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What drives bank performance in transitions economies? The impact of reforms and regulations

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Abstract

This paper investigates the effects of financial regulations and structural reforms on credit, labor and business markets on the cost efficiency of the banking industry in 10 Central and Eastern Europe (CEE) countries for the period 2004 to 2009. Cost efficiency scores are estimated using stochastic frontier analysis, whilst panel regressions examine the impact of regulation and liberalisation using the EBRD transitional reform indicator and the Fraser economic freedom index. By considering both indexes we are able to account for the effects of progress towards more sound banking practices as well as the impact of the credit market, labor market and business sector regulatory regimes on bank efficiency. In doing so, we recognize the important complementarities arising from progress towards (1) more effective banking supervision and regulation and (2) enterprise sector reforms inclusive of creditor protection rights and sound governance practices for bank performance. Our empirical analysis shows that structural reforms on labor and business markets exert a positive impact on bank performance. However, reforms in the banking sector have a negative effect if not accompanied by regulatory and supervisory safeguards to avoid excessive lending.

Keywords: *Regulation; EBRD reforms; Fraser economic freedom index; bank performance; Central and Eastern Europe countries.*

JEL Classification: *G21, P34, P52*

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1. Introduction

In the last two decades countries from the Central and Eastern Europe (CEE) experienced in the banking sectors dramatic changes including liberalization, consolidation and privatization. Under communism and the centralized economy, Fries and Taci (2005) mention that “inputs used by the state controlled banks were not necessarily of the scale and mix that minimized costs, because there was no incentive for profit maximization”. Post-communist economic transition of CEE banking sectors meant that the monobank system of the central-planning period was replaced by the market-oriented, privately owned, geographically and sectorally diversified banking systems of today. In particular, during this period one of the most remarkable developments in international banking has been the sharp increase of foreign bank participation in CEE countries (Poghosyan and Poghosyan, 2010). Financial regulatory reforms influence the degrees of current and potential competition in the banking sector evidenced by new bank formation, bank mergers, and cross-border branch banking (Kalish and Gilbert, 1973). The degree of efficiency with which banks utilize resources may depend on reforms and the incentives for banks to minimize costs may be related to the degrees of current and potential competition in their markets. According to Lehner and Schnitzer (2008) increased presence of foreign-owned banks fosters competition in the domestic market and improves bank performance via fostering access to better screening technologies. They show these effects are more pronounced for emerging markets and transition economies if foreign bank presence takes the form of acquisitions rather than greenfield investments which work better in less developed countries. And Poghosyan and Poghosyan (2010) provide further support for the hypothesis that foreign acquisitions improve the efficiency of the domestic banking industry especially when liberalization has strengthened the quality of host country's legal environment and institutions.

During the economic transition CEE countries saw very significant changes to their economies not only in the banking industry but also in the labor market and business sectors (see EBRD Transition Report, 2010; Gwartney et al. 2010, 2012). These reforms have had an impact on governance and managerial behavior and consequently on firm performance. According to Kuddo (2009), despite improvements in the business and labor environment closely linked to competitiveness, firms in transition countries still perceive labor market regulations as a major constraint to their business.

After the 2008 financial crisis, concerns about the health of the European Union (EU) banking system have escalated as a result of the direct exposure of European banks to troubled sovereigns reinforced by a weaker growth outlook for the EU region and stressed global funding markets. Furthermore, as the new regulatory standards are put into effect, European banks and EU lawmakers have started to realize the great challenges banks face to comply with increased capital and liquidity requirements. Against the backdrop of continuing financial market turbulence, falling lending volume compounded by exposures to distressed sovereigns, banks find it even more difficult to remain profitable which brings into the forefront the issue of efficiency. As a consequence of this, stronger emphasis is put on the importance of improved efficiency in the banking sector. Given the restructuring that took place in the last two decades, empirical studies focusing on banks from Central and Eastern Europe (transition countries), especially those countries who have become EU members in recent years, offer a good ground to investigate the impact of regulatory reforms on bank efficiency which should be of particular interest to policy makers and central banks.

Following the first-wave accession of eight CEE countries to the European Union in May 2004, the period from 2005 to 2007 was characterised by fast global output growth, closer financial market integration, abundant liquidity and build-up of large debt exposures. Cross-border bank lending acquired boom proportions during this period. While a portion of these debt flows went directly to end-borrowers, a substantial part was intermediated by local banks. Subsidiaries of European banking groups had access to important funding from parent banks willing to expand their market shares across the CEE region. In contrast, domestically-owned banks relied on borrowing in the international bond and syndicated loan markets (EBRD 2009). Further the EBRD (2009) report emphasizes that "financial integration – in the form of large debt flows, foreign direct investment, and an increasing presence of foreign banks - has been an integral part of the "development model" of transition countries (particularly in Europe) over the last two decades". However, financial integration encouraged excessive credit growth that is likely to have exceeded the capacity of bank risk management systems and supervisory institutions. Consequently the growth model on which many of the CEE countries relied in the pre-crisis period, based on cheap inflows of foreign capital to fund credit booms, was inherently risky and unsustainable. This experience has shown that by increasing reliance to local sources for both bank funding and for lending to households and small businesses and strengthening bank supervision could lead to "safer" growth in the future."

Growth in cross-border financial flows came into an abrupt halt during the 2007-2008 global financial crisis (GFC) driven by liquidity shortages in global markets and heightened levels of risk aversion triggered in part by solvency anxieties. With the financial turmoil reaching peak levels in late 2008 large declines in banks' international exposures had been observed with significant cuts plaguing CEE banking markets both in terms of accelerated withdrawals of funding from foreign markets and from foreign subsidiaries by international banks exacerbating the contraction of credit and triggering recession in many CEE countries. Coupled with a rise in local deposits, this signals a shift away from the foreign-financed banking model that has prevailed until recently in the CEE region (EBRD 2013). As the Eurozone sovereign debt crisis deteriorated in 2010, any signs of recovery soon evaporated across countries of the transition region, their exports tumbled and capital inflows further declined. The region's exposure to the euro area has thus turned from a benefit into a disadvantage, especially for central and south-eastern Europe (EBRD 2012). In this context further progress with economic reforms and liberal regulation policies are needed to restore confidence in the CEE economies and their banking sectors. An interesting question with important policy implications is to what extent such policy changes are conducive in improving bank performance and therefore promoting financial stability which brings into the forefront the issue of cost efficiency. This is largely an empirical question which this study intends to shed further light.

Our aim is to investigate the effects of regulatory reforms on banks' cost efficiency for CEE countries for the period 2004-2009. In this study, we use an assortment of information, such as the transition indicator of the European Bank for Reconstruction and Development (EBRD) and the Fraser economic freedom index (Gwartney et al. 2008, 2010, 2012), to study the degree to which slow progress in regulatory reforms may impede competition and distort bank behavior and, as a result, generate cost inefficiency in the mix of inputs used by banks.¹ We investigate the impact to cost efficiency of regulations related to credit market, as well as restrictions on labor and business markets, while controlling for other bank-specific, country and institutional-specific characteristics. By considering both indexes we are able to account for the effects of progress towards more sound banking practices as well as the impact of the credit market, labor market and business sector regulatory regime on bank efficiency. In doing so, we recognize the important complementarities arising from progress towards (1) more effective banking supervision and regulation and (2) enterprise sector reforms inclusive of creditor protection rights and sound governance practices for bank performance.

The recent crisis has exposed some major gaps in the growth model for emerging economies as well as gaps in their overall framework for bank supervision and regulation. This paper contributes to the existing literature by providing new evidence on the experiences of CEE countries during the crisis paying particular attention to the effects of economy wide regulatory reforms for the banking industry. Such an assessment is of considerable interest for policy makers given the insolvencies of several major banks in Europe, and accompanied large withdrawal of funding from the region by parent banks, thereby intensifying the contraction of credit and generating a recession in several CEE countries. To assess these effects empirically, we examine the repercussions of progress with regulatory reforms in the labor, credit markets and business sectors on bank efficiency. More precisely, we consider the different components of the credit regulation index which comprises not only prudential and supervisory activities but also issues relative to the ownership of banks, the share of private credit to total credit, and lending rates controls on bank performance in addition to regulations in the labor and business sectors. Our paper extends the previous research on the impact of financial and non-financial regulation on bank performance. In particular, we broaden the Mamatzakis et al. (2013) study by considering the joint effects of the EBRD indicators on markets and financial institutions in conjunction with the Fraser Index of Economic Freedom on bank efficiency in the CEE countries. An important finding of this study is that strengthening bank supervision is crucial for safeguarding bank performance. Our approach follows the methodology of Mamatzakis et al. (2013) as it derives cost efficiency scores for the same countries using the Frazer index however with some important differences. First, we use parametric methods – a stochastic frontier model to measure bank efficiency. The main advantage of this approach is the allowance for measurement error while controlling for firm-specific effects in constructing individual bank efficiency measures. Mamatzakis et al. (2013) use non-parametric methods such as Data Envelopment Analysis (DEA) which impose less structure on the efficiency frontier than parametric approaches, but they do not allow for random errors triggered by data problems or other measurement errors. This is a significant disadvantage to apply this method in CEE countries where measurement problems are important. Second, Mamatzakis et al. (2013) consider all the indices of the Fraser Index of Economic Freedom including the size of the government sector, legal rights protection, access to sound money, freedom to exchange with foreigners, and the regulation of credit, labour and business concluding that liberal regulation in the credit, labour and business markets is the most important channel through which economic freedom affects bank performance. The focus of this study is on analysing the

impact of regulations related to (1) the ownership structure of the banking system, (2) monetary policy such as lending rates control, and (3) the share of credit extended to the private sector on bank performance captured by indicators of the EBRD index in conjunction with subcomponents of the Fraser index. By considering the joint effects of the EBRD indicators on markets and financial institutions with the subcomponents of the Fraser index of economic freedom which relate to credit, labor and business regulations we focus in the indexes that have the strongest influence on bank performance which give us a more concise picture of the economic environment constraints in which banks operate in the CEE countries.

Studies on cross-country bank efficiency performance comparisons in transition countries focus on the relationship between ownership structure (foreign banks versus domestic banks, and private banks versus state-owned banks), asset size and bank efficiency rather than the role of regulation; see for example, the studies of Havrylchuk (2006), Bonin et al. (2005), Green et al. (2004), Yildirim and Philippatos (2007), Karas et al. (2010), Kosac et al. (2009) and Poghosyan and Poghosyan (2010). Some studies cover only the effect of credit/financial reforms on bank efficiency in transition countries (Fries et al. 2006, Koutsomanoli-Filippaki, Mamatzakis and Staikouras 2009, Brissimis, Delis and Papanikolaou 2008, Koutsomanoli-Filippaki, Margaritis and Staikouras 2009a, Koutsomanoli-Filippaki, Margaritis, Staikouras 2009b, Delis and Papanikolaou 2009, and Delis et al. 2011). Moreover, other types of structural reforms beside those on credit and financial sector such as reforms of the labor and business sectors may influence bank efficiency. As articulated by Fries and Taci (2005) banking reform progress is important to encourage sound practices and instill confidence in banks and attract deposits yet equally important for bank performance is enterprise sector reform that promotes creditor rights and sound governance and business practices since for example banks make profits by extending credit to businesses and households.

In this study, we examine the effects of financial regulations and structural reforms on credit, labor and business markets on the cost efficiency of the banking industry in 10 CEE countries. In particular, we use Stochastic Frontier Analysis (SFA) to estimate cost efficiency scores for banks. These efficiency scores are then employed in panel models, both static in terms of standard fixed effects models and also dynamic panel-VAR models that account for endogeneity issues, to estimate the impact of regulation on bank specific efficiency in CEE countries. Our results suggest that structural reforms on labor and business market exert a positive impact on bank efficiency: more liberal labor markets and business sectors seem to be

associated with better bank efficiency. While reforms in the banking sector have a negative effect on efficiency if not accompanied by a regulatory and supervisory framework that prevents excessive lending. Rapid growth of lending and the introduction of private banks and new financial products have a negative effect on bank efficiency.

The structure of the paper is as follows. Section 2 reviews the existing literature on bank efficiency and regulations. Section 3 describes the definition of variables, and the econometric models employed. Section 4 presents the data used and the descriptive statistics. Section 5 discusses the empirical results and section 6 concludes the paper.

2. Bank efficiency and regulations

2.1 Credit market regulation and efficiency

During the last three decades new types of bank regulation² have emerged with the Basel Accords and its capital adequacy requirements and supervision practices. The predictions about the effects of regulation and supervision³ on bank efficiency are not clear (Barth et al. 2013). Regulation has an impact on bank behavior in two opposing ways. On the one hand well-structured regulation enhances efficiency by fostering competition among banks and by encouraging effective governance of financial institutions. Barth et al. (2006, 2013) qualify this view as the *public interest view*. Restricting or limiting banking activities have a negative impact on bank efficiency and greater government ownership of the banking industry is associated with lower bank efficiency (Barth et al. 2013). From the *private interest view* (Barth et al. 2006, 2013) the imposition of regulation may increase the risk-taking behavior of banks (e.g. Kim and Santomero 1988, Genotte and Pyle 1991, Van Hoose 2007, among others). Regulation on financial activities may intensify moral hazard problems and provide more opportunities for banks to increase risk taking. These adverse incentive effects of regulation can lead to an efficiency loss. According to the *private interest view* bank regulation is negatively related to bank efficiency. We summarize the contrasting effects of credit market regulation on bank efficiency in terms of two competing hypotheses. Under the *public interest view hypothesis (H1)* we expect credit market regulation to be positively related to bank efficiency and under the *private interest view hypothesis (H1a)* we expect credit market regulation to be negatively related to bank efficiency.

Empirical research in cross-country studies has analyzed the impact of regulations on bank performance considering different financial measures (Barth, Caprio and Levine 2004, 2008), or bank ratings (Pasiouras et al. 2006, Demirgüç-Kunt, Detragiache and Tressel, 2008). Other cross-country studies have considered financial and non-financial factors to analyze the impact of regulations on bank efficiency (Pasiouras, Tanna and Zopounidis 2009, Barth et al. 2013, among others). The efficiency measures for the banks considered at these studies are constructed based on non-parametric methods to evaluate the performance of the individual banks. The results of these studies are not conclusive. Fries and Taci (2005) examine the relative cost efficiency of banks and find that progress in liberalising interest rates and credit allocation and in implementing a framework of prudential regulation and supervision, as measured by an index of the EBRD banking reform, has a non-linear association with cost efficiency. Yildirim and Philippatos (2007) analyse the cost and profit efficiency of banking sectors in 12 transition economies of CEE over the period 1993-2000, using the stochastic frontier approach (SFA) and the distribution free approach. They found that market concentration is negatively linked to efficiency and foreign banks are found to be more cost efficient but less profit efficient relative to domestically owned private banks and state-owned banks. In a more recent study, Brissimis et al. (2008) find that both banking sector reform and competition have a positive effect on bank efficiency, while the effect on total factor productivity is significant only toward the end of the reform process. Koutsomanoli-Filippaki, Mamatzakis, Staikouras (2009), investigate the impact of structural reforms on profit efficiency in the banking industry. They find that non-banking reforms, as measured by the EBRD non-banking transition indicator, are associated with higher profit inefficiency whereas banking reforms are important for bank profitability, as they assert a positive impact on profit efficiency. Also, Koutsomanoli-Filippaki, Margaritis, Staikouras 2009(b), examine the relationship between profit efficiency and banking reform using the EBRD index and find a positive relationship between these two variables. Delis et al. (2011) in a sample of banks from 22 countries in transition economies find that the ERBD banking reform index has a positive and statistically significant impact on TFP growth, a result consistent with earlier studies (e.g., Brissimis, Delis and Papanikolaou, 2008). Fang et al. (2011) in a sample of banks operating in six transition countries find that institutional development according to the EBRD indicators, proxied by progress in banking reforms, privatization and corporate governance restructuring in the business environment, have a positive impact on bank efficiency. Finally, in a recent

study, Mamatzakis et al. (2013) using the Fraser index in a sample of 10 CEE countries for the period 2000 to 2010 find that certain aspects of credit regulation such as foreign ownership and competition and private ownership are associated with improved efficiency.

2.2 Labor regulation and efficiency

According to Gwartney et al. (2008) different types of labor-market regulations may contravene the economic freedom of employees and employers. Furthermore, these authors report that “the most important are minimum wages, dismissal regulations, centralized wage settings, extension of union contracts to non-participating parties, and conscription” (Gwartney et al. 2008, p.7). Labor market regulation, although intending to safeguard employment and boost further growth, by forming rigidities could result in opposite outcomes (Botero et al. 2004). Moreover, rigidities, such as higher costs of formal employment procedures and lower labor flexibility in highly regulated labor markets, in parallel with increasing welfare expenditures, would explain variations in growth performance across countries (Botero et al. 2004, Layard et al. 1991). In a liberal labor environment, market determines wages and the conditions of hiring and firing. Our aim is to quantify the effects of labor market regulation on efficiency, in particular in the banking industry, an industry that heavily depends on employees for its performance. Several studies (e.g. Blanchard and Wolfers, 2000, Besley and Burgess, 2004) predominantly suggest that higher degree of labor market regulation induces efficiency losses for firms. Employment costs would rise as a result of labor market regulation, because of strict employment protection legislation (Scarpetta and Tressel, 2004). An increase in labor costs in the banking sector will affect the efficient use of inputs and consequently the performance of these firms. In turn, rising labor costs would negatively affect the firm’s return with respect to innovation and technology, whilst innovation investment would decline and similarly productivity growth and labor productivity growth would suffer (Malcomson, 1997). The latter may affect the firms’ probability of default and through spillover effects, the banking sector. As mentioned in the introduction the period from 2005 to 2007 was characterized among others, by fast growth output and credit boom.

This leads us to formulate our third testable hypothesis: labor market rigidities are expected to be negatively related to cost efficiency (*H2*), i.e. higher levels of the index of labor reforms in the market indicating a higher level of economic freedom (less regulatory restrictions) will be

positively related to cost efficiency. This means that less labor market rigidities will lead to greater bank efficiency.

2.3 Business market regulation and efficiency

The institutional setting concerning the labor market as mentioned in the previous sub-section, the business sector and the regulatory environment may affect bank efficiency and stability. According to De Haan et al. (2006) there is a broad consensus that in principle less regulation in labor, credit, and business sectors will be beneficial for growth. The institutional environment in which banks operate is important. For instance, Barth et al. (2013) in an empirical study involving 72 countries find that better institutional environment in terms of laws and regulations exerts a positive and significant impact on bank operating efficiency. Business market regulation refers to regulations and barriers that prevent entry and reduce competition in the market and may affect bank efficiency through spillover effects. More precisely, according to Giannone et al. (2010) “business sector regulation comprises price controls, administrative conditions for new businesses, government bureaucracy, and difficulties in starting a new business, irregular, additional payments connected with import and export permits, business licenses, exchange controls, tax assessments, police protection, or loan applications”. The contraction of credit impedes the financial and economic development of the transition countries. A favorable business environment, with protection of intellectual property, secures property rights, and without entry regulations, may affect positively the productivity growth of firms (Klapper et al. 2006). In a sample of firms across 34 countries including firms from transition countries, for the period 1998-1999 Klapper et al. (2006) find that low corruption, and low entry barriers would stimulate business activity and firm creation. These findings corroborate previous studies in transition countries (e.g. Johnson et al. 2002) where firms’ investment is affected by the perceived security of property rights. More precisely, insecure property rights mean firms have limited incentive to invest and therefore little demand for external finance. The latter has an impact on credit market development and therefore on bank performance. In transition countries according to Gwartney et al. (2010, 2012) improvements in the business environment that are closely linked to competitiveness are still needed. This leads us to formulate our fourth testable hypothesis: less regulatory restrictions in the business sector have a positive impact on bank efficiency (*H3*).

3. Empirical Methodology

The main advantage of measuring bank performance opting for a stochastic frontier analysis is that it provides parametric estimates of efficiency at bank level that are subject to statistical hypothesis testing (see Pastor and Serrano, 2005, Meeusen and Van den Broeck 1977). As such, the stochastic frontier analysis of this paper refrains from non-parametric estimations of previous literature (see Mamatzakis et al. 2013) where statistical inference is not directly available. Setting the underlying framework of our methodology, every bank in our sample attempts to minimize costs so as to reach the optimum level of minimum cost.

3.1 Measuring Cost Efficiency

Following the seminal work of Aigner et al. (1977) we employ the Stochastic Frontier Approach (SFA)⁴. The cost function of bank i takes the general form as developed by Aigner et al. (1977) and Meeusen and Van den Broeck (1977) of:

$$C_{it} = f(P_{it}, Y_{it}, N_{it}, Z_{it}) + v_{it} + u_{it} \quad (1)$$

Where C_{it} counts for the cost for bank i at year t , P_i is a vector of input prices, Y_i is a vector of outputs of the i th bank, N_i is a vector of fixed netputs and Z_i is a vector of various control variables. The special characteristic of equation (1) refers to the error term that consists of two parts, v_{it} counts essentially for the classical error term that follows a symmetric normal distribution whilst u_{it} represents the inefficiency as bank i could incur higher costs than the best performing bank in the sample. Given that inefficiency cannot take negative values it follows the half-normal distribution.

For selecting bank inputs and outputs we opt for the well known intermediation approach of Sealey and Lindley (1977). This approach has been widely employed due to its simplicity and punctuality in defining the principal function of a representative bank, that is a bank employs labor and utilizes capital so as to collect deposits and other funds and then transforms them into loans and other income generating assets. To this end, we follow the intermediation approach and select two inputs and two outputs. Labor measured by personnel expenses and financial capital represent the two inputs. Loans and other earning assets, which include government securities, bonds, equity investments, CDs and T-bills, are the outputs.

For the prices of inputs we estimate the price of the financial capital as the ratio of total interest expenses to total interest bearing borrowed funds. For the price of labor we opt for the ratio of personnel expenses to total assets. The sum of overheads, such as personnel and administrative expenses, interest, fee and commission expenses, count for total cost.

The following translog specification of the cost function is chosen due to its flexibility:⁵

$$\begin{aligned}
\ln C_i = & \alpha_0 + \sum_i a_i \ln P_i + \sum_i \beta_i \ln Y_i + \frac{1}{2} \sum_i \sum_j a_{ij} \ln P_i \ln P_j + \frac{1}{2} \sum_i \sum_j \beta_{ij} \ln Y_i \ln Y_j + \\
& \sum_i \sum_j \delta_{ij} \ln P_i \ln Y_j + \sum_i \varphi_i \ln N_i + \frac{1}{2} \sum_i \sum_j \phi_{ij} \ln N_i \ln N_j + \sum_i \sum_j \xi_{ij} \ln P_i \ln N_j \\
& + \sum_i \sum_j \zeta_{ij} \ln Y_i \ln N_j + \theta_1 t + \frac{1}{2} \theta_2 t^2 + \sum_i \mu_i t \ln P_i + \sum_i \kappa_i t \ln Y_i + \sum_i \nu_i t \ln N_i + k D_i + \sum_i \xi_i Z_i + \\
& u_i + v_i
\end{aligned} \tag{2}$$

As in Equation (1) TC_i denotes observed total cost for bank i , P_i is a vector of input prices, Y_i is a vector of outputs, N_i is a vector of fixed netputs and Z_i is a vector of control variables. In detail Y_i comprises of two outputs: loans (Y1) and other earning assets (Y2). Other earning assets count for government securities, bonds, equity investments, CDs. We include two inputs: labor and deposits. Thus, the vector P_i of input prices contains: personnel expenses to total assets (P1) and total interest expenses over total deposits and short-term funding (P2).

We also include two fixed netputs, namely physical capital and equity. Equity inclusion is of some importance as it represents valuable funding and as such could impact upon cost structure (Berger and Mester, 1997). Moreover, no inclusion of equity would result to bias estimations as banks with higher equity capital, representing banks with high capital, could display risk aversion in terms of behaviour compared to banks with lower level of equity.⁶

As Z_i we opt for GDP growth per capita so as to capture cross-country heterogeneity in terms of the underlying macroeconomic framework. Along these lines we also opt for inflation rate as a general financial stability index. Lastly, total cost is the sum of overheads, interest, fees and commission expenses.⁷

Lastly, we apply linear homogeneity and symmetry in quadratic terms in line with duality theory. Country and time effects are also captured. We opt for maximum likelihood estimation

for the stochastic frontier model where the parameters of error variance are $\sigma_\varepsilon^2 = \sigma_u^2 + \sigma_v^2$ and $\gamma = \sigma_u^2 / \sigma_\varepsilon^2$.

3.2 Determinants of Cost Efficiency

Next we employ cost efficiency scores, as derived from the sample of CEE countries that share a common frontier, to estimate the impact of the economic environment, using as control variables bank specific characteristics and the structure of the national financial systems.

3.2.1 Regulations

First, we employ the EBRD indicators formulated in 1994,⁸ representing one of the first attempts at quantifying the level of progress achieved in various aspects of transition of financial industry in East Europe and elsewhere. Currently, there are nine indicators, covering four broad aspects of transition (EBRD, 2010): first, there is the enterprises index, incorporating small- and large-scale privatization and enterprise restructuring; second the markets and trade index referring to price liberalization, competition policy, and trade and foreign exchange system, third the financial institutions index for capturing banking reform and interest rate liberalization and Securities markets and non-bank financial institutions, and lastly the infrastructure index for overall infrastructure reform. EBRD indexes are measured on a scale from 1 to 4+, where 1 represented little or no progress in reform, whilst 4 implies that a country undertakes major advances in transition in a particular aspect which corresponds to an advanced industry market economy (see table A2 in Appendix for more detailed description).

In our analysis we consider the EBRD transitions indicators covering the areas of markets and trade and more precisely the sub-component relatively to the competition policy (Compebrd) and the sub-components of the financial institutions area relating to the banking reform and interest rate liberalisation (Bankebrd) and to the securities markets and non-bank financial institutions (Secebrd). A favourable business environment with unrestricted entry to markets for firms and effective enforcement of competition policy will increase the demand for external finance. We can also expect that increasing competition between banks and capital markets would have a positive effect on the overall efficiency of the financial system (Koutsomanoli-Filippaki et al. 2009).

In addition to EBRD index, we also employ the Fraser Index of Economic Freedom (Gwartney et al. 2010)⁹. As mentioned, in this paper we consider the impact of credit, labor and business regulation on bank efficiency using the regulation variables provided by the Fraser index. According to Gwartney et al. (2012) higher economic freedom- freedom of exchange and protection of private property –is associated with a lower probability of banking crisis. In our analysis we emphasize the impact of credit regulation on bank performance and for this reason we consider the sub-components¹⁰ of the credit regulation index. In particular, we employ the credit regulation and its sub-components such as: bank ownership (percentage of deposits held in privately owned banks, CR-Own), foreign competition (rate of approval of foreign bank applications and the share of foreign banks over the total banking sector assets, CR-Comp), private sector credit (government borrowing crowding out effect on private borrowing, CR-Prs), and interest rate controls (negative real interest rates, CR-Nir). The index takes values from 0 to 10, with a higher value indicating higher level of economic freedom. For example, the sub-components of bank ownership and foreign competition would reveal private and foreign banks' impact on the sector's performance. More precisely, activity restrictions can limit the exploitation of economies of scope and scale in gathering and processing information about firms and could impede its ability to diversify income streams and reduce the franchise value a bank, which might limit the incentive for efficient behavior (see Table A1 in Appendix for more detailed description). Thus from the public interest view and according to our H1 hypothesis activity restrictiveness relative to foreign competition (CR-Comp) and private sector credit (CR-Prs) and greater government ownership are associated with lower bank efficiency. Furthermore, the indicator of the EBRD relative to banking reforms¹¹ and interest rate liberalization (Bankebrd) and the Fraser index on interest rate controls (CR-Nir) according to our H1(a) hypothesis are expected to be positively related to bank efficiency.

We also opt for the labor (LR) and business (BR) regulations component of Frazer. High scores in these indexes would imply liberalisation of labor market and business red tape. Moreover, labor regulation is of the utmost importance for bank performance given that personnel expenses directly affect costs (Scarpetta and Tressel 2004). Along these lines the business regulation affects bank performance as it dictates whether or not business activity is facilitated and promoted (Klapper et al. 2006, Johnson et al. 2002).

3.2.2 Bank specific variables and other variables

A number of variables were used to control for bank characteristics such as the log of total assets, the ratio of loans to assets, the ratio of equity to total assets and finally the ratio of loan loss provisions to loans. Total assets represent the size of the loan portfolio of each bank and are employed as a proxy for economies or diseconomies of scale and can lead to either higher or lower costs for the bank (Fries and Taci, 2005). According to Fries and Taci (2005) "if market concentration reflects market power for some banks, it may increase the costs for the sector in general through slack and inefficiency." This can happen for example in situations where bank mergers and acquisitions are driven by a strong desire to gain market share rather than the pursuit of improving bank efficiency. On the other hand, according to the same authors "if concentration of the market reflects market selection and consolidation through survival of more efficient banks, market concentration would be associated with lower costs". The ratio of loans to assets is used as a proxy for asset utilisation, which is expected to be positive as it represents well functioning intermediation by the bank and represents the biggest portion of earning assets. Equity over total assets is a proxy of capital adequacy or capital risk, aiming to reveal bank's risk preferences. It is expected to have a positive effect as higher equity to total assets implies that better capitalised banks have stronger incentives in improving their performance and minimising costs. Lastly, we also include loan loss provisions, counting for the quality of credit portfolio, to capture default. In empirical studies there is mixed evidence on the sign of loan loss provisions as there might be differentiations in its impact on bank performance in the short term compared to the long term. In the short term, loan loss provisions might have a negative impact on efficiency due to the underlying costs that the bank has incurred, whilst in the long term this could turn positive as the quality of credit portfolio improves.

To control for financial structure we consider domestic credit to the private sector over GDP to capture the level of development of the financial sector. We also employ the Hirschman-Herfindahl index (HHI) as a proxy for the level of market concentration in the sector.

Finally to analyse the impact of the general macroeconomic environment, we consider the real GDP per capita in purchasing power parity (PPP) terms (Karas et al 2010, Kosac et al 2009 and Poghosyan and Poghosyan 2010). We also include inflation to capture financial stability

from a macroeconomic perspective (Havrylchyk 2006, Bonin et al. 2005, and Yildirim and Philippatos 2007).

3.2.3 Fixed effects and Panel Vector Autoregression (VAR) Model

Panel data methods allow more complex behavioural models to be estimated (Baltagi, 2005). A fixed effects model can then be specified as:

$$Eff_{it} = m_i + b\alpha Z_{it} + g\alpha X_{it} + d\alpha reg_{it} + e_{it} \quad (3)$$

Where Eff_{it} denotes bank cost efficiency, Z_{it} is a vector of bank specific explanatory variables, X_{it} accounts for the level of economic development and financial structure variables, whilst reg_{it} is a vector of regulation and reform indicators such as the Fraser and the EBRD indexes.

The fixed effects capture unobserved time-invariant bank specific heterogeneity which may be correlated with the regulation indexes and EBRD indexes or with observed bank specific variables. Time dummies and country dummies may also be introduced to capture structural changes or other time-varying unobserved effects which may be common across banks and account for differences across countries, respectively.

One of the most frequent quoted criticism on models such as equation (3) refers to the endogeneity of some of the right hand variables, in particular the bank specific variables especially in situations where unobserved heterogeneity may be changing over time. As way to address this criticism and reinforce the validity of our findings we employ a vector autoregressive model where all the main variables of interest enter as left hand side variables in as many equations as the dimension of the dependent variables vector. Thus, the issue of endogeneity is tackled whilst we could observe the variety, if any, of any underlying causality relationships between the variables of our analysis. Given that our sample comes in the form of panel, the VAR we opt for is a panel VAR (PVAR) model so as to enhance the dynamic and static interdependencies that may exist between our bank performance measures with the EBRD/Fraser indexes. This is a major advantage of PVAR over a univariate panel regression model. An added feature of the PVAR model is that it allows to investigate through impulse response analysis the transmission of shocks such as for example those during the GFC across banks in the CEE region. Similarly, impulse response analysis is useful from a policy

perspective to investigate the response to reform/regulation changes on bank performance. The panel VAR is sufficiently flexible to pick up any structural breaks through the responses of variables to all shocks. The panel VAR can take the following general form:

$$Z_{it} = a_i + bZ_{it-1} + e_{it}, i=1, \dots, N, t=1, \dots, T. \quad (4)$$

Where Z_{it} , is a vector of the main bank specific variables such as bank efficiency (Eff_{it}), Fraser reform indexes covering credit regulation (CR_t), labor regulation (LR_t) and business regulation (BR_t). In addition, we also include three broad aspects of transition EBRD indexes: competition policy ($Compebrd_t$); financial institutions, banking reform and interest rate liberalization ($Bankebrd_t$) and securities markets and non-bank financial institutions ($Secebrd_t$).

In more detail, β in the VAR (4) is opted to be of dimensions 4x4 matrix of coefficients, whilst α_i captures in a vector bank's i fixed effects and $e_{i,t}$ denote iid residuals (Love and Zicchino, 2006). As required we apply forward mean-differencing to our variables with the Helmert procedure (Arellano and Bover, 1995). Lastly, Monte Carlo simulations provide the standard errors for the impulse response functions (IRFs thereafter).

4. Data and Descriptive Statistics

The data used in this paper were extracted from the IBCA-Bankscope database for the period 2004 to 2009. The data comprised samples of 168 commercial banks in line with other studies in CEE countries (e.g. Grigorian and Manole 2006, Mamatzakis et al. 2013) and, after removing errors and inconsistencies, 1,811 bank observations per year remain in an unbalanced panel. The bank data allows some cross-country comparisons, shown in Table 1. Table 1 shows significant differences in mean total assets, ranging from \$920 million in Bulgaria to \$6,057 million in the Czech Republic. The equity to assets (E/A) ratio suggests relatively weak cross-country heterogeneity, with 9% in the Czech Republic and 16% in Bulgaria while the loans to assets (L/A) ratio ranges from 45% in Latvia to 62% in Hungary. Loan loss provisions as a share of total loans (LLP/L) is centred around 3%, with the exception of the Czech Republic where it is 13%.¹²

The financial structure variables are also different between countries. Competitiveness in the sector (the Hirschman-Herfindahl index) ranges from 60% in Slovenia to 90% in Estonia, with

a mean of 67% and the domestic to private sector as a share of GDP from 24.65% in Romania to 58.38% in Estonia. Not surprisingly, the more developed countries in terms of GDP per capita also have the highest level of financial development, that is, the size of the private sector. Romania has the highest inflation rate (11.58%), followed by Latvia (10.15%), with the mean at 5.52%. Finally Bulgaria has the highest interest spread (16.58%), followed by Romania (11.83%) with the mean at 7.19%.

Table 1

Relative to the regulatory variables, all the new accession countries score highly in the overall index of credit regulations (CR). The mean score is high (0.85) and only Romania is below 0.8. With respect to the components of the CR index a similar picture emerges. The mean score of the CR-Own index, which measures the private banks share in the banking system is 0.81 while again, only Romania has a comparatively low score (0.45). The scores for the CR-Comp index, which measures the foreign banks in each country's share in the banking system, are lower than the overall index of credit regulations (CR) and the majority of the sample is between 0.7 and 0.8. Finally, the scores for the CR-PrS and the CR-Nir components of the index are very high, which means that on average the state does not crowd-out private borrowing and interest rates are determined largely by market forces in this period. Finally, the new member states score relatively low, in comparison with their CR scores, in labor (LR) and business regulations (BR) with mean of 0.62 and 0.57 levels respectively. Furthermore, Table 1 shows that the regulation indices have improved their scores over this period. This is especially true for the CR-Own and the CR-Comp indices as they reflect the lower state ownership and the increased presence of foreign banks resulting from the privatisation programmes and further reform to prepare for EU accession. On the other hand, labor regulations (LR) have improved at a slower rate and business regulations (BR) remained stable.

5. Results and Discussion

5.1 Cost Efficiency Estimates

Table 2 reports cost efficiency estimates obtained from equation 6 for each country for the period 2004 to 2009. The Stochastic Frontier Analysis (SFA) we employ herein provide parametric bank specific efficiency scores across countries ranging from 72.84% to 86.61%. According to the SFA results the average cost efficiency level for 10 transition countries under

examination is 0.794 indicating that the average bank could reduce its costs by 20.6% to match its performance with the most efficient bank. In other words, this result says that on average 20.6% of bank resources are wasted during the provision of banking services in transition economies. The banking system in Slovenia (86.61%) is the most cost efficient system and Bulgaria (72.84%) seems to be the least efficient during the sample period. It is interesting that these results come in some disagreement with the ones of Mamatzakis et al. (2013) where efficiency takes high values for some countries such as 90% for Hungary. However, note that our results are not directly comparable to Mamatzakis et al. (2013) as the authors opt for a non parametric method to measure efficiency. Our results corroborate previous studies for transition economies (e.g. Kasman and Yildirim 2006, Yildirim and Philippatos 2007, Mamatzakis et al. 2008).

Table 2

The results in Table 2 indicate that the average estimated cost efficiency scores from 2004 (date in which all countries joined the European Union except Bulgaria and Romania who joined the European Union in 2007) to 2009 has increased from 75.21% to 86.01% showing that the new members countries made significant performance improvements in their banking system once they join the EU market, in spite of the global financial crisis of 2008-2009.

5.2 The Determinants of Cost Efficiency

The two models are remarkably consistent and the expected signs confirmed. The total assets (lnTA) variable is significant at the 1% level and negative, indicating that on average larger banks increase their costs in their operations. A possible explanation for the negative impact of total assets (lnTA) on cost efficiency can be attributed to the remaining large state owned banks that are highly inefficient. As mentioned in the EBRD (2010) report banking remains very concentrated, with large public entities dominating in many cases. The next significant variable at 1% for both specifications is the ratio equity to assets (E/A) ratio that is positively correlated to cost efficiency indicating that banks with a good capital position are able to pursue business opportunities more effectively and have greater flexibility during unstable macroeconomic conditions. The positive sign for E/A suggests that better capitalized banks are more efficient. This result is in line with other studies that find a positive relationship between capital adequacy and efficiency (Berger and Mester 1997, Yildirim and Philippatos, 2007, Delis et al. 2011). The ratio loans to total assets (L/A) captures asset utilization. This variable is significant and

negative at the 1% level only in the bank specific model indicating that banks with higher ratio of loans to assets are less cost efficient, suggesting that the expenses associated with the credit origination and loan monitoring are quite substantial, increasing bank's cost inefficiency. This result is in contradiction with evidence reported by Yildirim and Philippatos (2007). The results of the financial and macroeconomic variables that are used are presented in Table 3. In the financial structure model the real GDP per capital in purchasing power parity (lnGDPcPPP) term is used to control for the general level of economic development. The negative and significant at the 1% coefficient of this variable indicates the negative impact of the economic development on cost efficiency, suggesting a more sophisticated domestic market is associated with higher operating and financial costs and has a negative effect on banking performance. One possible explanation of this is that banks in higher per capita income countries are more efficient in terms of generating stronger cash flows and savings, and hence a higher demand for financial services and higher profits than banks in low income countries. Our result is in line with evidence reported by Mamatzakis et al. (2013). The interest spread (SPR) is positive at 1% level of significance, reflecting the fact that higher spreads as associated with higher margins and thus higher efficiency. The last significant variable at the 5% is the Hirschman-Herfindahl index (HHI). This variable is used as a proxy for market concentration which is positively related to cost efficiency. This means that higher concentration is associated with lower costs resulting of either superior management or greater efficiency of the production process (Demsetz 1973). Our result is line with other studies that find a positive relationship between cost efficiency and concentration (e.g. Yildirim and Philippatos, 2007) and in contradiction with Delis et al. (2011) who found a negative relationship.

Table 3

5.3 The impact of Fraser Index and EBRD Regulations

First of all we consider the impact of credit regulation (CR), labor regulation (LR) and business regulation (BR) on cost efficiency. The results from table 4 indicate that the three variables are significant at the 1% level. Credit regulation is negatively correlated to cost efficiency rendering support to the *H1(a) hypothesis* meaning that rapid growth of lending and the introduction of private banks and new financial products has a negative effect on bank efficiency. However we find support for the *H2* and *H3 hypotheses*, that labor market

regulation (LR) and business regulation (BR) have a positive impact on cost efficiency. The results indicate that less labor market rigidities and less regulation and bureaucratic procedures that restrain entry and reduce competition in the business sector have a positive effect on cost efficiency. In other words, more liberal labor markets and business sectors seem to be associated with better bank efficiency. Mamatzakis et al. (2013) find that credit regulation (CR) and business regulation (BR) are not statistically significant while, labour regulation (LR) has a positive impact on efficiency. As before the variable (LnTA) which measures the size of the bank is significant and negative probably due to the presence of large owned banks that are highly inefficient and the E/A variable which captures the risk preferences of the bank significant and positive at the 1% level. The next significant variable at the 10% is the domestic credit provided to the private sector as % of GDP (DCPS). This means that enhancing credit provided to the private sector has a negative effect on cost efficiency. Finally inflation (INF) is significant at the 1% and positively related to cost efficiency but the coefficient is not very high (0.0045). High inflation affects bank behaviour and induces banks to compete through excessive branch networks (Kasman and Yildirim, 2006).

Table 4

To investigate further the impact of credit regulation on bank efficiency we consider its main components as defined by CR-Comp that is foreign bank presence in the domestic market, by CR-Nir that is the negative interest rate and CR-PrS that is credit to the private sector (Table 5). The results from table 5 show that only the CR-PrS variable is significant on cost efficiency at the 1% level. This result is in contradiction with Mamatzakis et al. (2013) who find no significance impact of this variable on cost efficiency. As before rapid growth of lending has a negative impact on cost efficiency. A possible explanation of the negative relationship between the CR-Prs variable and cost efficiency is that probably government borrowing is less costly with respect to screening and more secure as the probability of default is lower than borrowing to the private sector.

Most of the control variables remain consistent with earlier models. LnTA continues to have a negative influence to cost efficiency and is significant for all specifications at the 1% level. E/A continues to exert a positive impact on cost efficiency and is significant for all models at the 1% level. The DCPS variable continues to have a negative impact on cost efficiency in all specifications and is significant at the 1% for all models except for credit rating model where it is significant at the 10% level. The L/A variable is only significant at the CR-comp model at

the 10% level and has a negative impact on cost efficiency. Finally as before in all models inflation (INF) is positively correlated to cost efficiency and significant at the 1% level.

Table 5

To investigate the impact of EBRD reforms on bank inefficiency we consider the main indicators to the market sector reforms relatively to the competition policy (Compebrd), to the banking sector reforms (Bankebrd), and finally to the securities markets reforms (Secebrd). Table 6 presents the results using the EBRD reform indicators and bank-specific characteristics as the independent variables. The variable $\ln TA$ is as before significant at the 1% level in all specifications but the sign has changed in some specifications from negative to positive. For instance the results show that when we consider reforms at the market sector and the securities markets sector, $\ln TA$ which represents the size of the loan portfolio of each bank lead to lower costs for the banks suggesting that larger banks are more efficient. This result is in line with other studies that find a positive relationship between size and efficiency (Yildirim and Philippatos 2007, Delis et al. 2011). For the other two models we find a negative relationship between size and efficiency as before. The variable E/A is as before positive and significant at the 1% level for all specifications. The next significant variable is the ratio of Loan loss provisions to total loans (LLP/L) which is positive in all specification except the first model where is not significant. This ratio is a proxy for credit risk is significant at the 5% level when we consider reforms at the securities markets sectors and significant at the 1% when we consider reforms at the financial sector and reforms in all markets is positively related to cost efficiency: a higher level of problem loans is associated with higher cost efficiency level. This result is in contradiction with other studies that find a negative relationship between credit risk and efficiency (Yildirim and Philippatos 2007, Delis et al. 2011) but in line with Koutsomanoli-Filippaki, Margaritis, Staikouras 2009(a), and Koutsomanoli-Filippaki, Margaritis, Staikouras 2009(b). The variable $DCPS$ is as before significant and negative at the 1% level in all specifications except in the EBRD index market sector reform and in the securities markets sector reforms where it is significant at the 5% level. The variable SPR which measures the net interest spread is significant at the 5% level in all specifications except in the model with all indexes reforms which is significant at the 10% level and positively related to cost efficiency. As expected an increase in the net interest spread has a positive effect on cost efficiency. A high SPR indicates an effective use of earning assets. Finally the $Bankebrd$ variable which indicates reforms in the banking sector is significant at the 5% level and positive related to efficiency at the model where we consider reforms at the financial sectors. This means that the

rapid growth of lending and the introduction of private banks and new financial products have a positive effect on cost efficiency. However this can give a false impression of progress if these progress are not accompanied by institutional safety valves to avoid excessive lending. This can explain the negative effect on bank efficiency of reforms in the banking sector when we consider all EBRD indexes reforms rendering support to the H1(a) hypothesis as mentioned before. This variable is significant at the 1% level and changes sign from positive to negative. In other words any reform in the banking sector has a negative effect on efficiency if it not accompanied by regulatory and supervisory reforms¹³.

Table 6

5.3.1 Dynamic Panel Analysis

Prior to the panel-VAR analysis we are employing the Arellano and Bover (1995) estimation for Dynamic Panel Analysis of our basic model. A common criticism in the fixed panel models is the static nature of the underlying relationships among the variables, when one would expect that such types of relationships evolve over time. In addition, there is common to have endogeneity issues, the Arellano and Bover (1995) dynamic panel data analysis uses an instrumental methodology and GMM estimator that resolves also the issue of endogeneity.

In more detail, we employ the Arellano and Bover (1995) estimation method with robust standard errors. Note that advantage of this methodology also lies on the GMM estimation method that tackles the criticism of endogeneity. The model takes the following general form:

$$Eff_{it} = m_{it} + aEff_{it-1} + bSZ_{it} + gSEBRD_{it} + e_{it} \quad (5)$$

Where Eff_{it} is bank efficiency of bank i in year t , Z_{it} counts for bank specific control variables and $EBRD_{it}$ notes various EBRD reform indexes¹⁴.

Table 7 reports cost efficiency determinants in a dynamic analysis considering one lag and Frazer reforms indicators as well EBRD reforms indicators. Overall, the dynamic analysis is meaningful as the coefficient of lagged efficiency, Eff_{it} , is significant at the 1% significance level and takes values less than one.

Table 7

The efficiency estimate with one lag is positive and significant at the 1% level for both specifications. This means that past efficiency exert a positive impact on current efficiency. This finding is consistent with Delis et al. 2011. The next significant variable at 1% is the ratio equity to assets (E/A) used as proxy to capital risk which is negatively correlated to cost efficiency. The negative sign for E/A suggests that better capitalized banks are less efficient. This finding is in contradiction with our previous results. The LLP/L variable as before is significant at the 1% level and positively correlated to cost efficiency for both specifications. The DCPS variable is significant at the 5% level only at the Fraser reforms indicators model and negatively correlated to bank efficiency as before. The CR (Credit Regulation) variable is as before significant at the 5% level and negatively correlated to cost efficiency. Enhance in credit as mentioned before must be accompanied by institutional safeguards to prevent excessive and imprudent lending which has a negative impact on bank efficiency (EBRD 2010, Angkinad 2009). As before BR (Business Regulation) is significant at the 1% level and have a positive effect on bank efficiency: less regulation and bureaucratic procedures have apposite effect on cost efficiency. The EBRD index of market reform relatively to the competition policy (Compebrd) is significant at the 10% level and positively related to cost efficiency. Liberalisation as well continuous improvements in law enforcement and changes to competition law have a positive impact on cost efficiency. Finally the EBRD indexes of bank reforms (Bankebrd) and securities markets reforms (Secebrd) are not significant.¹⁵

5.3.2 IRFs and VDCs of Panel-VAR analysis

Prior to estimating the panel VAR it is crucial to select the lag order. Following Lutkepohl (2006) we employ the Arellano-Bond GMM estimator for different lags $j=1, 2$ and 3 .¹⁶ Note that we opt for up to three lags so as to examine any underlying autocorrelation. This standard testing methodology shows that by opting for lag order of one we take into account any concerns with reference to autocorrelation whilst we incorporate significant information that would have been lost if a lag order of two was to be opted instead. We also test for normality with the Sahpiro-Francia W-test without observing any violations.¹⁷

Figure 1 shows the impulse response functions (IRF). There are four different plots in Figure 1 as the dimension of the VAR is 4×4 thereby each plot presents the response to each of the four variables to its own shock or to shocks due to the remaining variables. To this end, in Figure 1 the plot in the first row depicts the response of bank efficiency (EFF) to a shock in

credit regulation (CR), labor regulation (LR) and business regulation (BR) respectively measured in standard deviations terms. All these indexes are from the Fraser regulation data set. It is clear from first row that the response of bank efficiency to credit regulation is positive for the first six years, with a hike after one period, whereas it dies out thereafter. This is an interesting result as it highlights that credit regulation improves bank performance, a result that one would expect to hold in particular in periods of financial crisis as prudent regulation leads to a safe and sound financial system. Our result is line with other cross-country studies that find a positive relationship between greater capital regulation stringency and bank efficiency (Barth et al. 2004, Barth et al. 2013) and Pasiouras, Tanna, and Zopounidis (2009) who found that stricter capital requirements have a positive impact on cost efficiency. More precisely Barth et al. (2004) found a positive relationship between barriers to foreign-bank entry and bank fragility, meaning that bank competition is associated to more efficient banking systems. On the other hand, labor regulation asserts a negative impact on bank efficiency. This result insinuates that banks could improve their performance in a more liberal labor market environment. This mean that less labor market rigidities which allow market forces to determine wages and establish the conditions of hiring and firing and refrain from the use of conscription does not necessarily lead to greater bank efficiency and ultimate economic growth business environment concerns unless there is a regulator in place to enforce rules and ensure supervision (EBRD 2010). Last the impact of business regulation is positive on bank efficiency but only in the very short run and convergences towards zero thereafter. This means that less bureaucratic procedures that restrain entry and reduce competition in the business sector have a positive effect on cost efficiency. Our results validate previous studies (EBRD 2010, Acemoglu et al. 2005, Easterly 2005) regarding the main issues that transition economies face, namely shortage in skills, corruption and weakness in the tax system.

Figure 1

The above panel-VAR importantly emphasizes the positive impact of bank specific reform efforts on the bank efficiency in line with Demirguc-Kunt et al. (2004) and Barth et al. (2006), Kondeas et al. (2008). Moreover, in terms of magnitude, it appears that credit regulation have the dominant effect on efficiency. The response of efficiency to one standard deviation shock of competition policy reform reaches is pick of 0.075 in the first period, implying that a one 1% shock in credit regulation causes a 0.075 increase in cost efficiency.

Table 8 presents the variance decomposition (VDC) estimations. These results are consistent with the impulse response functions (IRF) and provide further evidence of the importance of

reform in explaining the variation in cost efficiency. Specifically, 12.3% of forecast error variance of cost efficiency after 10 and 20 years is explained by credit regulation disturbances. Furthermore, 7.2% of the variation of cost efficiency is explained by labor regulation, whilst only 0.4% is explained by business regulation. Efficiency also explains part of forecast error variance of regulation, in particular credit regulation and business regulation. Thus, a feedback channel from bank performance to regulation, which is highly associated to the environment that banks operate, also exists. This would imply that banks in transition economies play a dominant role in financial markets and have the ability to influence institutional governance. Overall, the VDC analysis confirms the importance of bank specific regulation to bank cost efficiency as credit regulation plays the dominant role, whilst evidence of reverse causation also is present.

Table 8

Figure 2 presents the IRFs from the 4x4 panel VAR in the case of bank cost efficiency and three EBRD reform indexes. The first row shows that the responses of efficiency to are EBRD indexes for reforms in markets (competition policy), financial institutions (banking reform and interest rate liberalization) and securities markets and non-bank financial institutions respectively. Interestingly, one standard deviation shocks in EBRD reform indexes assert a negative impact on bank efficiency. This result should not come as surprise as it is expected (EBRD 2010) reforms have a negative impact on performance in the short run, and it is only in the long run that the economy could rip the fruits of structural changes towards more competitive forms of markets¹⁸. Note, however, that in terms of magnitude the effect of EBRD reforms does not have a strong negative impact on bank performance. The response of efficiency to one standard deviation shock of bank reform and interest rate liberalization is less than 0.04 in the first period, the period with the highest magnitude, implying that a one 1% shock in credit regulation causes a 0.04 decline in cost efficiency.

Figure 2

Table 9 presents the variance decomposition (VDC) estimations. These results show that EBRD reforms play a role in the variance decomposition of bank efficiency as 15% and 10% of the latter is explained by shocks in bank reform and competition reform respectively.

Table 9

6. Conclusion

This paper presents new evidence of the importance of reforms and regulations for the banking industry using the EBRD transitional reform indicator and the Fraser economic freedom index. By considering both indexes we are able to account for the effects of progress towards more sound banking practices as well as the impact of the credit market, labor market and business sector regulatory regimes on bank efficiency. Favourable economic conditions in the labor and business sector seem to improve cost efficiency while reforms in the banking sector must be accompanied by institutional safety valves to avoid excessive lending in order to have a positive effect on cost efficiency. By decomposing the credit regulation index of the Fraser freedom index into its three components (bank ownership (CR-Own), foreign competition (CR-Comp), private sector credit (CR-Prs), and interest rate controls (CR-Nir)), we find that (CR-Prs) has a negative impact on cost efficiency, meaning that cost efficiency increases when credit is directed to the state. Furthermore, by decomposing the EBRD transitions indicators, covering the areas of markets and trade and more precisely the sub-component relatively to the competition policy (Compebrd) and the sub-components of the financial institutions area relating to the banking reform and interest rate liberalisation (Bankebrd) and to the securities markets and non-bank financial institutions (Secebrd) we find evidence only for the Bankebrd variable. More precisely, reforms in the banking sector are positively related to efficiency, meaning that the rapid growth of lending and the introduction of private banks and new financial products have a positive effect on cost efficiency.

Dynamic panel analysis shows that reforms in the enterprises and markets sectors exert a positive impact on bank efficiency confirming the validity of the fixed effects panel regressions. Our results complement previous empirical studies (e.g. Mamatzakis et al. 2013) who find no evidence between credit and business regulation on bank efficiency. The effect of bank size and risk is negative meaning higher costs, while better-capitalized banks are more efficient. It will be of interest for future work to test also the relationship between capital requirements relative to the Basle Accords and cost efficiency. Improving the business and labor environment is warranted, in particular in the era after the financial crisis. Policy makers should pay attention equally on regulation and reforms so as to boost businesses and bank performance. Moreover, particular attention should be devoted on reforms regarding transparency, in particular in the banking industry. As policy implications, transition countries should promote financial stability and create an environment of simple rules.

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Notes

¹In the literature prior studies consider either the EBRD index of banking sector reform (e.g. Fries and Taci 2005, Koutsomanoli-Filippaki, Mamatzakis and Staikouras 2009, Brissimis, Delis and Papanikolaou 2008, Koutsomanoli-Filippaki, Margaritis and Staikouras 2009a, Koutsomanoli-Filippaki, Margaritis and Staikouras 2009b, Delis, Molyneux and Pasiouras 2011) or the Fraser Index of Economic Freedom (Mamatzakis et al. 2013) but not both.

²See Mishkin (2000), and Barth, Caprio, and Levine (2004), for a review of literature on different types of banking regulation.

³Following Barth et al. (2013) bank regulations and supervisory practices, concerns a wide range of bank activities, such as capital regulation, entry regulations, activities restrictions, supervisory power and independence, external governance and private-sector monitoring.

⁴We recognise the potential bias problem in the two step estimator but the main argument of opting for a two-step procedure is because we focus on the impact of a plethora of indexes such as Fraser and EBRD, and their sub-indexes, on efficiency, in addition to various other control variables. Including all variables in one stage would restrict attention to modeling heterogeneity in the error term of the SFA model rather than focusing on a more explicit specification of the underlying sources of inefficiency. There is also a practical consideration at stake, namely the likelihood function of the heterogeneous model often appears to be ill conditioned. Hence we have opted for the traditional two step procedure, which is common practice in the literature when there are many control variables, or second stage variables such as ours herein (see Koutsomanoli-Filippaki et al. 2009, Kasman and Yildirim 2006, among others).

⁵For simplification, we omit the subscripts for time (t).

⁶The treatment of physical capital as a fixed input is relatively standard in efficiency estimation (Berger and Mester, 1997), while the level of equity captures capitalization, insolvency risk and different risk preferences across banks (Mester, 1996; Berger and Mester 1997).

⁷Overheads contain which comprises of personnel and administrative expenses.

⁸The indicators have since been broadened and refined. For a detailed review of the reform process see EBRD Transition Report (2010).

⁹We think that combining different indexes such as the Fraser index and the EBRD indicators, and taking into account financial and non financial transition indicators give us a more complete idea of the economic environment in which banks operate in the CEE countries.

¹⁰There are quite a few studies that examine the impact of credit/financial reforms at an aggregate level on bank efficiency in transition countries (Fries et al 2006, Koutsomanoli-Filippaki et al, 2009, Delis and Papanikolaou, 2009 and Delis et al. 2011). An exception is the study of Mamatzakis et al. (2013) who consider the decomposition of credit regulation.

¹¹According to EBRD (2010) banking reforms concerns a wide range of reforms such as liberalization of interest rate, lending to private enterprises, significant presence of private banks, regulations of BIS standards, well-functioning bank competition etc.

¹²Due to the time dimension of the main variables of the bank cost function we test for the existence of panel unit roots in the underlying data generating process of the variables. Moreover, we perform the following unit root tests: Levin Lin Chu, Harris and Tzavalis, and Im- Pesaran-Shin. All tests show that our bank specific variables within the cost function framework of equation (2) do not suffer from stochastic trends and there are, thus, stationary.

¹³ An implication of the growth model prior to the crisis discussed in the introduction is that firms, especially those who were credit constrained, increase reliance to debt during good times when credit was cheap and often invest in over-ambitious projects, and in the case of CEEs this was exacerbated by financial deregulation and the credit inflow coming from foreign banks establishing presence in the CEE banking industry, but when times were bad, as during the crisis, they faced serious debt servicing problems and default spikes occurred which of course had a large adverse effect on bank loan portfolios.

¹⁴ Apart from the EBRD index, we also employ likewise for Frazer indexes.

¹⁵ For robustness related reasons, we run the models, both fixed effect analysis (that is static and thereby long run models) and dynamic panel analysis (that is short run models) without including the years of the financial meltdown. Results remain similar to the one reported herein (available under request).

¹⁶Optimal lag order of one is based on the Akaike Information Criterion (AIC), confirmed by Arellano-Bond AR tests.

¹⁷The results do not show violation of the normality. Panel Var results are available under request.

¹⁸For instance, financial development is a source of growth; at the same time it must be accompanied by macroeconomic reforms, and regulation. In other words, successful transition in the business sector is mainly about removing the role of the state and encouraging private ownership and market forces wherever possible. However, markets cannot function properly unless there are well-run, effective public institutions in place in order to enforce rules and ensure fair competition (EBRD 2010).