

Impact of European Integration on Efficiency and Productivity Growth of Romanian Banks

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In this paper we use a non-parametric stepwise approach to examine the efficiency and productivity of Romanian banking industry and its determinants in the face of European integration, during a five-year period, from 2004 to 2008. We limit our sample to this period in order to exclude the effect of the global financial crisis on production performance of the banking industry. Moreover, 2004-2008 is an important period because during this time frame, Romania was being considered for membership to European Union and for that reason Romanian authorities implemented a set of mandatory legislative improvements that accelerated the path towards market economy. We develop a two-stage empirical model that involves estimating bank performance in the first stage and assessing its determinants in the second one. In order to measure the productivity growth of the banking industry, we calculate Malmquist productivity growth index using a non-parametric linear programming approach.

Our results suggest that during the period under study, the privately-owned banks in Romania have been significantly more efficient and have enjoyed a higher productivity growth compared with the state-owned banks. Results of this research may offer directions to banking regulators for institution of suitable policies for encouraging banks to employ more efficient production practices and to supply high quality services at the lowest costs possible. The policy implication of our findings are a) Romanian banking firms should alter their "input mix" to reduce operational costs in order to enhance their efficiency and b) Romanian government authorities need to design regulatory acts to promote mergers and acquisition among banks to assist them to improve their overall efficiency by expansion and achieving optimal size.

Keywords: *efficiency, productivity, banks, Romania, European integration.*

Introduction

The creation of effective and efficient banking industry constituted an important objective for Romania in the process of economic reform and conversion from centralized to market economy. Achieving this objective required the liberalization of price formation, flow of goods and services and capital, as well as the innovative regulation of the banking market. The operations of banks in Romania underwent a significant change in the nineties, due to the economic transformation, new social and political order and environment. As such, like in any other emerging economy, Romanian banking industry needed series of regulatory reforms to function properly, with a higher degree of reliability, competency, and viability.

In addition, due to the continued transition from command to market economy and the European Union accession, the Central and Eastern European countries have been engaged in a series of liberalization, privatization and recapitalization exercises in the banking sector, which has made the banking market more competitive. It follows that the study of the efficiency of banking has become extremely important in view of the fact that the results of such study may aid the policy makers to initiate policies to promote efficient banking operations.

Information concerning the extent and trend towards efficiency plays an important role in the formulation of policies to enhance the performance of the banking industry. It is no surprise that the measurement of efficiency and performance of the banking firm has been the focus of interest for academicians, practitioners and regulators. Academic research has extensively focused on measuring efficiency of the banking industry using several methodologies. As a result, there exists a voluminous literature on the topic of banking efficiency, built up during last two decades. The focal point of this body of research has been both in developed and emerging countries. However, in papers pertaining to developed countries, attention has been centered on the analysis of market structure, deregulation of financial institutions and their impacts on efficiency. In studies concerning emerging countries, the focus has generally been on examination of the banking reforms, privatizations of the state banks, foreign direct investment in the banking industry, and the effects of public/regulatory policies on the efficiency of banking firms. (See for instance: Bonin *et al.*, 2005; Yildirim & Philippatos, 2007; Brissimis *et al.*, 2008; Koutsomanoli-Filippaki *et al.*, 2009; Asafei & Kumbhakar, 2008; Delis *et al.*, 2011).

The success of the economic transition in the 1990s, growth of privatization and equivalent progress path fostered by the EU accession has boosted the interest of researchers in the region (Kosak & Zoric, 2011) and the cross-country efficiency study of CEE banking sectors has received particular attention in the literature. In their study, Fang *et al.*, (2011) report that the institutional development measured by progress in banking regulatory reforms, privatization and enterprise corporate governance restructuring, has a positive impact on bank efficiency. Brissimis *et al.*, (2008) examine the relationship between banking sector reform and bank performance and their results indicate that both banking sector reform and competition exert a positive impact on the bank efficiency, while the effect of reform on total factor productivity growth is significant only by the end of the reform process.

Pasiouras *et al.*, (2009) using stochastic frontier analysis show that banking regulations that enhance market discipline and empower the supervisory power of the authorities increase both cost and profit efficiency of banks. The improvement in efficiency and productivity growth of the banking industry is one of the major concerns of public authorities since it contributes to the profitability and optimum functioning of banking firms, ensuring stability of the financial system. An efficient banking industry brings about a lower cost of intermediation to its customers, improvement of the quality of financial services and optimal allocation of resources

While there is extensive literature on efficiency and productivity analysis of banking sector in both advanced and emerging markets, little attention has been focused on Romanian banking sector, during country's transition from command to market economy and European integration process (Andries and Cocris, 2010). There are, nevertheless, several papers in which attempts have been made to perform a comparative analysis stressing the impact of property rights on banks' efficiency and productivity growth (Fries & Taci, 2001; Grigorian & Manole, 2002; Weill, 2003; Hasan & Marton, 2003; Bonin, *et al.*, 2005; Fries & Taci, 2005; Rossi *et al.*, 2005; Havrylychuk, 2006; Yildirim & Philippatos, 2007; Koutsomanoli-Filippaki *et al.*, 2009, Andries, 2011).

In this paper, we develop a unified framework to assess how financial liberalization and reforms in the banking sector applied within the context of European Union integration, as well as the associated changes in the industry structure, impact the banking performance, measured in terms of cost efficiency and total productivity growth of the Romania banking industry for a period from 2004 to 2008. We limit our sample to this period in order to exclude the effect of the global financial crisis on production performance of the banking industry. To do this, we develop a two-stage empirical model that involves estimation of bank performance in the first stage and assessing its determinants in the second one.

We attempt to fill the gap in the banking literature by providing evidence on the evolution of banking efficiency and productivity growth in Romania following the European Union accession process.

We believe 2004-2008 is an important period because during this time frame Romania was being considered for membership to European Union and for that reason

Romanian authorities implemented a set of mandatory legislative improvements that accelerated the path towards market economy. Upon acceptance, Romanian banking system was required to comply with the regulatory regime and structure practiced by other members of EU.

We hypothesize that the integration of European economies would foster an intense competitive banking environment in which survival of Romanian banks depend on enhancing their efficiency and viability. Thus, the examination of efficiency and productivity growth of Romanian banking industry is warranted since the outcome provides valuable information regarding the efficiency position of Romanian banks in this state of increased competition. Results of this research, furthermore, may offer directions to banking regulators for institution of suitable policies for encouraging banks to employ more efficient production practices, supply high quality services at the lowest possible costs.

To start, we use Data Envelopment Analysis (DEA) approach to compute overall cost efficiency and its components: overall technical efficiency and allocative efficiency. In addition, we examine the Malmquist productivity growth index and its elements (technical efficiency change and technological change). The DEA approach is nonparametric in nature and involves solving a set of linear programs to construct a host of efficiency frontiers relative to which efficiency of each bank in the sample is assessed.

Furthermore, we identify several economic and accounting variables to test empirically whether they are statistically associated with the level of efficiency and productivity growth in Romanian banking sector. This is a very significant contribution, since the detection of sources of inefficiency supplies both bank managers and regulators helpful information to seek remedies for mitigation of inefficiency problems.

One of the major findings of this paper is that private banks are significantly more efficient and have enjoyed higher productivity growth compared to state-owned banks over the period under study. It follows that to achieve higher efficiency and productively growth, Romanian regulators should design policies and regulatory acts to promote more privatization and competition.

The rest of the paper is organized as follows: Section 1 describes the banking system in Romania; Section 2 explains data and methodology; Section 3 discusses the empirical results; and Section 4 contains summary and conclusions of the paper.

The reform and modernization of Romanian banking system after 1990

The year 1989 marked the beginning of the transition of Romanian economy from centralized to market economic system. The transition proved to be much more complicated than initially thought of, entailing reforms in the political, economic, financial, banking and social area (Cerna *et al.*, 2004).

Following the 1989 revolution, Romanian banking system went through a period of profound transformations, evolving from a mono-bank type, specific to a command economy, to a two level-tier banking system: on one level

the National Bank of Romania (NBR, the central bank of Romania) and on the other, the commercial banks.

Romanian banking system underwent a complex process from the imminent systemic crisis in the late nineties, to a modern, sophisticated banking system, and more adapted to the international standards. For instance, during 1990 to 1998 a series of regulatory acts were passed, including those related to banking activities, the Statute of the National Bank of Romania and the law for the privatization of banks. These regulations were considered to be essential for the development of an effective and efficient banking system in particular and of the economy in general.

Starting 1999, the National Bank of Romania initiated a banking restructuring program. The goal of this program was to reduce overall risk of the banks' operations, to improve the quality of prudential supervision and, prevent banks from functioning under inadequate net worth. In addition, NBR established a regulatory mechanism to guarantee the safety of banks' deposits and introduced a bank rating and early warning scheme, along with a legislative framework to discourage fraudulent behavior in the banking sector. The extensive intervention of the central bank to regulate effectively the banking industry was successful starting with 2004. The banks initiated steps to restructure their organizations, make operations profitable and diversify their service offerings. Moreover, superior economic growth and improved purchasing power of the population resulted in the expansion of banking system assets. As competition in the banking market intensified, profitability, cost reduction initiatives and the level of capitalization became the main determinants of the ability of banks to manage their risks.

The year 2005 represents a pivotal time for Romanian banking system. Connected to the European integration process, during this time, series of major events occurred, such as implementation of European mandates regarding the New Capital Agreement Basel II and the continuation of the liberalization process for the capital account. At the same time, the banking industry privatization procedure registered great progress by finalizing the third and last stage of privatization of the Romanian Commercial Bank,

the largest bank in the industry. Another noteworthy event in 2005 was the denomination of national currency (the "four zeros" cut), useful for closing the inflationary period, to recover the trust in the national currency, as well to minimize overall costs to the banking system and simplification of future process of adopting euro as a national currency.

In 2006, a set of policy actions was taken by Romanian government in preparation for joining the European Union on January 1, 2007. The aims of these actions were to enhance the possibility that the economy continue with favorable performances concerning disinflation and economic growth. Under these circumstances, Romanian banking industry strengthened its dominant position in the financial system, with significant growth, due to sustained dynamics along with maintaining financial stability indicators at reasonable levels.

Romanian banking system enjoyed more growth in 2007, on a similar trajectory to prior years. This development includes robust growth in intermediation, based on launching and maintaining diverse product offerings to catch-up with the European Union level, establishing advanced and dynamic credit market, reducing deposit-loan ratio, due to focusing on cheaper external financing. Deposits attracted from companies and households constituted the main sources of funds for banks in 2007, though, the level of these "domestic deposits" have continuously decreased since then. However, given the instability in the international financial markets and potential liquidity problems, it became crucial for Romanian banks to identify domestic resources in order to elevate the level of deposits, with correspondingly less focus on external financing.

Table 1 displays the number of Romanian banks and branches of foreign banks in Romania from 2004 to 2008. As can be seen, since 2004, the number of private owned banks with mostly foreign capital has increased significantly. These banks had a high financial supporting capacity from the parent banks and high possibilities to oblige the increased prudential requirements introduced by NBR.

Table 1

Structural indicators of Romanian banking system

Indicator	2004	2005	2006	2007	2008
Number of credit institutions	40	40	39	42	43
Banks with majority private capital	38	38	37	40	41
Banks with majority foreign capital. of which:	30	30	33	36	37
Foreign bank branches	7	6	7	10	10
Banks with majority private capital including foreign bank branches (percent)	93.1	94.0	94.5	94.5	93.6
Banks with majority foreign capital including foreign bank branches (percent)	62.1	62.2	88.6	87.8	86.7

Source: National Bank of Romania - Financial Stability Report 2009

Following Romania's admission to the European Union in January 2007, Romanian banks faced direct competition with the foreign banks. In other words, the statute of the EU membership led to a more competitive banking environment in which, the profitability of Romanian banks became dependent on keeping sizeable market share, building up a loyal customer base and offering a set of highly marketable products to enjoy economies of scale and scope.

The competition resulted in the boost in foreign capital and the foreign banks subsequently followed the natural route of consolidation as evident in the rise of registered capital. In addition, one can observe a slight tendency of increase in external liabilities and their contribution to financing activities of the banking industry. Notably the presence of foreign banks is a blessing to the market place, since their existence increases competition which brings about lower interest rate charges for loans. This was because

the foreign banks had access to cheaper capital from the euro area, where the inflation rate and risk were lower.

As can be seen from the data exhibited in *Table 1*, the organizational structure of Romanian banks has been relatively constant over the period of study. However, a number of points should be highlighted. Concentrating on 2008, there are 43 banks in the sample, out of which 2 are owned with majority of state capital and the rest are held by majority of private capital, including foreign capital. Out of 41 privately owned banks (foreign or Romanian), 27 banks have majority foreign capital but are incorporated in Romania (therefore, they are subject to Romanian regulatory requirements) and other 10 banks are actually branches of foreign banks, 100 % owned by foreigners and incorporated outside Romania. In addition, the figures in *Table 1* suggest that the number of these foreign incorporated banks has increased from 7 in 2006 to 10 in 2007 (after Romania became a member of the EU). This increase may be due to the fact that EU incorporated banks enjoyed more relaxed banking regulations (Euro area regulations) compared to the Romanian regulation.

Methodology and Data

Methodology

In order to assess the efficiency of Romanian banks, we first assume that banks employ an “intermediation production process”, such that one set of inputs is intermediated into another set of outputs. Second, we assume that production technology is characterized by more general variable returns to scale (VRS) technology. Third, we assume, by pooling all yearly subsamples, that the banks in the sample all face common best practice frontiers. Under these assumptions, we use non-parametric Data Envelopment Analysis to construct a number of input-oriented efficient frontiers relative to which efficiency indices are computed (Banker *et al.*, 1984).

More specifically, we initially compute the overall cost efficiency (OE) index for each Romanian bank in the sample. This index is simply the ratio of the minimum potential total production cost to the observed total production cost of the bank. Formally, in order to compute OE for each bank j ($j=1 \dots n$), as a first step, we solved the following linear program to obtain minimum potential total production cost for bank j :

$$\begin{aligned} \min \quad & \sum_{i=1}^m p_{ij}^o \tilde{x}_{io}^* = C_j^* \\ \text{subject to:} \\ & \sum_{j=1}^n \lambda_j x_{ij} \leq \tilde{x}_{io}, i = 1, 2, \dots, m; \\ & \sum_{j=1}^n \lambda_j y_{rj} \geq y_{ro}, r = 1, 2, \dots, s; \\ & \lambda_j, \tilde{x}_{io} \geq 0 \\ & \sum_{j=1}^n \lambda_j = 1, j = 1, 2, \dots, n \end{aligned} \tag{1}$$

where: C_j^* is a potential minimum total cost, p_{ij}^o are the unit price of the input i of bank j ; l_j is a vector of weights (intensity variables) assigned to bank j ; y is a vector with dimension $(1 \times s)$ of outputs produced by bank j ; x is a vector of inputs with dimension $(1 \times m)$ utilized by bank j ; n , m and s represent numbers of banks, inputs and outputs.

Having potential minimum total production cost calculated for bank j , the overall cost efficiency of this bank is measured as:

$$OE_j = \frac{C_j^*}{C_j} = \frac{\sum_{i=1}^m P_{ij}^o \tilde{x}_{io}^*}{\sum_{i=1}^m P_{ij}^o x_{io}} \tag{2}$$

where: C_j^* is defined earlier and C_j is the actual total cost incurred by bank j .

The OE can be broken down into two more efficiency indices. These efficiency indices are overall technical efficiency (OTE) and allocative efficiency (AE). Let bank j be an observation in our sample of n banks, the OE of this bank can be broken down into:

$$OE_j = OTE_j \times AE_j \tag{3}$$

In order to assess the OTE of the banks in the sample, the following linear programming problem (LP) is solved for each bank j :

$$\begin{aligned} \min \quad & \theta_j - \varepsilon \left(\sum_{i=1}^m s_i^- + \sum_{r=1}^s s_r^+ \right) \\ \text{subject to :} \\ & \sum_{j=1}^n \lambda_j x_{ij} + s_i^- = \theta x_{io}, i = 1, 2, \dots, m; \\ & \sum_{j=1}^n \lambda_j y_{rj} - s_r^+ = y_{ro}, r = 1, 2, \dots, s; \\ & \lambda_j \geq 0, j = 1, 2, \dots, n; \\ & \sum_{j=1}^n \lambda_j = 1 \end{aligned} \tag{4}$$

where: $q_{j \in 1}$ is the scalar total technical efficiency score for the j^{th} bank, s_i^-, s_r^+ are input and output slack, with other variables as defined earlier.

We note that the additional constraint $\sum_{j=1}^n \lambda_j = 1$ is imposed on the linear programming model to allow for VRS. Finally, the allocative efficiency, for bank j is computed as:

$$AE_j = \frac{OE_j}{OTE_j} \tag{5}$$

This efficiency index assesses the degree of “optimal input mix” utilization, given cost minimization behavior of the banks.

In order to examine the productivity growth of Romanian banks during a five-year period, from 2004 to 2008, we compute Malmquist productivity growth index for each bank. We then break down this index into two parts: technological change and change in technical efficiency. More specifically, following Färe *et al.* (1994), Berg *et al.* (1992), and others, the Malmquist productivity growth index for bank *j* is written as:

$$M_j = DOTE_j \times DT_j \tag{6}$$

where: M_j is the Malmquist productivity growth index of bank *j*; ΔOTE_j is the overall technical efficiency gain (loss) of bank *j* between 2004 and 2008; ΔT_j is the technological progress (regress) of bank *j* over the period.

We notice that $M_j > 1$ ($M_j < 1$) implies productivity growth (productivity decline), respectively between 2004 and 2008. Additionally, the first term on the right side of Equation (6), (ΔOTE_j), indicates for change in overall technical efficiency between two years and the second term, ΔT , represents technological change between two years. Specifically, $\Delta OTE_j > 1$ ($\Delta OTE_j < 1$) is an indication that OTE of bank *j* has increased (declined) between 2004 and 2008 and $\Delta T_j > 1$ ($\Delta T_j < 1$) is an indication that bank *j* has displayed technological progress (technological regress) between 2004 and 2008.

Furthermore, we identify several economic and accounting variables to test empirically whether they are statistically associated with the level of efficiency and productivity growth in Romanian banking sector. This is a very significant contribution of the paper since, the detection of sources of inefficiency supply the bank managers and regulators helpful information to seek for mitigation of inefficiency problems.

We use multivariate regression model to test the association between efficiency indices and several economic and accounting variables expected to affect efficiency. In this model, the estimated efficiency indices are dependent variables, while the accounting and economics variables, that we expect to affect efficiency, play the role of independent variables. However, since the dependent variables assume values in the interval (0, 1), the least square regression analysis approach is not applicable. In order to accommodate this situation, we will use Tobit multiple regression, which allows the use of some truncated dependent variables.

More formally, the relation between the estimated efficiency indices, as dependent variable, and the selected independent variables is modeled through the following Tobit model as follows:

$$y_j = \begin{cases} 1 & \text{if } y_j^* \geq 1 \\ y_j^* = s_j \delta + u_j & \text{if } 1 > y_j^* > 0, \text{ where } u_j \sim N(0, \sigma^2) \\ 0 & \text{if } y_j^* \leq 0 \end{cases} \tag{7}$$

where: $u_j \sim N(0, \sigma^2)$ and s_j is a vector of the variables that explains the efficiency of banks; δ is a vector of unknown variables; y_j^* is a latent variable that is observed for values greater than 0 and lower than 1 and $j = 1, 2, \dots, n$.

The probability function for the estimation of the unknown variable (δ) in the Tobit model within the limit values of $a = 0$ and $a = 1$ is identified in the form:

$$L = \prod_{y_j > a} \frac{1}{\sigma} f\left(\frac{y_j - \delta}{\sigma}\right) \prod_{y_j < a} f\left(-\frac{\delta}{\sigma}\right) \tag{8}$$

Data

The data sets used in this study are collected from the Annual Reports of banks, the Reports of the National Bank of Romania and the Ministry of Public Finances. The sample comprises 19 Romanian banks active from 2004-2008. In this paper, bank inputs and outputs are defined consistent with the value-added approach, proposed originally by Berger and Humphrey (1992). These authors used deposits as an output because deposits lead to the creation of value added. Following Fiordelisi *et al.* (2011), we used the following set of inputs and outputs in order to quantify the efficiency and structural changes of the productivity of banks: loans, other earning assets and demand deposits – as outputs, personnel expenses, fixed assets and financial capital (sum of total deposits, total money market funding, total other funding and equity) – as inputs. All variables are expressed in million EUR. Input prices are obtained as total personnel expenses over total assets, other operating expenses over fixed assets and interest expenses over financial capital.

Table 2 displays the descriptive statistics of input and output variables.

It can be seen from Table 2 that the amount of the loans made by Romanian banks has increased significantly during the period, compared to the other variables that show lower increases.

Table 2

Variables used in the analysis of the efficiency and productivity of banks in Romania (mil. EUR)

Year		Loans	Other Earning Assets	Personnel Expenses	Fixed Assets	Financial Capital	Personnel Cost	Operational cost	Financial Cost
2004	Mean	405.8418	218.7773	22.92061	53.88504	902.6954	0.456005	0.384884	0.018189
	Std. Dev.	709.7983	331.7567	44.16045	114.5545	1515.561	0.85459	0.481324	0.030818
2005	Mean	666.3247	330.6431	31.4173	62.32362	1384.984	0.008432	42.78339	4.853153
	Std. Dev.	1126.839	530.8543	56.27883	124.9073	2289.712	0.019536	94.56658	7.823428
2006	Mean	1157.735	351.5102	40.83559	71.00634	2091.428	0.169732	2.294426	0.114247
	Std. Dev.	1970.219	568.6552	64.47629	128.397	3427.088	0.31575	5.392667	0.200098

Year		Loans	Other Earning Assets	Personnel Expenses	Fixed Assets	Financial Capital	Personnel Cost	Operational cost	Financial Cost
2007	Mean	1759.637	386.3307	51.74117	77.83441	2842.457	0.0985	2.533937	0.185579
	Std. Dev.	2658.676	545.3391	78.22994	123.2951	4247.068	0.188588	4.948066	0.484423
2008	Mean	2084.46	240.5396	54.57033	78.12238	3172.972	0.016763	2.920958	0.120132
	Std. Dev.	2982.161	259.5998	67.75402	116.9998	4379.745	0.01627	5.436104	0.174728
Total	Mean	1214.8	305.5602	40.297	68.63436	2078.907	0.149886	10.18352	1.05826
	Std. Dev.	2132.152	459.4155	63.02084	119.4906	3399.526	0.439381	44.6957	3.926884

Source: own elaboration

Table 3 contains the means and standard deviations of the variables that we expect to explain the variation in computed efficiency indices of Romanian banks. These variables are: structure of capital (Equity/Total assets – EC_TA); size of the bank (Total Assets – TA); Net Interest Margin (NIM); return on assets (ROA); GDP increase rate

(%) (GDP_G); annual inflation rate (%) (IR); ownership form of the bank (FP); Herfindahl-Hirschman index (HHI); percentage of the assets owned by foreign banks (ASFB); the banking reform and interest rate liberalization indicator (BREF).

Table 3

Variables used in the analysis of the factors influencing the level of efficiency of the banks in Romania

Year		Net Interest Margin	Return on Average Assets	Equity / Total Assets	Total Assets	GDP growth	Inflation Rate	Index of banking sector reform	HHI	Asset share of foreign-owned banks (%)
2004	Mean	8.66	1.13	15.63	918.60	8.40	11.88	3.00	1111.00	58.50
	Std. Dev.	3.12	2.48	7.97	1540.22					
2005	Mean	7.19	0.95	12.82	1402.34	4.17	8.99	3.00	1115.00	59.20
	Std. Dev.	2.58	2.14	4.11	2320.20					
2006	Mean	6.44	1.07	12.08	2129.08	7.90	6.58	3.00	1165.00	87.90
	Std. Dev.	2.12	1.58	3.46	3500.26					
2007	Mean	5.46	1.07	10.34	2911.16	6.00	4.84	3.30	1041.00	87.30
	Std. Dev.	1.60	1.16	3.79	4351.59					
2008	Mean	5.58	1.00	11.40	3258.66	9.43	7.85	3.30	922.00	87.70
	Std. Dev.	1.44	2.06	4.29	4537.61					
Total	Mean	6.67	1.04	12.45	2123.97	7.18	8.03	3.12	1070.80	76.12
	Std. Dev.	2.51	1.90	5.21	3490.63	1.88	2.38	0.15	84.68	14.18

Source: own elaboration

We notice that Romanian banking industry has shown a significant increase in total assets from 918.60 million Euros to 3,258.66 million Euros during the period under study. The percentage change in total assets of the banks with foreign capital has revealed an increase, from 58.5 % to 87.7 %. This increase is due to a surge in the privatization of the Romanian Commercial Bank, in 2005, encouraged by Romanian authorities. On the other hand, the return on assets (ROA) and the equity as a percent of total assets (EC_TA) of Romanian banks, on average, have declined from 1.13 % to 1.00 %, and from 15.63 % to 11.40 % respectively. The Herfindahl-Hirschman concentration index has registered a decrease, particularly starting with 2007, from a value of 1,111 to 922.

The banking reform and interest rate liberalization indicator is compiled by the European Bank for Reconstruction and Development, with the primary purpose of assessing the progress of the banking systems of formerly communist countries; it quantifies and qualifies the degree of liberalization of the banking industry. This indicator provides a ranking of progress in liberalization and institutional reform of the banking sector, on a scale of 1 - indicating little progress in reform - to 4 - representing a level that approximates the

institutional standards and norms of an industrialized market economy (Koutsomanoli-Filippaki *et al.*, 2009). The average level of this indicator for Romanian banking system during 2004-2008 period was 3.12, this increased in 2007 at 3.3 from 3.

Empirical results

Table 4 displays means and standard deviations of the efficiency measures calculated for Romanian banks using the models described in the Methodology section. We note that the mean of overall efficiency for Romanian banks over the sample period is 64.90 percent, which translates into relatively high cost inefficiency. More specifically, this suggests that, on average, Romanian banks could have benefited from potential a total production cost saving of 35.10 percent, if they expected total overall efficiency. This result is consistent with the article published in International Monetary Fund Survey Magazine (Koliadina, 2008) in which it is argued the due to “institutional weaknesses” and lack of economies of scale, banks operating in Southeastern Europe are not cost-efficient. It follows that NBR should utilize policies to eliminate the “institutional weaknesses” and to promote competition,

resulting in reduction of intermediation costs, leading to higher cost efficiencies of the banks. In addition, the findings shown in Table 4 suggest that the cost inefficiency of Romanian banks is caused mainly by allocative inefficiency, while overall technical efficiency plays an insignificant role. As can be seen, Romanian banks during the sample period could have generated, on average, 4.06

percent more output than they actually produced had they been fully overall technical efficient. The contribution of allocative inefficiency to cost inefficiency of the banks is more severe since these banks operate, on average, considerably at suboptimal input mix. Specifically, the banks could have increased their allocative efficiency by 33.50 percent had they been utilizing optimal input mix.

Table 4

Levels of efficiency of the banks in Romania obtained through the DEA method

Year		Overall Efficiency	Overall Technical Efficiency	Allocative efficiency
2004	Mean	0.5783	0.9150	0.6055
	Std. Dev.	0.3515	0.1347	0.3274
2005	Mean	0.6288	0.9790	0.6354
	Std. Dev.	0.3110	0.0410	0.3040
2006	Mean	0.6151	0.9637	0.6308
	Std. Dev.	0.2823	0.0627	0.2705
2007	Mean	0.7048	0.9742	0.7163
	Std. Dev.	0.2686	0.0416	0.2560
2008	Mean	0.7182	0.9652	0.7372
	Std. Dev.	0.2401	0.0475	0.2247
2004-2008	Mean	0.6490	0.9594	0.6650
	Std. Dev.	0.2919	0.0764	0.2778

Source: own elaboration

The general trend of efficiency measures over sample period is presented in Figure 1. This figure shows that Romanian banks have enjoyed a little improvement in their overall efficiency from 2004 to 2006, at which point the overall efficiency has increased by 9 percent in 2007, then by about 1 percent in 2008. The overall technical efficiency exhibited stability after an increase of about 6 percent in 2005, compared with 2004. Furthermore, Figure

1 illustrates that allocative efficiency has been the key contributor to the enhancement in overall efficiency of Romanian banks during the period of study, as shown by the upward trend over time. More specifically, these banks have steadily chosen better “input mix” consistent with cost minimization, since the allocative efficiency has increased from 60.55 percent in 2004 to 73.72 percent in 2008, a boost of over 13 percent.

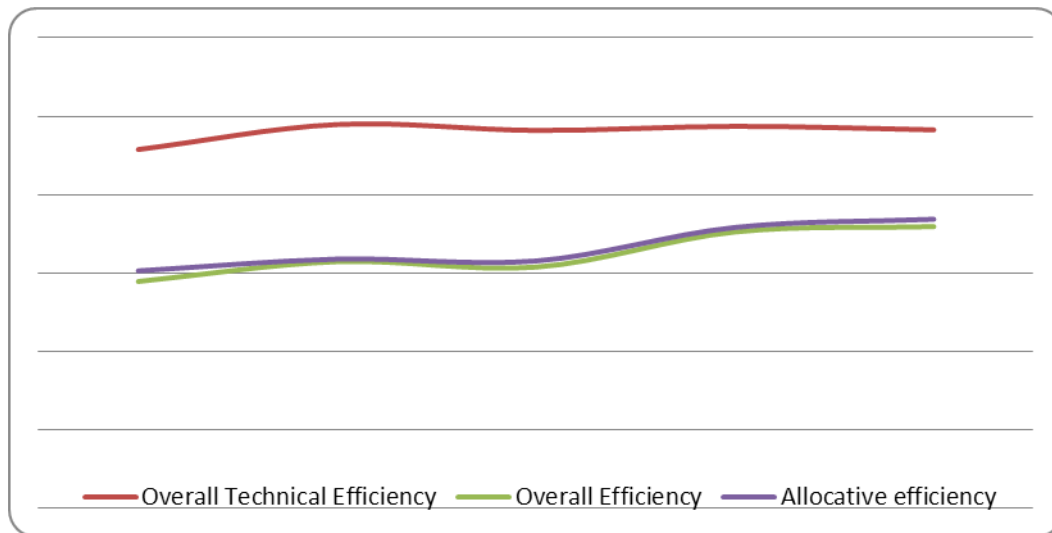


Figure 1. The trend of banks efficiency in Romania during 2004-2008

Source: own elaboration

Table 5 reports means and standard deviation values of the Malmquist productivity growth index and its components: the technical efficiency change and technological change for all banks. We recall that if the values of the Malmquist productivity growth index and its components are higher than unity, then the banks have enjoyed an enhancement in productivity growth, overall technical efficiency and technological progress.

As can be seen in Table 5, the Malmquist productivity growth of Romanian banks is, on average, higher than unity in all years under study except 2006, during which the banks suffered from decline in productivity growth.

Further analysis of Table 5 provides evidence to indicate that in 2005, the increase in productivity growth is exclusively due to technological progress.

Malmquist productivity index and decomposition components

Period		Malmquist Index	Efficiency Change	Frontier Shift
2004-2005	Mean	1.1652	0.9022	1.2766
	Std. Dev.	0.6068	0.1263	0.5647
2005-2006	Mean	1.0133	1.0154	0.9952
	Std. Dev.	0.1510	0.0594	0.1208
2006-2007	Mean	0.9047	1.0166	0.8895
	Std. Dev.	0.1060	0.0844	0.0665
2007-2008	Mean	1.0356	1.0179	1.0173
	Std. Dev.	0.1536	0.0809	0.1295
Average	Mean	1.0297	0.9880	1.0446
	Std. Dev.	0.3330	0.1022	0.3250

Source: own elaboration

It is evident that in 2006 the Malmquist productivity growth index of Romanian banks is less than unity due to the level of technological progress (shift in frontier) not overall technical efficiency change. In addition, the results in Table 5 suggest that since 2007, the productivity of Romanian banks has deteriorated as a result of a major technological regress (88.95 percent) while the banks demonstrate a little overall technical efficiency enhancement.

Finally, we observe the increase in productivity growth has declined in 2008 caused by both higher overall technical efficiency change and technological progress.

In sum, during the period under study, the productivity growth of Romanian banks has increased. It is apparent that the biggest share of this growth is technological progress, while the banks suffer a decline in their overall technical efficiency between 2004 and 2008.

Given our assumption that all banks over the entire sample period utilize the same technology and therefore face common frontiers, Table 6 shows the means of overall efficiency (and its components) along with productivity growth index (and its components) for Romanian banks of different ownership structure.

Table 6

Technical efficiency, Malmquist productivity index and decomposition in components by ownership form and size of banks

	Overall Efficiency	Overall Technical Efficiency	Allocative efficiency	Malmquist Index	Efficiency Change	Frontier Shift
State Ownership	0.372	0.880	0.407	0.936	0.922	1.026
Private Ownership	0.674	0.967	0.689	1.038	0.994	1.046
Small size	0.532	0.949	0.552	1.019	0.995	1.026
Medium size	0.741	0.966	0.755	1.073	0.987	1.088
Large size	1.000	1.000	1.000	0.929	0.956	0.977

Source: own elaboration

As can be seen, banks owned by the state demonstrate the lowest overall efficiency of 37.2 percent, which implies that these banks could have produced the same level of outputs by using 62.8 percent less had they been 100 percent overall efficient. Not only does the overall technical and allocative inefficiency contribute to this high level of inefficiency, but also the contribution of allocative inefficiency is more significant. This implies that these banks generally choose a suboptimal input mix. The results shown in Table 6 suggest that the biggest share of inefficiency of privately owned banks, similar to state owned banks, is again misallocation of resources and lack of the optimal utilization of input mix. We observe further that the state owned banks have suffered deterioration in productivity growth which appears mainly due to decline in their overall efficiency, while they have benefited a little from technological progress. On the other hand, the privately owned banks have enjoyed an increase in productivity growth caused solely by technological growth, while experiencing a small overall technical inefficiency over sample period. The most important implication of these results is that the government and the National Bank of Romania should formulate policies to encourage more privatization of banking firms in order to assist the banking

industry to achieve higher efficiency, with emphases on cost minimization practices and optimal allocation of resources to foster higher productivity growth. Table 6 also includes productivity growth and overall efficiency indices (and their components) according to the size of the banks, where the value of total assets is used as a measure of size. Specifically, banks are classified into three different size categories: small (if the value of total assets is less than 1,000 million of EUR), medium (if the value of total assets is higher than 1,000 million of EUR but less than 3,000 million of EUR) and large (if the value of total assets is higher than 3,000 million EUR). As can be seen, the results reveal that large banks have achieved 100 percent efficiency for all efficiency measures, followed by medium size banks, and small size banks respectively. These findings indicate that actions initiated to support mergers and acquisitions will benefit the banking industry to higher efficiency. Conversely, further the analysis of figures in Table 6 suggests that small and medium size banks have outperformed their larger counterparts in the case of productivity growth, with productivity growth indices of 1.073 and 1.019 respectively, where technological progress is chiefly responsible for this superior growth.

Table 7 reports the estimated results of Tobit multiple regression model. In this model, efficiency indices are used

as a dependent variable and a set of financial and economic variables, described earlier, as independent variables.

Table 7

Tobit regression coefficients regarding efficiency

Independent Variable	Dependent Variable		
	Overall Efficiency	Overall Technical Efficiency	Allocative Efficiency
NIM	-0.0623*** (0.0101)	-0.0083** (0.0033)	-0.0595*** (0.0095)
ROA	0.0505*** (0.0131)	0.0134** (0.0055)	0.0460*** (0.0124)
EC_TA	-0.0009 (0.0050)	0.0049*** (0.0018)	-0.0027 (0.0047)
TA	2.60E-05*** (6.45E-06)	2.59E-06** (1.08E-06)	2.47E-05*** (6.06E-06)
GDP_G	0.0009 (0.0467)	-0.0477*** (0.0165)	0.0094 (0.0439)
IR	0.0147 (0.0541)	0.0490*** (0.0159)	0.0095 (0.0508)
FP	0.2035*** (0.0751)	0.0862* (0.0489)	0.1819** (0.0706)
BREF	0.1804 (0.2077)	0.0215 (0.0674)	0.2072 (0.1952)
HHI	0.0002 (0.0003)	1.00E-05 (0.0001)	0.0002 (0.0003)
ASFB	-0.0023 (0.0105)	0.0095*** (0.0035)	-0.0035 (0.0099)

Note: Standard deviations are presented between brackets. *, **, *** indicates significance levels at 10 %, 5 % and 1 %.

Source: own elaboration

We see in the second column of Table 7 that all efficiency indices computed for Romanian banks are positively and statistically significantly influenced with ROA and TA, while they are negatively and statistically significantly associated with NIM. However, we observe a positive and statistically significant association between overall technical efficiency index and EC_TA, ASFB, while this index is negatively and statistically significantly impacted by GDP_G.

Conclusions

In this paper, we use a non-parametric approach to examine the efficiency of Romanian banking industry and its determinants in the face of European integration, during a five-year period from 2004 to 2008. We, in addition, calculate Malmquist productivity index and its components to assess the productivity growth of the banking firms over the sample period. Finally, we employ Tobit multiple regression to investigate the factors affecting efficiency of

Romanian banking industry. The results indicate that Romanian banking firms enjoy, on average, a productivity growth of 45.16 % from 2004 to 2008. This growth is due to an increase in both technical efficiency and technological change.

The policy implications of our results are important for bank managers and regulatory authorities in terms of optimal size of operation and input utilization. The findings suggest that a) banking firms should alter their “input mix” and to reduce operational costs in order to enhance their efficiency and b) Romanian government authorities should adopt policies to promote mergers and acquisitions among banks, in order to assist them to improve their overall efficiency by expansion and achieving an optimal size. It follows that Romanian government authorities must encourage the entrance of new foreign banks, in order to increase the overall efficiency of the banking system.

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Alin Marius Andries, Seyed Mehdiian, Ovidiu Stoica

Europos integracijos įtaka Rumunijos bankų efektyvumo ir našumo augimui

Santrauka

Efektvios ir našios bankų pramonės sukūrimas buvo vienas iš svarbesnių Rumunijos tikslų ekonominės reformos ir perejimo iš centralizuotos ekonomikos į rinkos ekonomiką metu. Bankų operacijos Rumunijoje, dėl ekonominių transformacijų, socialinės ir politinės tvarkos bei aplinkos, patyrė svarbiausią pokytį paskutiniajame dešimtmetyje. Rumunijos bankams reikia nemažai reformų, kad jie galėtų veikti tinkamai, įgytų aukštesnius patikimumo, kompetencijos, gyvybingumo ir efektyvumo vertinimus. Šie aspektai buvo laikomi svarbiausiais, ypač plečiant ir tobulinant efektyvią ir našią bankų sistemą. Perėjimas nuo centralizuotos prie rinkos ekonomikos, buvo susijęs su bankų reorganizavimu į akcines bendroves. Tai sąlygojo jų veiklos savarankiškumą, kai kurių valstybės valdomų bankų privatizavimą ir naujų bankinių institucijų, su vietiniu ir užsienio kapitalu, atsiradimą. Pradedant nuo 1999 metų, Rumunijos nacionalinis bankas inicijavo bankų restruktūrizavimo programą. Šios programos tikslas buvo sumažinti bendrą bankų operacijų riziką, siekiant pagerinti „protingo“ vadovavimo kokybę ir apsaugoti bankus nuo funkcionavimo, esant netinkamai grynajai vertei. Didelis centrinio banko kišimasis, norint efektyviai sureguliuoti bankų pramonę, sėkmingai buvo pradėtas 2004 metais. Konkurencija bankų rinkose suintensyvėjo, nes pelningumas, kainų mažinimo iniciatyvos ir kapitalizacijos lygis tapo pagrindiniais bankų gebėjimo valdyti savo riziką veiksniais. Po Rumunijos priėmimo į Europos Sąjungą (2007 m. sausio mėnesį), Rumunijos bankai susidūrė su tiesiogine užsienio bankų konkurencija.

Siekdami iširti Rumunijos bankų pramonės efektyvumą ir našumą bei juos lemiančius veiksnius, susidūrė su Europos integracija per ketverius metus, šiame darbe naudotas neparаметrinis laipsniškas metodas. Šis pavyzdys tirtas laikotarpiu (2004 - 2008), nes buvo norima išvengti pasaulinės finansinės krizės įtakos bankų pramonės veiklos našumui nustatyti. Be to, 2004-2008 metai yra svarbūs, nes šiuo laikotarpiu Rumunija buvo kandidatė į Europos Sąjungos nares. Dėl šios priežasties, Rumunijos valdžia patobulino daug teisinių aktų, kurie paskatino ėjimą į rinkos ekonomiką. Buvo išbūlinas dviejų etapų empirinis modelis, kuris apėmė banko veiklos įvertinimą pirmajame etape ir jo veiksmų įvertinimą antrajame. Naudotas Duomenų apsupty analizės (plg. angl. Data Envelopment Analysis - DEA) metodas, kad galima būtų apskaičiuoti bendrųjų kaštų efektyvumą ir jo dalis: bendrą techninį ir paskirstymo efektyvumą. Buvo manyta: pirma, kad bankai panaudoja „tarpininkavimo našumo procesą“ taip, kad vienos sąnaudos yra įtraukiamos į kito rezultatus. Antra, kad našumo technologiją apibūdina daug bendresnė kintamo mašto gražos (plg. angl. variable returns to scale - VRS) technologija. Trečia: pateikus visus metinius pavyzdžius, bankai, laikomi pavyzdžiais, susiduria su vienoda „geriausios praktikos riba“. Norėdami įvertinti bankų pramonės našumo augimą, mes skaičiuojame Malmquist našumo augimo indeksą, o naudodami neparаметrinį linijinį programavimo būdą, panaudojame Tobit daugkartinę regresiją, norėdami nustatyti veiksnius, darančius įtaką Rumunijos bankų pramonės efektyvumui. Taip pat mes nustatome kelis ekonominius ir apskaitos kintamuosius, norėdami empiriškai patikrinti ar jie yra statistiškai susiję su efektyvumo ir našumo augimo lygiu Rumunijos bankų sektoriuje. Tai labai svarbus įnašas, nes neefektyvumo šaltinių nustatymas ir bankų vadovams, ir prižiūrėtojams suteikia naudingos informacijos, reikalingos ieškant priemonių neefektyvumo problemoms sumažinti.

Rezultatai rodo, kad Rumunijos bankų našumas nuo 2007 metų blogėjo dėl technologijų smukimo. Bankai rodė mažą, bendrą techninio efektyvumo didėjimą, nors našumo didėjimas smuko 2008 metais ir dėl aukštesnio bendro techninio efektyvumo pasikeitimo, ir dėl technologinės pažangos. Apskritai tariant, per tiriamąjį laikotarpį našumo augimas Rumunijos bankuose padidėjo. Akivaizdu, kad didesnę šio augimo dalį sudaro technologinė pažanga, nors bankai 2004 – 2008 metais patyrė savo bendro techninio efektyvumo smukimą.

Tolesnės išvados reiškia, kad privataus kapitalo bankai Rumunijoje buvo daug efektyvesni ir turėjo didesnę našumo augimą lyginant su valstybinio kapitalo bankais. Šio darbo rezultatai naudingi bankų prižiūrėtojams, nes pasteikia siūlymus kaip nustatyti tinkamą politiką, kaip skatinti bankus panaudoti efektyvesnę našumą ir teikti aukštos kokybės paslaugas kiek įmanoma mažesnėmis kainomis. Šio tyrimo esmė yra tokia: a) Rumunijos bankinės įmonės turėtų keisti jų „sąnaudų mišinį“ norėdamos sumažinti veiklos kaštus, kad galėtų sustiprinti savo efektyvumą, ir b) Rumunijos vyriausybei reikia sukurti reguliuojančius aktus, norint skatinti susiliejimus ir išigijimus tarp bankų. Tai padėtų jiems gerinti jų bendrą efektyvumą plečiantis ir pasiekiant optimalų dydį.

Raktažodžiai: *efektyvumas, našumas, bankai, Rumunija, Europos integracija.*

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