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Investigating bank efficiency in transition economies: A window-based weight assurance region approach

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ABSTRACT

This paper examines the efficiency of 116 banks for nine new EU members in Central and Eastern European (CEE) countries over the period 2004–2015. We employ the weight assurance region (WAR) and we treat deposits as an intermediate variable in a two-stage data-envelopment analysis model. We then expand the WAR model by including a window-based approach to take into account the patterns of efficiency over time. The results indicate a low level of efficiency over the entire period of analysis, especially for Eastern European and Balkan countries rather than Central European countries. Overall, we find that inefficiency in CEE countries is mainly driven by the *profitability* stage rather than the *value added activity* stage.

1. Introduction

In the last two decades, Central and Eastern European (CEE) countries have gone through an important liberalization and privatization process, and have adopted important structural changes that substantially reformed the banking system. This intensive restructuring period characterized by relevant regulatory changes caught the interest of many researchers and has been the subject of several studies. Whereas the reform of the banking system takes a similar form, the speed of adoption and the effect of such changes among CEE countries were different. Overall, results show that the regulatory changes have been beneficial for the efficiency of CEE countries. In particular, several studies demonstrate that the privatization of state-owned commercial banks and a more liberal policy towards foreign banks enhanced the efficiency of the banking system in CEE countries (Bonin et al., 2005a, b; Fries and Taci, 2005; Hasan and Marton, 2003; Matousek and Taci, 2004; Weill, 2003).

The financing sector in the transition region has gone through important changes since the 2008–09 crisis. Prior to the crisis, the banking system played a key role in supporting the investment and growth in transaction credit. Especially cross-border capital flows played a pivotal role in spurring the growth in emerging Europe during the 2000s. Starting in 2009, transaction countries experienced a sharper drop in the rate of the investment and a consistent deleveraging process in the banking system (EBRD, 2015), which have contributed to a widening of the credit crunch of SMEs. In addition, there was a decline in net capital flows from advanced European economies and in the percentage of total assets held by foreign banks. While this has worked as an external adjustment mechanism between domestic investments and levels of domestic savings (with the last one traditionally lower than the first one), the sudden decline of financial sources has however contributed to an enlargement of the investment shortfall (there was a drop by 20% of GDP since 2008: EBRD, 2015). In this context, the large overhang of NPLs has also contributed to exacerbate the drop in investments. The rise of NPLs has in fact harmed banking lending activities, increased funding costs and overall decreased operational efficiency. Before,

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despite the fact that Western countries were affected more by the global financial crisis and sovereign debt, transaction countries were weakened as well[1]. Correa and Sapriza (2014) show that sovereign debt problems can be transmitted to other countries through global banks that can be either directly or indirectly exposed to countries in distress. Further, as explained by Makin and Narayan (2011), an economy's net foreign borrowing is driven not only by domestic saving and investment behaviours, but also by foreign saving and investment strategies. In general, the financial crisis has harmed banking activities from both the funding side and the lending side. In fact, banks reduced their lending activities (e.g. De Haas and Van Horen, 2013), while at the same time suffering from pressure due to the freezing of the European Interbank market and the risk of withdrawal of deposits from customers (Iyer et al., 2014). All these negative events suggest that the recent financial crisis could have exerted a negative impact on the efficiency of banks in transaction economies. This could lead to a drop of competitiveness of the banking system in these regions with a negative impact on their integration process with Western European countries as a consequence.

In this context, this paper aims to underline banks' efficiency dynamics to provide new insights on the speed and recovery process patterns in transaction economies. In particular, we aim to examine to what extent the financial crisis affected the efficiency of banks in transaction economies. We further investigate whether and to what extent the global financial crisis (GFC) slowed down the recovery after the 2008–09 financial crisis. Finally, we provide new insights on how and to what extent the GFC affected different stages of bank production processes. Our contribution consists of providing new insights on how and to what extent the financial crisis affected the different stages of production of banking activities. In this way, we can better investigate the transmission sources of inefficiency in the banking system during the financial crisis. This issue is of great concern to policy makers who need to assess and monitor the stability and competitiveness of the European banking system in order to intervene with prompt, corrective actions. In particular, we contribute to the existing literature on efficiency in transactions countries in a different way. First, while previous papers have in fact examined the banks' efficiency of the whole process in transaction economies before the financial crisis (e.g. Brissimis et al., 2008; Delis et al., 2011; Havrylchyk, 2006; Koutsomanoli-Filippaki et al., 2009; Yildirim and Philippatos, 2007), we provide novel evidence on how and to what extent the GFC affected banks in these countries. Second, we use a two-stage data envelopment analysis (DEA) model that treats deposits as an intermediate variable (Fukuyama and Matousek, 2011; Fukuyama and Weber, 2010; Holod and Lewis, 2011). From an empirical viewpoint, this allows us to disentangle the production process of a bank into separate stages by focusing on the lending and funding activities. This is important given the changes that occurred in the period of analysis. The boost of credit supply from the banking sector, drop of loans to deposits by 120% in 2008 (EBRD, 2015), and limited expansion of the domestic deposit base could have indeed affected both the lending and funding side.

In particular, we make use of the weight assurance region (WAR) model, recently developed by Halkos et al. (2015). This new framework combines the two-stage DEA model introduced by Chen et al. (2009) and the assurance region approach proposed by Thompson et al. (1990). The additive two-stage DEA model of Chen et al. (2009) calculates the contribution of each stage inside the model, in order to avoid any bias. However, Halkos et al. (2015) notified an extreme case where the contribution of one stage is zero. As explained by Thanassoulis et al. (2004) this may not be reasonable. Halkos et al. (2015) proposed the weight assurance region (WAR) model to overcome this problem. In addition, the WAR model allows for the incorporating *a priori* value judgements into the model, such as known information and/or widely accepted beliefs or preferences, and other types of information as described by Thanassoulis et al. (2004). The WAR model is an advancement of the original additive two-stage DEA model which can be considered as a special case of the WAR model with no additional information. We adapt this model to the banking case. The advantage of this model is twofold. Primarily, in the presence of *a priori* information or prior assumptions, the model allows the incorporation of assurance region-based weights regarding the contribution of each stage to the overall process. Furthermore, this model has the advantage of being flexible and solves the infeasibility problem of the original additive model. Finally, the paper extends the WAR model by including the dimension of time through a window-analysis approach. This allows us to include the effects of macroeconomic and structural changes in our measures of inefficiencies.

The paper presents the following structure: Section 2 briefly discuss the main changes in the CEE banking system and recent economic trend; Section 3 presents the deposit dilemma and the two-stage DEA models; Section 4 provides the framework and the mathematical formulation of the model; Section 5 discusses the results; finally, Section 6 concludes the paper.

2. The CEE banking system and recent economic trend

Starting from the early 1990s, the majority of CEE countries have dismantled the mono-bank structure and moved to a two-tiered banking system by separating policy-oriented activities of the central bank authorities from business-oriented activities of commercial banks. The majority of CEE countries also allowed for the privatization of state-owned banks and opened up the frontier to new players, either private banks or foreign banking institutions. However, at the beginning of the transaction period, all CEE countries experienced a period of instability and underwent a crisis period. Both a liberal licensing policy and low minimum capital requirements allowed a high number of new domestic commercial banks to enter the markets. These new players, however, started to engage in harsh price competition with state-owned banks and aggressive lending strategies (Matousek and Sarantis, 2009). This attitude was supported by weaknesses in the legal prudential system. In this context, several of these new commercial banks, in general small in size, were forced to exit the market or to merge with other banks (Bonin and Wachtel, 2002). At the same time, state-owned banks suffered consistent losses due to bad loans. As pointed out by Koutsomanoli-Filippaki et al. (2009), such a phenomenon was intensified by bad management, and inadequate banking skills and systems to properly assess credit risks. These unsound practices, combined with structural reforms not efficiently supported by a solid regulatory framework, speed and amount of monetary policy interventions, are all factors that have contributed to the economic and banking instability of CEE countries in the early 1990s. In response to this crisis period, CEE countries launched a restructuring program though a massive privatization process of the state-owned banks, and opened up the frontier to foreign banks. The presence of both private and foreign banks started to enhance the efficiency of banking system. However, as pointed out by Matousek and Sergi (2005) the process of consolidation, privatisation and re-capitalisation of commercial banks was not the same across all CEE countries. Baltic countries in particular sped up the process of privatization from the first stage of the transaction period, and exhibited the highest financial deepening compared to other CEE countries (Matousek and Sarantis, 2009). In addition to the growth of foreign investment, reduction of import barriers and development of a tax policy, the globalization process was also an important growth factor of CEE economies from 1990 to 2009 (Gurgul and Lach, 2014).

In the period before the crisis, back in 2006, financial sectors were booming and economies were catching up with the more advanced economies in the European Union in terms of rates of growth and income. In particular, foreign direct investment (FDI) and cross-border

[1] http://www.ebrd.com/downloads/research/REP/regional-economic-prospects1210.pdf, 01/10/2015.

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