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LATEST CHALLENGES IN EFFICIENCY CONVERGENCE IN BALKAN AND BALTIC COUNTRIES

Case study

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Abstract

Using a sample of Balkan and Baltic countries and by employing a Data Envelopment Analysis model, we want to highlight the main challenges for the highly concentrated banking system. Over the period 2007 - 2011, these countries have coped with the worst financial crisis from the Great Depression, which has severe effects on the banking systems. Our sample includes the least developed countries in the EU and for reference purpose, Luxembourg, with the highest GDP per capita. We expect to find similarities between Balkan countries and Baltic countries and we can draw lessons from Luxembourg`s results.

In 1993, the Single Market is completed with the four freedoms: movement of goods, services, people and money. On 1 January 2002, euro notes and coins arrive, but only Luxembourg adopts the single currency. On 1 May 2004, eight countries of Central and Eastern Europe (Czech Republic, Estonia, Latvia, Lithuania, Hungary, Poland, Slovenia and Slovakia) join the EU. In addition, Cyprus and Malta become members. Romania and Bulgaria did not complete all the necessary steps and join the EU on 1 January 2007.

In the last two decades, European banking sector have become increasingly integrated. The twin forces of deregulation and technological change contributed to the progressive process of financial integration and has enhanced competition and emphasized the importance of improved efficiency. Until now, this variable has always been an asset for banks, but was not prioritized, because the conditions differed from today. Economic conditions have changed due to process of financial integration and bank`s structure, performance and function had to adapt to the conditions of the time.

This paper is organized along the following lines. The next section reviews the literature of bank efficiency estimation using Data Envelopment Analysis. Section 3 outlines the methodology of efficiency estimation. Section 4 describes the data used for this paper. Section 5 details the empirical results and section 6 concludes.

Literature review

The efficiency of banks has been widely and extensively studied in the past few decades. For banks, efficiency implies improved profitability, greater amounts of funds channelled through the system, better prices and service quality for consumers, and greater safety in terms of improved capital buffers in absorbing risk (Berger et al. 1993). Data Envelopment Analysis was used for measuring technical efficiency of banks in Indian banking sector. The results showed that the reforms were implemented with success and the efficiency of the banks has improved and the foreign banks have better efficiency scores that private sector and public sector banks (Sanjeev, 2006).

Another researcher used a modified Tobin`s Q ratio as a measure of bank franchise value. The banks with better management or production technologies possess a long-run competitive advantage. Banks with a large market share in a concentrated market are able to generate non-competitive rents. Even in the member states of the European Union, country-specific macroeconomic variables have a significant impact on bank performance. For the study, a set of 183 banks from 15 European countries between 1997 and 2004 is used (De Jonghe & Vennet, 2008).

Cost and profit efficiency in the banking systems of ten member states of the European Union over the period 1998 – 2003 were examined using the stochastic frontier approach. Several steps have been made towards financial integration and towards enhancing integration in the banking systems from the ten EU member states but many issues still remain to be tackled (Mamatzakis et. al., 2008). An investigation over the new European banking landscape over the period 1998 – 2005 to examine the differences between old and new member states revealed that there are significant differences. Indeed, total operating expenses for the ten new member states have declined during the period, but they remain at a higher level compared with the old member states (Staikouras et al., 2008).

The cost and profit efficiency of banks in South Africa were analyzed using a stochastic frontier model to determine both cost and profit efficiency of four large and four small, South African-based banks. The study showed that South African banks have significantly improved their cost efficiencies between 2000 and

2005. However, efficiency gains on profitability, over the same period, have not been significant. With regard to bank size, cost efficiency declined with increasing bank size (Ncube, 2009).

A balance sheet from banks across the EU25 over the period from 1997 to 2005 is used to provide empirical evidence that national banking market concentration has a negative impact on European banks financial soundness. The market concentration has a positive impact on banks ROAA capital ratios and the volatility of the ROAA. The banks from the Eastern European countries exhibit a lower level of competitive pressure and a higher percentage of government-owned banks are more prone to financial fragility (Uhde & Heimeshoff, 2009). The bank efficiency and productivity change can be assessed by using directional technology distance function. The foreign banks have better results that domestic private and state-owned bank in terms of both productivity growth and efficiency. In conclusion, the productivity change in Central and Eastern countries is driven by technological change rather than efficiency change (Koutsomanoli-Fillippaki et al., 2009).

Another study that used both methods, Data Envelopment Analysis (DEA) and Stochastic
Frontier Analysis (SFA) was targeted on the main banks in Romania, the Czech Republic and Hungary for the period 2000-2006. The banks from these countries reach low levels of technical efficiency and cost efficiency, the main factors that influence efficiency are quality of the assets, banks size, annual inflation rate, banking reform, form of ownership and interest rate liberalization (Andries; Cocris, 2010). Some researchers start with a large list of variables and then use statistical screening or dimension reduction to obtain a reduced set of variables (Fethi & Pasiouras, 2010). By using two different approaches, a parametric method, Stochastic Frontier Analysis and a non-parametric method, Data Envelopment Analysis, in central and east European countries, one researcher showed that the average efficiency of banks grew between 2004 and 2008. The results may be due to increased competition from other member states of European Union and extensive legislative changes that boosted banks efficiency (Andries, 2011).

Another study uses Fourier flexible cost function with time-varying technical efficiency under the framework of the meta-frontier. The popular intermediation approach is used, which views banks as an intermediary between depositors and borrowers (Huang et. al, 2011).

The competition in the banking system of the EU27 as a whole, but also in both old member states and new member states was investigated using two measures of competition, the Learner Index and H-statistics for a panel of 923 commercial banks from 27 countries of the European Union for the period 2001 – 2009. The results showed that competition in the EU27 had higher scores in 2009 in comparison with 2001. This increase in competition could be explained by entry of foreign banks and deregulation. The decrease of competition in old member states could be explained by a decrease of interest rate and the orientation of European multinational banks to markets with many more possibilities to increase their profits (Andries & Capraru, 2012). Another sample of 22 EU countries over the period 2000 – 2008 was investigated by using Data Envelopment Analysis, in the first stage of the analysis, then two distinct accounting ratios to capture the costs of intermediation and cost effectiveness. By strengthening capital restrictions and official supervisory powers, the efficiency of banks operations can be improved. Banks from countries with less concentrated and more developed systems tend to have relatively higher levels of efficiency (Chortareas et. al., 2012).

Many studies use some kind of frontier to measure the efficiency of a banking system. A new approach was used, SORM SBM DEA for analyzing the efficiency of Indonesian banking system during the period 2003 - 2007. The results show that the estimated efficiency scores are very sensitive to the choice of methodology used for dealing with negative numbers (Hadad et. al, 2012).

At the beginning of the 2013, a survey on bank branch efficiency and performance research using DEA was published. There is a significant diversity among studies in terms of the input-output selection. The business environment is dynamic and developing more reliable DEA models will be an important topic in future bank branch studies (Paradi & Zhu, 2013). We want to thrown light on the efficiencies of banks in developing countries, particularly, in Baltic & Balkan countries in the context of euro adoption, effects of financial crisis and in highly concentrated banking systems.

Methodology

Data Envelopment Analysis is a mathematical programming technique for the development of production frontiers and the measurement of efficiency relative to those frontiers. Each bank in the sample is assigned an efficiency score between zero and one, banks with higher scores are more efficient that those with lower scores. One of the advantages of DEA is that it works well with small samples, as the one used in our research. Other advantages of this technique are that it does not require any assumptions to be made about the distribution of inefficiency and it does not require a particular functional form on the data in determining the most efficient banks. DEA has drawbacks, it assumes data free of measurement error and it is sensitive to outliers. Coelli et al. (2005) also point out that: (i) having few observations and many inputs and/or outputs will result in many firms appearing on the DEA frontier; (ii) treating inputs/outputs as homogenous commodities when they are heterogeneous may bias the results; (iii) not accounting for differences in the environment may give misleading results; (iv) standard DEA does not control for multi-period optimization or risk managerial decision making.

The main advantage to this method is its ability to accommodate a multiplicity of inputs and outputs. It is also useful because it takes into consideration returns to scale in calculating efficiency, allowing for the concept of increasing or decreasing efficiency based on size and output levels. A drawback of this technique is that model specification and inclusion/exclusion of variables that can affect the results (Berger, 2010).

In the literature has been a constant debate on the choice of inputs and outputs for measuring the efficiency of the banks. There are manly two approaches that have been used in former studies. The first is the *production approach*, where banks are viewed to be producing deposits and loans (outputs) using capital and labour (inputs). This view takes into account physical inputs and outputs, and does not assign a monetary value to a specific input or output. The main criticism is that it does not take into account the interest costs which represent a major proportion of expenses in most countries. Ferrier and Lovell (1990), and Fried *et al* (1993) follow this approach.

The *intermediation approach* is the second one, where banks are viewed as intermediaries between the provider of funds and users of funds. In this view, deposits are regarded as being converted into loans. This approach is the most used because it take into account interest expenses, which represents a large proportion of bank`s costs (Elyasiani and Mehdian, 1990; Berger and Humphrey, 1991). One of the advantage is that is extremely adaptable, since categories of deposits, loans and financial investments

and financial borrowings may be assigned as either inputs or outputs (Colwell and Davis, 1992). This paper uses the intermediation approach.

We chose two types of inputs and outputs for our study: for Estonia, Latvia and Lithuania, interest expenses, noninterest expenses for input and interest income and noninterest income for outputs (Sathye, 2001); for Romania, Bulgaria and Luxembourg we chose deposits and operating costs for inputs variable and loans, investments and other income for outputs variable (Ram Mohan and Ray, 2004). We chose two types of inputs and outputs because we want to highlight the differences between the two groups of countries: Balkan countries and Baltic countries.

Data selection

For our study, we used a selection of six countries: Latvia, Lithuania, Estonia, Romania, Bulgaria and Luxembourg. As of 16 July, 2012, the International Monetary Fund (IMF) labels the following countries as emerging economies: Argentina, Brazil, Bulgaria, Chile, China, Estonia, Hungary, India, Indonesia, Latvia, Lithuania, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, Romania, Russia, South Africa, Thailand, Turkey, Ukraine and Venezuela. Estonia is also included in the group of advanced economies by the IMF. Luxembourg have the highest GDP in the European Union, with 83,600 euro per capita in 2012 (Eurostat) and is included for reference purpose. Baltic countries are selected from IMF list because of their traditional economic relationship, geographic position and level of development. Romania and Bulgaria were selected because of geographic position and level of development. In particular, balance sheet and income statement date are used, for Bulgaria, Romania and Luxembourg, which is obtained from annual reports of banks spanning the period 2007 to 2011. For the other countries, Estonia, Lithuania and Latvia the Bankscope database is used.

Empirical results

We chose DEAP version 1.2. written by Tim Coelli, from Department of Econometrics, University of New England, Armidale, Australia. In our instructions set, we chose VRS over CRS because the banks operate in imperfect competition, constraints on finance, which may cause a DMU to be not operating at optimal scale. Second option was input oriented over output oriented because banks are constrained to minimize inputs, outputs are controlled by market. The last option was Malmquist TFP index to measure the productivity change, and to decompose this productivity change into technical change and technical efficiency change. Note that all Malmquist index averages are geometric means.

First country from our sample was Bulgaria (Table No. 1). We can see that technical efficiency change (effch) was lower than in Romanian, technological change (techch) is better in Bulgaria, also pure technical efficiency change (pech) is higher. Scale efficiency change (sech) is lower in Bulgaria comparative with Romania and total factor productivity change (tfpch) is higher in former country. Overall, we can see a better image of banking sector in Bulgaria because of higher efficiency scores, which means that banks can produce larger amounts of outputs using the same amount of inputs.

Lower efficiency score in Romania means that the bank services and products offered by these banks are very expensive. We can see from Table No. 2 that main bank in this country, BRD, BCR, Banca Transilvania and Raiffeisen has lower score that Bulgarian counterpart. Based on our study, we can see that banking products and services are less expensive in Bulgaria comparative with Romania.

From our sample of Baltic countries, we look first at Estonia and Latvia (Table No. 3 & 4). Estonia obtains lower technical efficiency change, pure technical efficiency change, scale efficiency change and total factor productivity change. The only section in which it is performing better is technological change. The main differences between these countries are the Estonian banking sector is larger from total assets point of view, but with fewer and larger banks. We can see that a highly concentrated banking system is not a better option from efficiency approach.

Second, in our Baltic subsample, we look at Latvia and Lithuania scores. Lithuania (Table No. 5) gets better score at technological change, pure technical efficiency change and total factor productivity change. Results are pretty close because of the relative same size of banking sector, from total assets and number of banks point of view.

Finally, we look at results from Lithuania and Luxembourg. It is no surprise to see better score in Table No. 6 at technical efficiency change, pure technical efficiency change and scale efficiency change comparative with Lithuania.

Luxembourg is the countries with highest gross domestic product per capita in European Union 27, so better efficiency can be linked with higher GDP, but further studies must be made to get a better picture.

Conclusion

In the last two decades, European banking sector have become increasingly integrated. The twin forces of deregulation and technological change contributed to the progressive process of financial integration and has enhanced competition and emphasized the importance of improved efficiency.

Banks are assumed efficient by using the right amount of inputs in the right proportions in order to convert them into financial products and services. It comprises a way for evaluating banks performance and separates the banks that perform well from the banks that perform poorly.

For our study, we chose two types of inputs and outputs: for Estonia, Latvia and Lithuania, interest expenses, noninterest expenses for input and interest income and noninterest income for outputs; for Romania, Bulgaria and Luxembourg we chose deposits and operating costs for inputs variable and loans, investments and other income for outputs variable.

In our instructions set in DEAP, we chose VRS over CRS because the banks operate in imperfect competition, constraints on finance, which may cause a DMU to be not operating at optimal scale. Second option was input oriented over output oriented because banks are constrained to minimize inputs, outputs are controlled by market. The last option was Malmquist TFP index to measure productivity change, and to decompose this productivity change into technical change and technical efficiency change.

Our results are mixed, from each subsample countries, one is better than other ones: in Balkan, Bulgaria has better scores than Romania, in Baltic subsample, banks from Latvia has better scores than banks from Lithuania and Estonia. In further research, we can use a longer period, a larger sample of banks, Data Envelopment Analysis, and Stochastic Frontier Analysis in comparative, to see which method provides better results by using different types of inputs and outputs.

Overall, we can see that banking systems with more banks and a lower degree of concentration obtain better score. One reason can be the improved competition that stimulates banks to use inputs and outputs efficient and to provide lower price for products and services to gain a larger market share.

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Tables

Table No. 1 *Malmquist index summary of firm means for Bulgaria*

firm	effch	techch	pech	sech	tfpch
1	0.991	0.989	1.000	0.991	0.980
2	0.922	1.021	1.000	0.922	0.941
3	1.001	0.990	1.000	1.001	0.991
4	1.051	1.070	1.050	1.001	1.125
mean	0.990	1.017	1.012	0.978	1.007

Table No. 2 *Malmquist index summary of firm means for Romania*

firm	effch	techch	pech	sech	tfpch
1	1.000	0.925	1.000	1.000	0.925
2	1.000	0.963	1.000	1.000	0.963
3	1.000	0.830	1.000	1.000	0.830
4	0.968	0.848	1.000	0.968	0.821
mean	0.992	0.890	1.000	0.992	0.882

Table No. 3 *Malmquist index summary of firm means for Estonia*

firm	effch	techch	pech	sech	tfpch
1	1.000	0.943	1.000	1.000	0.943
2	0.889	0.916	0.950	0.936	0.814
3	1.000	1.080	1.000	1.000	1.080
4	0.832	1.037	1.000	0.832	0.863
mean	0.927	0.992	0.987	0.939	0.920

Table No. 4 *Malmquist index summary of firm means for Latvia*

firm	effch	techch	pech	sech	tfpch
1	1.018	0.892	1.000	1.018	0.909
2	1.010	0.968	1.014	0.996	0.977
3	1.061	0.943	1.000	1.061	1.001
4	1.027	0.944	1.032	0.995	0.970
5	1.079	0.971	1.081	0.998	1.047
6	0.997	0.943	1.000	0.997	0.940
7	1.086	0.953	1.071	1.013	1.035
8	0.995	0.960	0.995	0.999	0.954
9	1.033	0.880	1.031	1.002	0.909
10	0.888	0.887	0.816	1.088	0.787
11	0.890	0.872	0.892	0.998	0.777
12	1.120	0.927	1.109	1.010	1.039
13	0.988	0.955	1.000	0.988	0.943
14	0.973	0.912	0.993	0.980	0.888
15	1.072	1.013	1.000	1.072	1.086
16	1.132	0.890	0.960	1.180	1.008
17	0.852	0.971	0.861	0.990	0.828
mean	1.010	0.934	0.989	1.022	0.943

Table No. 5 *Malmquist index summary of firm means for Lithuania*

firm	effch	techch	pech	sech	tfpch
1	0.950	0.999	1.000	0.950	0.949
2	1.000	1.112	1.000	1.000	1.112
3	1.007	1.046	1.018	0.989	1.053
4	1.000	1.093	1.000	1.000	1.093
5	0.905	0.929	0.911	0.993	0.840
6	0.993	1.003	1.008	0.985	0.996
7	1.019	1.045	1.000	1.019	1.064
8	1.059	1.111	1.061	0.998	1.177
9	1.006	1.043	1.000	1.006	1.049
mean	0.992	1.041	0.999	0.993	1.033

Table No. 6 Malmquist index summary of firm means for Luxembourg

firm	effch	techch	pech	sech	tfpch
1	1.058	0.863	1.000	1.058	0.913
2	1.000	0.817	1.000	1.000	0.817
3	1.148	0.788	1.000	1.148	0.904
mean	1.067	0.822	1.000	1.067	0.877