA is a non-parametric linear programming technique that computes a comparative ratio of outputs to inputs for each unit, which is reported as the relative technical efficiency score. All non-parametric methods generally yield slightly lower mean efficiency estimates and seem to have a greater dispersion than the results of parametric models [Berger and Humphrey, 1997]. Among a number of DEA models, the most popular are the CCR and BCC-models. The CCR model [Charnes et al., 1978] yields an objective evaluation of overall efficiency and identifies inefficiencies. It estimates efficiency on the assumption of constant return to scale (CRTS). The BCC model [Banker et al., 1984] estimates efficiency on the assumption of variable return to scale (VRTS). It distinguishes between technical and scale inefficiencies by estimating pure technical efficiency at the given scale of operation.

Technical efficiency is related to the ability of a firm to produce outputs with given inputs: a production plan is technically efficient if there is no way to produce the same output(s) with less input(s) or to produce more output(s) with the same inputs. Technical efficiency considers scale and scope economies. Technical efficiency has been analysed assuming constant (E_crs), variable ($E\_vrs)$ and non-increasing (E_n) returns to scale. For the above three efficiency measures, the following property also holds:

$$0 < E\_crs \leq E\_n \leq E\_vrs \geq 1.$$

We should notice that VRTS technical efficiency scores are greater than or equal to CRST technical efficiency scores. Following the scale properties of the two major DEA models we have the following definition of scale efficiency:

$$E\_s = E\_\text{crs}/E\_vrs. \text{ If } 0 < E\_crs < E\_vrs \leq 1$$

When scale efficiency is smaller than 1, the given bank is scale inefficient (either too big or too small). Based on scale efficiency measure (E_s) only, it is not possible to distinguish in which region bank is operating: increasing or decreasing returns to scale. To make this distinction, these measures must be compared with E_n measure. If $E\_crs = E\_n$ this means that bank is not scale efficient and is operating with increasing returns to scale. If $E\_n > E\_crs$ that bank is operating with decreasing return to scale.

The efficiency of the banking sectors in the Czech Republic, Slovakia, Slovenia, Hungary and Poland was test by the expanded BCC model, output-oriented. In the technical efficiency analysis, the classification of input and

output was applied based on *value added approach* (VAA) [Grigorian and Manole, 2002], were the input was: (x_1) – personnel expenses, (x_2) – total fixed assets, (x_3) – interest expense. The output was: (y_1) – total loans net, (y_2) – liquid assets, (y_3) – total deposits. The results of the technical efficiency measures E_crs (constant returns to scale) and E_vrs (variable returns to scale) are presented in table 4.

Table 4

Efficiency measures of CEE-5 countries

Year	2002	2003	2004	2005	2006	2007	2008	2009	No. of banks
E_crs									
Czech Republic	0.55	0.74	0.84	0.68	0.81	0.79	0.66	0.80	27
Poland	0.49	0.59	0.71	0.65	0.68	0.32	0.66	0.42	41
Slovakia	0.65	0.96	0.70	0.97	0.97	0.79	0.91	0.87	17
Slovenia	0,44	0.95	0.88	0.88	0.92	0.90	0.82	0.42	19
Hungary	0.30	0.20	0.53	0.55	0.58	0.68	0.59	0.30	32
E_vrs									
Czech Republic	0.67	0.88	0.94	0.88	0.88	0.92	0.91	0.90	27
Poland	0.80	0.86	0.77	0.81	0.86	0.56	0.85	0.87	41
Slovakia	0.81	0.97	0.78	0.98	0.98	0.93	0.95	0.91	17
Slovenia	0,78	0.97	0.96	0.93	0.94	0.96	0.94	0.73	19
Hungary	0.64	0.52	0.67	0.76	0.82	0.86	0.80	0.73	32

Source: own calculations, Bankscope database

The results of the analysis confirmed that the accession of CEE-5 countries to the EU has boosted the efficiency of commercial banks in the analysed period, particularly between 2004-2006. However, bank efficiency in most of analysed countries decreased in 2008-2009 (2007 for Poland), particularly for Hungarian and Slovenian banks. The process of changes of scale efficiency was also analyzed by a comparison of technical efficiency measures (E_crs, E_vrs, E_n) and scale efficiency measures (E_s), as illustrated in Fig. 3. In 2009, the majority of examined banks in Poland and in the Czech Republic were operating with increasing or constant returns to scale. For the majority of banks $E\_n = E\_crs$.

To sum up, the results of the analysis showed that the efficiency of CEE-5 banking sectors increased after EU accession and decreased due to the financial crisis. The majority of banks, especially in Poland, were operating with increasing returns to scale, which means that there is still the room for new M&A. On average, banks in the Czech Republic, Slovakia and Poland were least affected by the crisis.
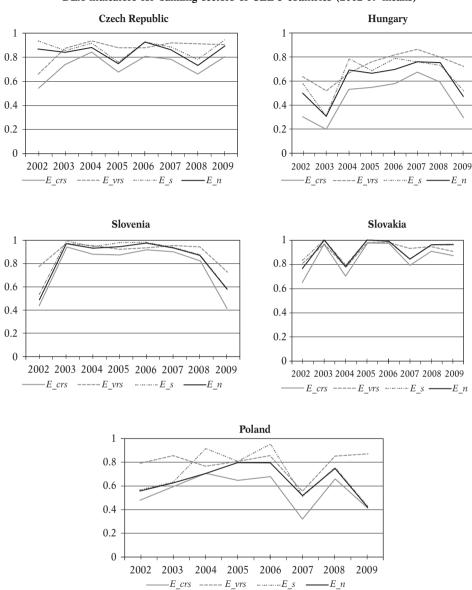
Figure 3

DEA indicators for banking sectors of CEE-5 countries (2002-09 means)

Source: own analysis, Bankscope database

Banking market competitive conditions in CEE-5

In the financial literature, many DEA analysis of East European banks [Anayiotos et al., 2010], [Chortareas et al., 2012], [Delis et al., 2011], [Lensink

et al., 2008], [Miklaszewska and Mikołajczyk, 2011], showed that the efficiency scores before the crisis were strongly linked to the host country level of development, stressing the importance of the governance model and domestic institutional structure. Thus, assuming the importance of host county conditions, the following step was to compare the competitive environment in CEE-5 countries. The level of competition of CEE-5 was evaluated using the H-statistic based on the reduced form of revenue equation of the firms [Panzar and Rosse, 1987], [Claessens and Laeven, 2004], [Bikker and Bos, 2008].

The *dependent variable IR_{it}* is the natural logarithm of interest income $ln(II)_{it}$ or the natural logarithm of interest income divided by total assets $ln(II/TA)_{it}$ of bank i in time t, *explanatory variables* were defined for each bank i in period t, as follows: w_{1it} – price of funds (relation of interest expenses to total liabilities); w_{2it} – price of labor (personnel expenses, relation of pay and pay-related cost to net assets); w_{3it} – price of physical capital (relation of depreciation to fixed assets), oth_{it} – relation of loans to deposit, where: e_{it} – error, a_1, a_2, a_3, d – regression coefficients[2]:

$$ln(IR_{it)}) = c_i + a_1{}^*lnw_{lit} + a_2{}^*lnw_{pit} + a_3{}^*lnw_{kit} + d^*oth_{it} + e_{it} \qquad (1)$$

The panel data for this analysis comprises data from Bankscope and covers the period from 2002 to 2009 and two variants of reduced form of revenue equation were estimated [Pawłowska, 2011]. The first variant explains the natural logarithm of interest income divided by total assets *ln(II/TA)* as a dependent variable, whereas the second model explains the natural logarithm of interest income *ln(II)*. In order to analyse changes in the level of competition in the banking sectors the value of *H statistic* function was calculated for the entire period and for two sub-periods: 2002-2007 (H_1) and 2008-2009 (H_2) (tab. 5).

T a b l e 5

Value of H statistic for CEE-5

Estimations results with time interaction terms for overall sample:		Dependent variable: Interest Income				
		Czech Republic	Hungary	Slovakia	Slovenia	Poland
H_1	2002-2007	0.28	0.34	0.19	0.27	0.30
H_2	2008-2009	0.07	0.003	0.11	-0.012	0.09
p(F-test)	$H_0 : H_1 = H_2$	(0.037)*	(0.000)***	(0.612)	(0.034)*	(0.002)**
H	2002-2009	-0.25	0.35	0.28	0.30	0.16

[2] The sum of regression ratios ($a_1 + a_2 + a3$) determines the value of H statistic for the sector of commercial banks.

c o n t i n u e d   T a b l e   5
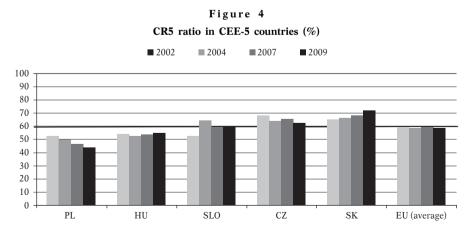
Estimations results with time interaction terms for overall sample:		Dependent variable: Interest Income/Total Assets				
		Czech Republic	Hungary	Slovakia	Slovenia	Poland
H_1	2002-2007	0.48	0.85	0.85	0.44	0.83
H_2	2008-2009	0.38	0.98	0.76	0.39	0.44
p(F-test)	$H_0 : H_1 = H_2$	(0.290)	(0.526)	(0.276)	(0.851)	(0.003)
H	2002-2009	0.43	0.55	0.70	0.53	0.68

Source: own analysis, Bankscope database. * — significant at the level of 10%, ** 5%, *** 1%

The empirical results with respect to the H-statistic showed that the values of H statistics were higher when the dependent variable was scaled by assets. The results of the empirical analysis demonstrated that between 2002-2007 commercial banks in CEE-5 operated in the environment of monopolistic competition (values of H statistic were between 0 and 1). By estimating the different regression equations with interaction terms for two periods, significant changes over time were found for the two sub-periods in the overall sample, which was confirmed by the test for significance of the differences between the two periods ($H_1 = H_2$) for the Czech Republic, Slovenia, Hungary and Poland, mainly when dependent variable was based on the natural logarithm of interest income *ln(II)*.

The level of competition in the Polish banking sector was similar to the euro zone countries level [Bikker and Spierdijk, 2008]. A strong driver for an increase in competition in the CEE-5 banking sectors was the accession to the European Union.

F i g u r e   4

CR5 ratio in CEE-5 countries (%)

Source: ECB and own calculations. Note: red line – EU average in 2009

However, if we look at the concentration ratios CR5[3] in CEE-5 countries, we observed a decrease in the level of concentration in Poland. Furthermore, the level of concentration in Poland is the lowest in comparison to the other CEE-5 countries. By contrast, in the whole EU the increase in concentration have been observed, due to massive consolidation process (see figure 4). It should be stressed that the degree of competition does not always depend on concentration measures because other market characteristics, such as dynamic barriers to entry and exit, are more important.

CEE-5 bank soundness

Assessing bank safety is even more difficult than assessing its efficiency. In this section, the Z-Score index of bank sensitivity to default has been adopted as a proxy measure of bank soundness. The index is based on the volatility of returns and the lack of adequate capital as the main sources of risk [Lown et al., 2000]. The Z-Score is calculated as the sum of equity capital to assets ratio (CAR) and return on assets ratio (ROA), divided by standard deviation of ROA. Thus the value of the Z-Score is determined by the level of capitalization and by the level and stability of profits, and can be interpreted as the distance from a default, measured by standard deviation of profits. A high level in the Z-Score denotes bank stability, which means it has enough equity capital to cover potential losses. The key element, which has a considerable influence on the Z-Score, is the denominator. If the level of profitability is stable, it contributes to the high value of the index, but during unstable times (increase or decrease in profits) it causes a sudden decline in the Z-Score.

In this section the Z-Score is calculated in two different ways. Firstly, standard deviation of ROA is calculated for the whole 2004-2010 period and the denominator of the Z-Score formula is constant. That allows to express the impact of the value of ROA and CAR, the volatility of profits averaging for the whole period (fig. 5a).

$$Z - Score_t = \frac{ROA_t + CAR_t}{\sigma(ROA)} \tag{2}$$

ROA_t, CAR_t – *Return on Assets and Capital to Assets Ratio for year t;*
$\sigma(ROA)$ – *standard deviation for 7 years period.*

However, in order to analyze the impact of growing instability on financial markets after 2007, the average Z-Score was also calculated in 3 year rolling windows, starting from 2004-2006 period and terminating in 2008-2010 (fig. 5b).

$$Z - Score_{3y} = \frac{\overline{ROA} + \overline{CAR}}{\sigma(ROA)} \tag{3}$$

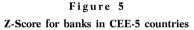[3]   This index is calculated as market share of the 5 largest banks in all banking assets.

$\overline{ROA}, \overline{CAR}$ – *3y arithmetic average;*
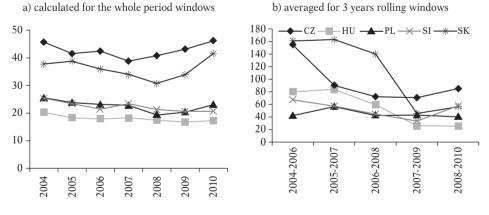*σ(ROA) – standard deviation for 3y period.*

The bank data were extracted from the Bankscope database. The original data set comprised all CEE-5 banks categorized as commercial or saving banks, but to prevent distortion banks with assets lower than 0.5% of the total domestic banking sector assets were excluded. That reduced the number of banks from 130 to 97.

T a b l e   6
Banking sector capitalization and profitability ratios in CEE-5 countries

Country\Year	2004	2005	2006	2007	2008	2009	2010	2004	2005	2006	2007	2008	2009	2010
	CAR							ROA						
CZ	8,0	8,0	7,4	7,0	7,8	8,5	8,8	1,56	1,62	1,49	1,56	1,32	1,70	1,62
HU	7,9	8,0	8,5	8,5	7,7	8,3	8,5	1,80	1,93	1,71	1,85	1,67	0,91	0,69
PL	10,0	9,9	9,8	9,7	9,2	10,8	11,9	1,01	1,78	2,08	2,19	2,21	1,20	1,55
SI	7,9	7,6	7,2	7,8	7,6	7,2	7,0	0,67	0,97	1,03	1,06	0,33	0,10	-0,28
SK	8,0	8,0	7,7	7,3	6,7	8,6	9,3	1,44	1,46	1,51	1,47	1,42	0,85	1,28
Total	**8,4**	**8,3**	**8,1**	**8,1**	**7,8**	**8,7**	**9,1**	**1,30**	**1,55**	**1,56**	**1,63**	**1,39**	**0,95**	**0,97**

Source: own calculations

F i g u r e   5
Z-Score for banks in CEE-5 countries

a) calculated for the whole period windows   b) averaged for 3 years rolling windows

Source: own calculations

When the volatility of profits was flattened for the 7 year period, the value of Z-Score slowly decreased, on average from 31 to 26 in 2008, and then slightly increased to 29 in 2010. This resulted from changes in capital ratio, which diminished till 2008, and then substantially rose, well above the pre-crisis level in all countries but Slovenia. Poland recorded high bank capitalization and profitability in 2006-2008 period, however it was accompanied by high volatility

of ROA, and consequently Z-Score between 20-25 was much lower than in the Czech Republic and Slovakia, and similar to Slovenia, where banks had the lowest ROA in CEE-5 region and also low CAR value (tab. 6). Calculating the Z-Score in 3 year rolling windows resulted in its much higher values, particularly in the Czech Republic and Slovakia in the pre-crisis period. The steepest fall of the Z-Score was in Slovakia, from 160 to 46, the lowest level, below 30, was in Hungary. Thus our results indicate a sharp decline in bank safety in CEE-5 countries in 2007-2009 period, triggered by the crisis. Its main reason was not so much a fall in profitability, which remained much higher than in most developed economies, but the high volatility of ROA, resulting from the excessive profitability in pre-crisis period. The reinvestment of bank profits after 2008 resulted in the increase of the Z-Score in the period 2008-2010.

Concluding remarks

Economic theory provides some contrasting evidence as to the impact of bank regulation and supervision on bank performance. Furthermore, most research in this area concentrates on banking markets in highly developed countries. From the data presented in the empirical part of the paper, it is evident that the 2008 crisis affected CEE banks to a lesser degree than those in highly developed countries, although a short-term bank efficiency loss was evident. CEE banks entered the crisis in good shape, after their successful restructuring in the 1990s and high economic growth following EU accession. Because of the high profitability generated by the traditional bank intermediary model, many global risk areas had not yet developed there, with the result that during the crisis they required less restructuring than did their global owners. Banking sector assets in CEE-5 countries have remained relatively small as a percentage of their GDPs and bank concentration is low, with a resulting low threat of systemic risk. Market stability, as measured by Z-score index, decreased initially both for all CEE banking sectors and for the top three banks in each CEE-5 country, although this trend was reversed during the 2008-2010 period. It can be concluded that in CEE, strong banks created sound systems, which have survived the global financial crisis relatively well.

In the light of the 2008 crisis, the traditional business model of banking intermediation, which dominates in Central and Eastern Europe, turned out to be the safest. Nevertheless, CEE banks will have no choice but to participate in the new European regulatory and supervisory architecture, centered on the prevention of systemic risk posed by large global banks. The newest EU proposals of creating Banking Union is a step to deal with this issue, by giving strong supervisory powers to ECB and creating a mechanism of shared bank rescue burden for the eurozone members. However, this plan weakens the current European supervisory structure, which has centered on EBA, before it managed to demonstrate its long-term impact. Moreover, instead of deleveraging big banks, it will create another rescue vehicle for them, increasing moral hazard behavior. For CEE banks, with small and competitive banking sectors,

the emerging new regulatory architecture will most likely provide more costs and benefits.

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PO-KRYZYSOWA ARCHITEKTURA REGULACYJNA A BANKI EUROPY ŚRODKOWEJ I WSCHODNIEJ

Streszczenie

Celem artykułu jest analiza kształtu i konsekwencji zmian w otoczeniu regulacyjnym banków, spowodowanych globalnym kryzysem finansowym 2008 roku. W artykule podjęto próbę odpowiedzi na pytanie, czy zmiany architektury regulacyjnej w UE będą mieć pozytywny czy też negatywny długookresowy wpływ na stabilność i efektywność banków, ze szczególnym uwzględnieniem sektorów bankowych krajów Europy Środkowo-Wschodniej (CEE). W celu odpowiedzi na to pytanie, w artykule przeprowadzono analizę ilościową efektywności, konkurencji i stabilności sektorów bankowych w krajach Europy Środkowo--Wschodniej, w dwóch różnych okresach: przed kryzysem (okres dynamicznej ekspansji na rynku kredytowym) i w okresie globalnego spowolnienia gospodarczego po 2008 r. Efektywność banków analizowano z wykorzystaniem metody DEA, poziom konkurencji został oszacowany z wykorzystaniem statystyki H, stabilność analizowano wykorzystując indeks Z-score. Wyniki analizy potwierdzają dobrą kondycję finansową banków w krajach Europy Środkowo-Wschodniej, które przetrwały globalny kryzys finansowy relatywnie lepiej, niż banki z krajów UE-15. Jednakże pokryzysowe zmiany regulacyjne w UE będą mieć negatywny wpływ na ich dalszą dynamikę rozwoju.

Słowa kluczowe: regulacje bankowe, efektywność i stabilność banków, banki w EŚW

Kody JEL: G21, G28