# DO SAFE BANKS CREATE SAFE SYSTEMS?
## CENTRAL AND EASTERN EUROPEAN BANKS' PERSPECTIVE

**Ewa Miklaszewska, Katarzyna Mikołajczyk**
*Cracow University of Economics*
**Małgorzata Pawłowska**[1]
*Warsaw School of Economics, National Bank of Poland*

The aim of this paper is to contribute to the discussion on the anticipated long-term impact of the post-crisis regulatory environment on bank stability and efficiency, with a focus on Central and Eastern European (CEE) banks. The main research question is whether relatively stable CEE banks, operating in an unstable global environment, will be negatively affected by post-crisis European regulatory architecture. To answer this question, this paper analyses how CEE banks performed in two different periods: the pre-crisis period of dynamic credit market expansion and the period of global economic slowdown after 2008 crisis. Bank efficiency and performance is measured using DEA methodology, competitive conditions' measures (H-statistics) and Z-score index.

*Keywords:* banking regulation, bank efficiency, bank competition, CEE banks.

Although the 2008 financial crisis affected the entire world, for the first time the leading industrialized nations were more affected than the emerging countries, for whom the crisis was largely secondary in nature, in this respect making the crisis unique (IMF, 2010a). However, its long term consequences, both direct in terms of changing strategies of foreign owned banks, and

1. The views expressed in this paper are the views of the authors and do not necessarily reflect those of the National Bank of Poland.

*e-mail:* uumiklas@cyf-kr.edu.pl; efmikola@cyf-kr.edu.pl;
*e-mail:* mpawlo1@sgh.waw.pl, malgorzata.pawlowska@nbp.pl

indirect in the form of a necessary adaptation to new global and European regulations, are borne by all countries.

Economic theory provides some contrasting evidence as to the impact of bank regulation and supervision on bank performance (e.g. Barth *et al.* 2004, 2008 and 2010). Furthermore, as noted by Chortareas *et al.* (2012) and Delis *et al.* (2011), most research in this area concentrates on banking markets in highly developed countries. Thus this paper concentrates on the long-term impact of new, post-crisis regulatory architecture, on a relatively homogeneous group of Central and Eastern 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 euro zone. They are at a similar stage of institutional development, financial and macroeconomic reform, and banking sector depth (IMF, 2010b). Before the global crisis of 2008, their banking sector enjoyed rapid growth, 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? The empirical part of the paper is based on the non parametric Data Envelopment Analysis (DEA) technique, measures of market competition and bank stability index Z-score, using Bankscope Database. The paper is organised as follows: the first part describes the foundation of post-crisis European regulatory and supervisory architecture. Following this, we discuss 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 (2002-2011), using DEA methodology, market competition measures and Z-score calculations. In the concluding section we present the anticipated long-term consequences of the post-crisis regulatory and supervisory architecture on CEE banks.

## 1. Building post-crisis regulatory architecture

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 (IMF, 2013). Banks were safe, but inefficient, and losing market share to non-banking firms. 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. 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 (Allen *et al.*, 2011). In the pre-crisis period, the dominant source of bank efficiency stemmed from expansion into new markets, non depository funding and non interest-based sources of profits (Demirgüç-Kunt and Huizinga, 2009), and the adoption of new models for conducting banking activities, based on product synergies, scale and scope benefits and global coverage. Table 1 demonstrates how dramatically the biggest banks' assets have expanded in the deregulation period.

Changes in bank scale and scope of activities were facilitated by the new regulatory philosophy, as exemplified by the shift from the Basel 1 to Basel 2 regulatory framework, where market discipline and bank self-regulation were intended to replace tight supervision. The 2007-2009 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 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.

Table 1. The largest global banks by assets, $ bln, in selected years

| 1985 | | 1995 | | 2009 | |
|---|---|---|---|---|---|
| Top banks | Assets | Top banks | Assets | Top banks | Assets |
| Citicorp | 167 | Deutsche Bank | 503 | BNP Paribas | 2 965 |
| Dai-Ichi Kangyo B. | 158 | Sanwa Bank | 501 | RBS | 2 750 |
| Fuji Bank | 142 | Sumitomo Bank | 500 | Crédit Agricole | 2 441 |
| Sumitomo Bank | 135 | Dai-Ichi Kangyo B. | 499 | HSBC | 2 364 |
| Mitsubishi Bank | 133 | Fuji Bank | 487 | Barclays | 2 235 |
| BNP | 123 | Sakura Bank | 478 | Bank of Am. | 2 223 |
| Sanwa Bank | 123 | Mitsubishi Bank | 475 | Deutsche Bank | 2 162 |
| Crédit Agricole | 123 | Norinchukin Bank | 430 | JP Morgan | 2 032 |
| Bank of America | 115 | Crédit Agricole | 386 | Mitsubishi FG | 2 026 |
| Credit Lyonnais | 111 | ICBC | 374 | Citigroup | 1 857 |

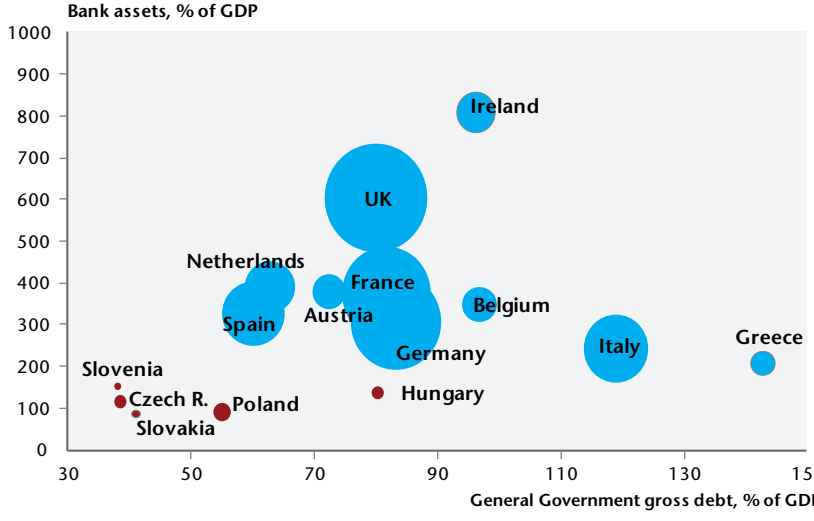
*Source:* Data for 1985 and 1995: *The Economist*, 2006; for 2009: *The Banker*, 2010.

The global financial crisis of 2007–2009 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 most frequent restructuring pattern for global banks turned out to be partial or total nationalization (World Economic Forum, 2010). As a result, 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). Figure 1 illustrates that in CEE, relatively small banks operate in relatively safe macroeconomic environment (moderately indebted countries). However, some European countries have inflated banking sectors' assets, and a limited possibility of further government stabilizing intervention, due to large budget deficits.

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). Basel 3 focused on strengthening prudential regulations, mostly by requiring more and better capital

and better loss absorption capacities by large banks (BIS, 2010). EU and US authorities have supplemented Basel 3 by instituting complex supervisory infrastructures, based on a number of newly created institutions together with a redefinition of the objectives and prerogatives of those already in existence (Masciandaro *et al.*, 2011). The complexity of banking regulation, plus overlapping prerogatives on newly created institutions, have considerably increased regulatory costs on banks. Moreover, in the EU, the new institutional safety net has not been implemented consistently and has been modified according to changes in macroeconomic priorities: from financial stability (EBA–based framework) to financial growth (ECB-based framework), which has led to increased organisational uncertainty.

**Figure 1. 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.

## 2. New European supervisory architecture and the CEE

The New European Supervisory Architecture was constructed upon three pillars (Masera, 2010 and Masciandaro *et al.*, 2009):

— Macro-prudential supervision, assured by the European Systemic Risk Board (ESRB). 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 is 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 main tasks of the ESRB are (Giovannini, 2010 and Beck *et al.*, 2010) to establish adequate procedures to obtain information about macro-economic risks for financial stability, to identify macro-prudential risks in Europe, to provide early risk warnings to EU supervisors and other relevant actors and to determine how to achieve effective follow-up to warnings/recommendations.

The EU new institutional regulatory structure of 2010 was based on the perceived necessity to deal with systemic risk, which entails considerable costs and regulatory burdens, particularly for countries where 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).

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 and the aim to harmonize the supervisory activities in the EU had to reconcile with different national objectives and institutional arrangements (Masciandaro and Quintyn, 2008). The European Banking Authority has been created as the new micro-prudential bank regulator, with 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 was 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 had 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 and to foster depositor and investor protection by improving transparency and disclosure of information. However, EBA turned out to be week in a subsequent clashed with strong national regulators in the EU and the hopes placed in its role and authority have not materialized.

The views have been expressed that global financial stability and cross-border banking cannot be supported by nationally based supervision. The "financial trilemma' states that financial stability, financial integration and national financial policies are incompatible (Schoenmaker, 2011), and hence a single supervisory power and lender of last resort function should be centralised in the ECB. There has also been growing recognition that a supervisory system focusing predominantly on bank safety may actually produce lower economic growth. Consequently, the ECB seems to be better equipped to prevent banking contractions and to stimulate growth with cheaper loans and investment programmes to generate growth. These arguments were crucial to the decision by the European Council and the Euro Area Summit in June 2012 to move ahead from the coordination of national banking supervision towards an integrated system, whereby the large banks within the euro zone will come under the direct supervision of the ECB, planned initially for January 2014 and later moved to March 2014.

The Banking Union will consist of three parts: a common banking supervisor (Single Supervisory Mechanism, SSM), a common resolution framework and a common deposit guarantee scheme, the latter two to be constructed at a later date.

From 2014, the ECB will become responsible for tasks such as authorizing credit institutions compliance with capital, leverage, and liquidity requirements and carrying out supervision of financial conglomerates. The ECB will be able to take early intervention measures by requiring bank to take remedial action. Initially there was a proposal that the ECB should be directly responsible for all 6,000 euro zone banks, on the principle that during a financial crisis, even a relatively small bank may threaten the entire financial system. Under a compromise forged with national regulators, the ECB will now oversee large banks with more than 30 bn euros in assets, or with 20% of national GDP (around 200 of the biggest European banks). In addition, the Single Supervisory Mechanism is a precondition for allowing the possibility of a direct recapitalization of banks by the European Stability Mechanism (ESM) – the euro zone's permanent bailout fund. Consequently, the Banking Union confers strong powers on the ECB, with an option for non-euro countries to join it on a voluntary basis. In contrast to the European Banking Authority, which affected EU banks indirectly, setting the rules and harmonising standards, the ECB will be able to impose its will directly on the largest banks within the euro zone.

The idea of a Banking Union has sometimes been depicted as the result of a choice between either "returning to the past", where banks focus their activities on their countries of origin, or establishing a Banking Union, where banks would be encouraged to diversify across the EU and where supervision would be at the European level (Avaro and Sterdyniak, 2014). However, this alternative disregards the diverse structures of the EU banking systems and overlooks the challenges and threats which are created to smaller banks. That is why, although EU states outside the euro area may sign up to the Banking Union, in most non-euro based countries they hesitate to do this.

The stability of the financial sector depends on the ability to establish independent, strong and respected supervision. CEE countries are host markets to global banks, hence the national

regulators have already a limited powers (Lizal, 2011). Shifting decision-making powers to new European centres may further weaken domestic supervision in CEE countries. Before the crisis, there was a discussion as to whether banking supervision in the EU should be centralized in the ECB. After the crisis, one of the arguments for placing it within an independent institution (EBA) was that 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. The composition of the EBA supervisory board illustrates it well: out of a total of 27 EBA supervisory board members, 14 are national central banks and 13 are independent authorities (EBA, 2011).

All CEE-5 countries have adopted an integrated supervisory regime, although differently placed (Apinis *et al.,* 2010). 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 established 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. The reasons for this trend towards building an integrated supervisory system in some CEE countries are unclear. The most frequent justification was to point out to the creation of synergies, but the financial markets in CEE are relatively small, without much scope for a synergy effect.

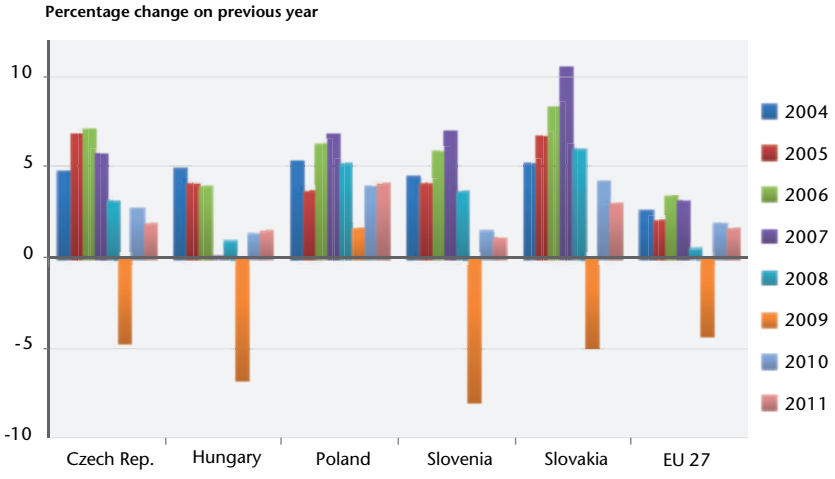
## 3. Banking sector in CEE-5 countries: main characteristics

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 with exports contributing 60-80% of GDP (with the exception of Poland, which has the largest domestic market), 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 (Ernst & Young, 2007). The process of fundamental bank reforms, economic restructuring and privatization has now largely been completed in these countries. After EU accession in 2004, CEE countries enjoyed rapid economic and banking sector growth. The global crisis of 2007-2009 had a negative effect on the assessment of this region as economic growth collapsed (Figure 2). The first and most seriously affected country was Hungary; the sharpest decline in output was in Slovenia, while Poland managed to keep in positive GDP and credit growth throughout the crisis.

Before the crisis, CEE countries enjoyed dynamic banking sector growth and high bank profitability (average ROE above 20% till 2007). Despite numerous gloomy projections, the macro-economic and profitability figures remained good throughout the crisis and

bank performance in CEE-5 countries was less affected by the crisis than in the old EU countries.

**Figure 2. Real GDP growth rates**




Source: Eurostat.

A relatively liberal financial sector combined with large foreign ownership has been another distinguishing feature. Poland has the largest and low concentrated banking sector (the lowest C5 ratio in Table 2) with low dependence on sophisticated financial instruments and relatively low leverage: total loans to total deposits around 100%. 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).

In CEE-5 countries banks have remained small, following a traditional model of banking intermediation, and not presenting a significant systemic risk (Table 3). Foreign banks invested heavily in the CEE region right from the beginning of the transition period and only in Poland and Slovenia some large banks are still controlled by the State or domestic private capital.

### Table 2. CEE-5: Macroeconomic and banking key figures

| | Total loans as % of GDP | | Total loans as % of total deposits | | C5 Ratio | Bank assets (bil. EUR) | % Share of foreign banks |
|---|---|---|---|---|---|---|---|
| | 2006 | 2009 | 2006 | 2009 | 2009 | 2009 | 2009 |
| **CZE** | 45 | 58 | 67 | 75 | 62 | 160 | 87 |
| **HUN** | 63 | 79 | 119 | 130 | 55 | 126 | 91 |
| **POL** | 35 | 57 | 79 | 102 | 44 | 274 | 63 |
| **SVK** | 48 | 49 | 110 | 142 | 72 | 54 | 94 |
| **SVN** | 69 | 101 | 119 | 146 | 60 | 53 | 37 |
| **EU 27** | 146 | 162 | 143 | 113 | 44 | 42 144 | – |

*Source:* ECB (2010) and Raiffeisen Research (2011).

### Table 3. The largest banks by assets in CEE-5 countries, 2009

| Bank/Country | Bank assets mln.EUR | Bank assets as % of country GDP | Main shareholder |
|---|---|---|---|
| **Czech Republic** | | | |
| 1. Ceskoslovenska Obchodni Banka A.S. (CSOB) | 32 462 | 23.7 | KBC (BE) |
| 2. Ceska Sporitelna a.s. | 32 317 | 23.5 | ERSTE Group (AT) |
| 3. Komercni Banka | 26 268 | 19.1 | Societe Generale (FR) |
| **Hungary** | | | |
| 1. OTP Bank Plc | 36 006 | 38.7 | Private global investors |
| 2. MKB Bank Zrt | 11 466 | 12.3 | Bayerische Landesbank (DE) |
| 3. K&H Bank Zrt | 11 311 | 12.2 | KBC (BE) |
| **Poland** | | | |
| 1. PKO BP SA | 38 109 | 12.3 | State |
| 2. Bank Pekao SA | 31 810 | 10.3 | Unicredit (IT) |
| 3. BRE Bank SA | 19 732 | 6.4 | Commerzbank (DE) |
| **Slovenia** | | | |
| 1. NLB dd-Nova Ljubljanska Banka d.d. | 19 606 | 56.2 | State (33%), KBC (30%) |
| 2. Nova Kreditna Banka Maribor d.d. | 5 786 | 16.6 | State |
| 3. Abanka Vipa dd | 4 557 | 13.1 | Domestic private investors |
| **Slovakia** | | | |
| 1. Slovenska sporitel'na as-Slovak Savings Bank | 11 485 | 18.1 | ERSTE Group (AT) |
| 2. Vseobecna Uverova Banka a.s. | 9 852 | 15.6 | Intesa Sanpaolo (LU) |
| 3. Tatra Banka a.s. | 9 014 | 14.2 | Raiffeisen (AT) |

*Source*: Own calculations, based on Bankscope database.

Through the 2007-2009 crisis, banks in CEE-5 countries have remained profitable and well-capitalized, except for Slovenia. On average, the Polish and Czech Republic top banks were least affected by the crisis, while the Hungarian ones were quickest in regaining stability and recapitalization. Austrian banks were among the first to enter CEE, followed by Italian, and later Belgian and French banks. Consequently, UniCredit, Raiffeisen and Erste are the largest CEE players (UniCredit, 2010). The investment in CEE-5 banks turned out to be very profitable, not only from 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.

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).

## 4. CEE-5 banks' efficiency: DEA results

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, technical and scale efficiency in the period 2002-09 has been investigated, using DEA technique, based on the Bankscope database. Only commercial and savings banks were analysed. 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 (Charnes *et al.,* 1998). 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). 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. 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 has been analysed assuming constant, variable and non-increasing returns to scale. The following symbols have been applied:

— E_crs – measure of technical efficiency under constant returns to scale assumption,

— E_vrs - measure of technical efficiency under variable returns to scale assumption,

— E_n – measure of technical efficiency under non-increasing returns to scale assumption.

For the above three efficiency measures (E_crs, E_n, E_vrs), 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 (CCR and BCC-models) we have the definition of scale efficiency: $E\_s = E\_crs/E\_vrs$. If $0 < E\_crs < E\_vrs \leq 1$, this means that scale efficiency $e\_s < 1$ and the given bank/firm is scale inefficient (but we do not know if it is too big or too small). Based on scale efficiency measure (E_s) only, it is not possible to distinguish in which region

the given bank/firm 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/firm is not scale efficient and is operating with increasing returns to scale. If E_n > E_crs, this means that bank/firm is operating with decreasing return to scale.

In order to test how bank efficiency changed over the period 2002-2009, an efficiency analysis has been carried out for the banking sectors in the Czech Republic, Slovakia, Slovenia, Hungary and Poland. The model chosen for estimation of efficiency is the expanded BCC model, output-oriented. In the technical efficiency analysis according to the DEA method, we have applied the classification of input and output based on *value added approach* (VAA) proposed by 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 efficiency analysis according to DEA method of E_crs and E_vrs measures in the period 2002-2011 are presented in Table 4.

**Table 4. Efficiency measures of CEE-5 countries**

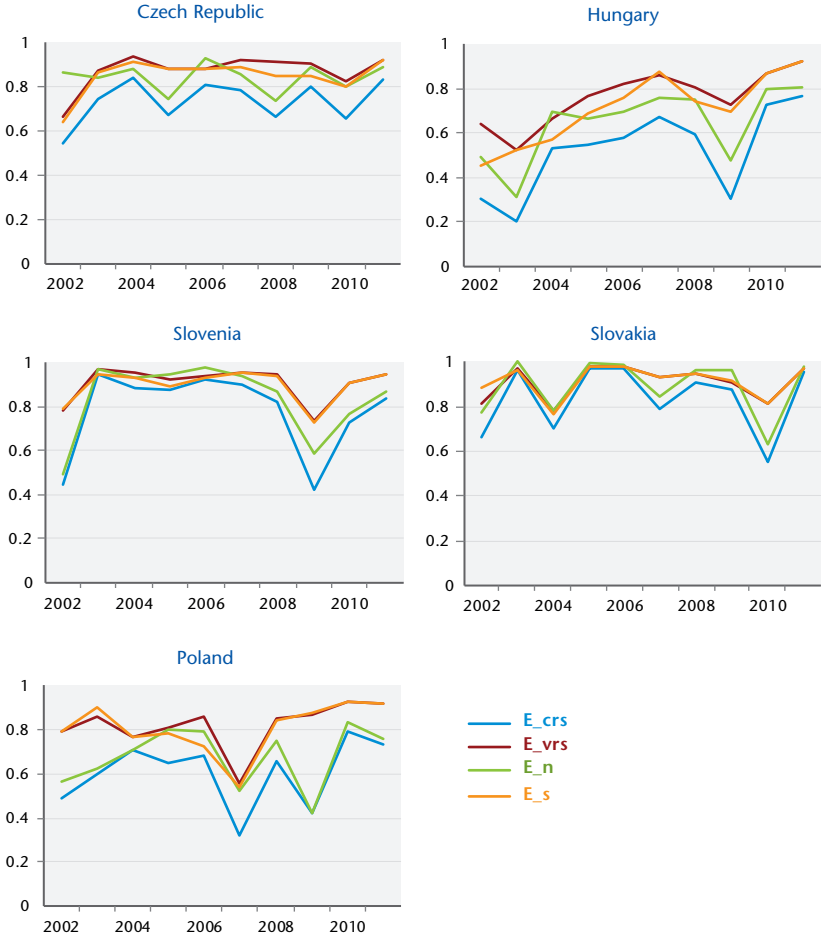
| Year | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | No. of banks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | E_crs | | | | | |
| **Czech Rep.** | 0.55 | 0.74 | 0.84 | 0.68 | 0.81 | 0.79 | 0.66 | 0.80 | 0.66 | 0.83 | **27** |
| **Poland** | 0.49 | 0.59 | 0.71 | 0.65 | 0.68 | 0.32 | 0.66 | 0.42 | 0.79 | 0.73 | **41** |
| **Slovakia** | 0.65 | 0.96 | 0.70 | 0.97 | 0.97 | 0.79 | 0.91 | 0.87 | 0.55 | 0.95 | **17** |
| **Slovenia** | 0,44 | 0.95 | 0.88 | 0.88 | 0.92 | 0.90 | 0.82 | 0.42 | 0.71 | 0.83 | **19** |
| **Hungary** | 0.30 | 0.20 | 0.53 | 0.55 | 0.58 | 0.68 | 0.59 | 0.30 | 0.73 | 0.76 | **32** |
| | | | | | | E_vrs | | | | | |
| **Czech Rep.** | 0.67 | 0.88 | 0.94 | 0.88 | 0.88 | 0.92 | 0.91 | 0.90 | 0.82 | 0.92 | **27** |
| **Poland** | 0.80 | 0.86 | 0.77 | 0.81 | 0.86 | 0.56 | 0.85 | 0.87 | 0.93 | 0.92 | **41** |
| **Slovakia** | 0.81 | 0.97 | 0.78 | 0.98 | 0.98 | 0.93 | 0.95 | 0.91 | 0.81 | 0.97 | **17** |
| **Slovenia** | 0,78 | 0.97 | 0.96 | 0.93 | 0.94 | 0.96 | 0.94 | 0.73 | 0.91 | 0.94 | **19** |
| **Hungary** | 0.64 | 0.52 | 0.67 | 0.76 | 0.82 | 0.86 | 0.80 | 0.73 | 0.87 | 0.92 | **32** |

*Source:* Own calculations, Bankscope database.

The results of the analysis have 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, efficiency in all analysed countries decreased in 2008-2009, most dramatically for Hungarian banks. In 2010-2011, efficiency increased, especially in Poland.

**Figure 3. DEA indicators for banking sectors of CEE-5 countries (2002-11 means)**




*Source:* Own analysis, BankScope database.

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) (Figure 3). The result of comparison in 2011 showed that the majority of examined banks in Poland and the Czech Republic were operating with increasing or constant returns to scale region (for the majority of banks E_n = E_crs). 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 in Poland were operating with increasing returns to scale, which means that there is still room for new M&A.

## 5. Banking market competitive conditions in CEE-5

Anayiotos *et al.* (2010), researching the relative efficiency of East European banks using DEA technique, showed that DEA efficiency scores before the recent crisis were strongly linked to the host country level of development. Miklaszewska and Mikolajczyk (2011) pointed to the importance of bank home-country governance model: better efficiency results were recorded by banks controlled by foreign institutions govern by shareholder model (i.e. US) than those controlled by European capital (area with the stakeholder model). Lensink *et al.* (2008) indicated that domestic institutional structure did matter for bank efficiency. Thus, assuming the importance of host country conditions, our next 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; Yildirim and Philippatos, 2007; Bikker and Bos, 2008).

In order to estimate the H-statistic for the Polish banking sector, we used the reduced form of revenue equation, where 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]:

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

2. The sum of regression ratios ($a_1+a_2+a_3$) determines the value of H statistic for the sector of commercial banks.

The panel data for this analysis comprises data from BankScope and cover 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 ($H_2$) (Table 5). We also made additional estimation for the period from 2010 to 2011, for the two variants of reduced form of revenue equation.

**Table 5. Value of H statistic for CEE-5**

| Estimations results with time interaction terms for overall sample: | | *Dependent variable: Interest Income* | | | | |
|---|---|---|---|---|---|---|
| | | Czech R. | 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) |
| $H_3$ | 2002-2009 | -0.25 | 0.35 | 0.28 | 0.30 | 0.16 |
| $H_4$ | 2010-2011* | -0.16 | -0.14 | -0.13 | -0.45 | 0.07 |
| **Estimations results with time interaction terms for overall sample:** | | *Dependent variable: Interest Income/ Total Assets* | | | | |
| | | Czech R. | 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) |
| $H_3$ | 2002-2009 | 0.43 | 0.55 | 0.70 | 0.53 | 0.68 |
| $H_4$ | 2010-2011* | 0.15 | 0.30 | 0.01 | 0.07 | 0.19 |

* Tentative results.
*Source:* Own analysis, BankScope database.

The empirical results with respect to the H-statistic in the period 2002-2009, have shown 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 and 2007 (before the financial crisis) 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)*. In the period between 2010 and 2011 competition decrease in the CEE-5 banking sectors.

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. In the period 2008-2009, the slight decrease in competition resulted from the financial crisis' consequences.

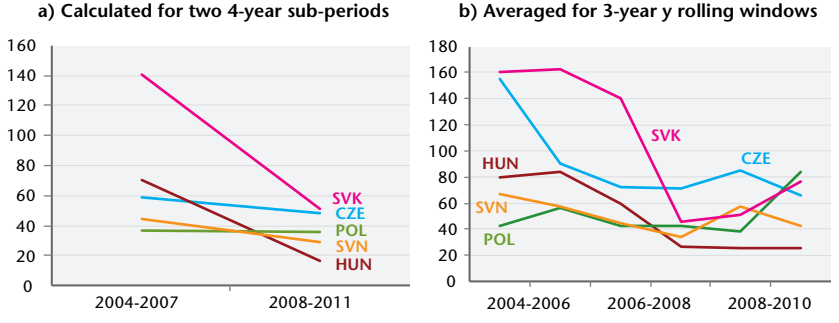
## 6. CEE-5 bank soundness

In the post-crisis period, bank risk/return preferences have shifted towards risk minimizing, both globally and in the CEE countries. However, 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. 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.

$$Z - Score_t = \frac{\overline{ROA} + \overline{CAR}}{\sigma(ROA)} \qquad [2]$$

The Z-Score is calculated in two different ways. Firstly, it is calculated for two 4-year periods: 2004-2007 and 2008-2011. That allows to compare the average results in two different macroeconomic conditions, pre-crisis credit-boom vs. crisis and post-crisis downturn (Figure 4a). However, in order to analyze the impact of growing instability on financial markets, the average Z-Score was also calculated in 3-year rolling windows, starting from 2004-2006 period and terminating in 2009-2011 (Figure 4b). The banks 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.

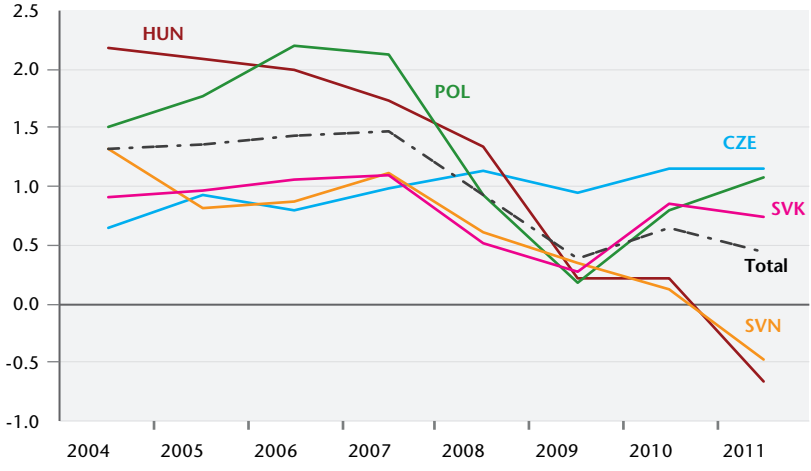
Figure 4. Z-Score for banks in CEE-5 countries




*Source:* Own calculations, based on Bankscope database.

When calculated for two sub-periods, Z-Score indices substantially diminished, on average from 64 to 36. The decrease could be observed in all countries, especially for the Slovak and Hungarian banks. This resulted mainly from changes in their profitability, both the lower level and higher volatility. The average return on assets for all banks included in this study was gradually rising from 1.32% in 2004 to 1.47% in 2007, then diminished to its lowest level 0.39% in 2009, and slowly increased thereafter. However, after 2009 there are two different paths for CEE-5 countries: gradual recovery for Polish, Czech and Slovak banks, and deep decrease for Slovenian and Hungarian banks (Figure 5).

**Figure 5. Return on assets (%) for banks included in the study, by countries**




*Source:* Own calculations, based on Bankscope database.

Calculations in 3-year rolling windows allow to see gradual character of changes in the Z-Sore level. Thus our results indicate a sharp decline in bank safety in CEE-5 countries in the 2007-2009 period, triggered by the crisis. Its main reason was not only 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. However, the restored profitability in most banks accompanied by the higher capitalization ratios after 2009 resulted in the increase of the Z-Score for the final sub-periods.

## 7. Rethinking bank regulation: concluding remarks

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 clear. CEE banks entered the crisis in good shape, after their successful restructuring in the 1990s and dynamic economic growth following EU accession. Because of the high profitability generated by the traditional bank intermediary model, many global risk areas had not developed there. Consequently, the CEE-5 banks emerged from the 2008 crisis relatively unscathed and not in need of fundamental restructuring. During

the crisis, their global owners behaved responsibly, restraining from depleting bank capital, although M&A did intensify as a result of restructuring carried out by bank foreign owners.

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 and it can be concluded that in CEE, strong banks create sound systems, which have survived the global financial crisis relatively well. 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 a banking union will strengthen it even further, by giving strong supervisory powers to ECB and creating a mechanism of shared bank rescue burden for the euro zone members. Moreover, this step will weaken the current European supervisory structure based on EBA governance, before it managed to demonstrate its performance. The banking union, instead of deleveraging big banks, will create another rescue vehicle for them, increasing moral hazard behavior. For CEE banks, with small and competitive banking sectors, it may increase the tendency for bank concentration, away of the healthy and competitive banking model.

To conclude, the post-crisis complex regulatory and supervisory model, which has emerged in the EU, based on a number of new regulatory bodies with overlapping competencies and a central stabilizing role play for large banks by the ECB, may not produce the desired more efficient and stable banking system, particularly in the peripheral countries with competitive banking markets, such as the CEE.

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