

ARE FOREIGN BANKS IN CENTRAL AND EASTERN EUROPE MORE EFFICIENT THAN DOMESTIC BANKS?#

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ARE FOREIGN BANKS IN CENTRAL AND EASTERN EUROPE MORE EFFICIENT THAN DOMESTIC BANKS?

Abstract

In this paper, we investigate the efficiency of banks in Central and Eastern Europe. The aim is to evaluate whether foreign-owned banks are more efficient than domestic banks and can therefore play a key role in energising the emerging financial systems in transition economies. Our measures of efficiency are based on standard microeconomic theory. Using a panel of 273 foreign and domestic banks located in Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland and Romania for the period 1995 – 1999, we estimate a system of equations, consisting of an augmented translog cost function and two cost share equations. We calculate measures of economies and scale and scope on a bank-by-bank basis, and compare across countries and across ownership forms. The evidence we uncover suggests three main results. First, banks in our sample European transition economies exhibit a reasonable degree of efficiency overall. Second, the mean foreign bank does not appear to be significantly different from the mean domestic bank in the sample economies: we mostly reject the hypothesis that foreign banks are more efficient than domestic banks in these economies. Third, we find little or no empirical evidence to sustain the argument that bank ownership (foreign versus domestic) is an important factor in reducing the banks' total costs.

Key words: central and eastern Europe; foreign banks; translog cost function; economies of scale; economies of scope

JEL Classification No.: G210; D240

1. Introduction

One of the central issues in the move to a market economy by the transition economies of Central and Eastern Europe is the development of an efficient financial system. In most transition economies, a key policy element has been the opening up of the banking system to foreign competition at a relatively early stage in the transition process. The motivation for this policy is that foreign banks can immediately import financial management, organizational skills, and general banking experience which are likely to be in short supply among domestic entrepreneurs. Foreign banks may therefore provide a clear competitive yardstick against which domestic banks can be evaluated by customers and regulators and thus themselves develop efficient banking practises more rapidly. Irrespective of their precise motives, or methods of penetration, banks have rapidly become among the most important foreign investors in the European transition economies (Mathieson and Roldos, 2001).¹

The purpose of this paper is to examine more rigorously the prevailing belief that the banking sector in Central and Eastern Europe benefits substantially, in terms of efficiency, from the entry of foreign banks. Hence, the main questions addressed by this paper are twofold. First is the question of whether foreign ownership is an important factor in reducing a bank's total costs. Second is the issue of whether foreign banks operate more efficiently, in terms of economies of scale and scope, than do domestic banks in Central and Eastern Europe.

Several recent papers have addressed the issue of foreign bank ownership in Central and Eastern Europe. However, most of these papers have concentrated either on the determinants of entry or on a country-specific study of X-inefficiency. The main contribution of this paper is that it is, to our knowledge, the first cross-country study which carries out a systematic estimation of economies of scale and scope in banks located in the transition economies. We implement an innovative research methodology by estimating and testing a system of equations, consisting of an augmented translog cost function and the associated cost share equations, on a panel of 273 foreign and domestic banks which operated in Bulgaria, Croatia,

the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland and Romania during 1995 - 1999.

We find evidence that, in general, banks in Central and Eastern Europe operate at a reasonable level of efficiency in terms of economies of scale and scope. Moreover, we generally reject the hypothesis that foreign banks are more efficient than domestic banks in the sample European transition economies: the evidence suggests that, in terms of efficiency, foreign banks are, on average, not substantially different from domestic banks. Indeed, in some cases, domestic banks are more efficient. In addition, we do not find any empirical grounds to sustain the argument that bank ownership (foreign versus domestic) is an important factor in reducing banks' total operating and interest costs.

The remainder of this paper is structured into four sections. Section 2 presents a short review of the relevant literature. In section 3, the econometric methodology is discussed. An empirical model is specified as a system of equations, comprising a multiproduct translog total cost function and two share equations, followed by a discussion of measurement and data. Section 4 reports the empirical results, concentrating on the evidence on economies of scale and scope, and the tests of differences between domestic and foreign-owned banks. Section 5 contains some concluding remarks.

2. Background Literature

The main questions addressed in this paper derive from a synthesis of two strands of the literature: that on bank efficiency and that on the impact of foreign bank entry on the domestic banking sector.

The literature on bank efficiency is based on two different approaches to efficiency measurement: the first measures efficiency in terms of economies of scale and scope; the second uses the efficient frontier concept, or X-inefficiency, which may be disaggregated into technical and allocative inefficiency. Until recently, measurement of scale and scope economies dominated the theoretical and empirical literatures. In this approach, banks are

assumed to be operating on a cost function, and inefficiencies may arise either from the use of inefficient technology (associated with higher costs along all or part of the cost function), or from an inefficient scale or scope (product mix). In principle, inefficient scale or scope may be attributable either to the management of the individual bank or to the structure of the market and the number of competing banks. The more recent, frontier efficiency, literature measures inefficiency with reference to a production (or cost, or profit) frontier, estimated using parametric or non-parametric techniques from the technologies used by sample banks. Deviations inside the frontier are ascribed primarily to inefficiencies in management.

In comparing the two approaches, Molyneux et al. (1996, p. 252) concluded that “...differences in managerial ability to control costs or maximise revenues seem to be larger than the cost effects of the choice of scale and scope of production.” This would suggest the use of frontier efficiency to study banks in Central and Eastern Europe. However, the disadvantage of the frontier approach is that the method does not readily offer possible remedies for inefficient firms since, by construction, inefficiency is attributable primarily to unobservable management actions. In contrast, as Berger and Humphrey (1991, 1997) and others have argued, measures of economies of scale and scope provide a natural framework for informing bank management on possible bank branching and cost reduction strategies, and informing regulators about the efficient number of banks in the market.

There are few existing studies on the efficiency of banks in the transition economies of Europe, and these do not explicitly distinguish between foreign owned and locally owned banks; see, for example, Yildirim and Philippatos (2002), Mertens and Urga (2001) and Kraft and Tirtiroglu (1998). More recently, there have been some country-specific studies of bank efficiency using the cost frontier approach. Weill (2003) and Havrylchyk (2003) studied small samples of banks in the Czech Republic and Poland, and both authors found some evidence that foreign banks were more efficient than domestic banks. These studies are however limited by the small samples and short time period studied.

The second strand of the literature concerns the impact of the entry of foreign firms into emerging markets. Litan, Masson and Pomerleano (2001) point to a steadily rising presence of foreign firms in the financial sector during the past decade. They argue that foreign firms bring important benefits to the markets they enter: improved technologies, increased investment; and more experienced management. In the banking sector in particular, foreign entrants bring more sophisticated risk management techniques and greater financial stability because they tend to be more diversified than their domestic counterparts. It is also argued that for the most part, foreign banks have helped increase the competitiveness and efficiency of the domestic banks in the host markets. Mathieson and Roldos (2001) show results whereby efficiency gains are reflected in lower operating costs and smaller margins between interest rates on loans and deposits among the foreign banks as well as the domestic banks.

In addition, foreign banks seem to enjoy higher profits than their local counterparts. Using 7,900 bank observations from 80 countries for 1988-1995, Claessens, Demirguc-Kunt and Huizinga (2001) examine the extent and effect of foreign presence in domestic banking markets by investigating how net interest margins, overheads, taxes paid and profitability differ between foreign and domestic banks. It is found that foreign banks have higher profits than domestic banks in developing countries, while the opposite holds true in industrial countries. An increased presence of foreign banks is also associated with a reduction in profitability and margins for domestic banks. These results are consistent with the evidence obtained by Demirguc-Kunt and Huizinga (2001).

There is also evidence to suggest that the efficiency benefits of foreign bank entry are amplified by financial liberalisation. Bhattacharyya, Lovell and Sahay (1997) examine the productive efficiency of 70 Indian commercial banks during the early stages of liberalization (1986-1991), using a combination of data envelopment analysis and stochastic frontier analysis. It is found that publicly owned Indian banks have been the most efficient, followed by foreign-owned banks and privately-owned Indian banks. In addition, there was a temporal improvement in the performance of foreign-owned banks, virtually no trend in the

performance of privately-owned Indian banks, and a temporal decline in the performance of publicly-owned Indian banks, following a period of liberalization.

Further, it may be argued that, given the strategies by host governments in the European transition economies, we would particularly expect foreign banks to have important effects on efficiency and the cost structure of the banking system in these countries. In these economies, foreign bank entry has responded to two main approaches used by governments to transform the banking sector (Claessens, 1997). First, existing banks and especially the debt-burdened big state banks have been rehabilitated (the 'rehabilitation' approach). Second, new entrants have been allowed into the system or a completely new and parallel banking system has been allowed to emerge (the 'new entry' approach). In responding to these, foreign banks have maintained a clear focus on their motives for entry (Konopielko, 1999). The most common reason for foreign bank entry is the need to support the client base, especially in Poland and the Czech Republic. Other reasons include: a response to international competitive pressures; and the search for new business opportunities, reflecting the belief in the growth potential of the transition economies (Konopielko, 1999, p. 468).

However, the existing evidence does not point to there being unalloyed benefits from foreign bank entry. The experience of Latin America in the 1990s suggests that, in some countries, whereas local banks acquired by foreign owners became stronger in comparison with their domestic counterparts, their profitability was only comparable to or weaker than that of domestic banks. Moreover, efficiency gains may be eroded if foreign-owned banks adversely affect the stability of domestic bank credit by providing additional channels for capital flight. On these issues, see Dages, Goldberg and Kinney (2000) and Claessens, Dermirguc-Kunt and Huizinga (2001). Indeed, it may be argued that if other dangers of foreign bank entry prevail, as in the case when foreign-owned banks withdraw rapidly from the domestic market in the face of a financial crisis as witnessed during the recent experience in South East Asia, or when foreign banks may aggravate the risk profile of domestic banks by using their financial power to pick the most lucrative aspects of the domestic market (cherry picking) thereby marginalizing the domestic banks and pushing them to more risky business, domestic

bank competitiveness and efficiency is achieved before rather than after the entry of foreign banks i.e. efficiency is a pre-condition rather than a result of foreign bank entry.

A seminal effort to weave together these two strands of the literature is offered by Berger, Dai, Ongena, and Smith (2003), who discuss the issue of domestic versus foreign bank efficiency and provide a review of the key issues in the literature. However, they view foreign bank entry as part of a broader paradigm of the globalisation of financial institutions and the cross-border consolidation of banks. No attention is paid to Central and East European markets or to the entry of foreign banks there; instead, the paper focuses on evidence from the major industrialized nations.

The contributions of this paper are twofold: first, we provide further general evidence on the efficiency of foreign banks in emerging markets; second, we empirically contest the intuitive argument that the banking sector in Central and Eastern Europe necessarily benefits greatly, in terms of efficiency, from the entry of foreign banks. We therefore contribute to one of the major directions for future research proposed by Berger, Dai, Ongena, and Smith (2003), namely to investigate whether banks in emerging markets have ‘home field advantages’ or, alternatively, whether banking markets in these economies support a limited form of the ‘global advantage hypothesis’: i.e. that foreign banks from certain foreign countries are more efficient after all.

3. Econometric Methodology

3.1 The empirical model

We specify a multi-product, three-input, three-output, model to capture the cost and output behaviour of banks in European transition economies. The model is estimated using a translog cost function and two share equations². However, the cost function is augmented with a foreign-domestic ownership dummy, as follows:

$$LnTC = \alpha_0 + \sum_{j=1}^3 \alpha_j LnY_j + \sum_{i=1}^3 \beta_i LnP_i + 0.5 \sum_{j=1}^3 \sum_{k=1}^3 \sigma_{jk} LnY_j LnY_k$$

$$+ 0.5 \sum_{i=1}^3 \sum_{h=1}^3 \gamma_{ih} \ln P_i \ln P_h + 0.5 \sum_{j=1}^3 \sum_{i=1}^3 \delta_{ji} \ln Y_j \ln P_i + \eta F + \varepsilon \quad (1)$$

Here, TC is the total cost; $\sigma_{ik} = \sigma_{ki}$, $\gamma_{jh} = \gamma_{hj}$ (the symmetry restrictions); Y_j are the output variables; P_i the input prices; and F is a dummy variable for foreign banks. The coefficients to be estimated are: α , β , σ , γ , δ , and η ; the coefficient of special interest to this study is the foreign dummy coefficient (η); subscripts j and k denote each of the three outputs, and subscripts i and h denote each of the three input prices.

The regularity conditions are: $\sum_{i=1}^3 \beta_i = 1$, $\sum_{i=1}^3 \gamma_{ih} = 0$ and $\sum_{i=1}^3 \delta_{ji} = 0$. These conditions

provide the unique correspondence between the cost function and the underlying production function; for details, see for example Gropper (1991, pp. 719-720). Accordingly, the cost function must be homogeneous of degree one and concave in factor prices, as well as non-decreasing in both factor prices and output quantities. The cost share equations (derived using Shephard's lemma) are expressed as:

$$SH_i = \partial \ln TC / \partial \ln P_i = \beta_i + \sum_{h=1}^3 \gamma_{ih} \ln P_h + \sum_{j=1}^3 \delta_{ji} \ln Y_j \quad (2)$$

with $i = 1, 2$ denoting the two cost share equations to be estimated.

Our general approach was to estimate the cost function (1) and the two share equations (2) simultaneously for each country using the seemingly unrelated regression (SUR) method to impose the necessary cross-equation restrictions. As explained later in this section, we estimated a different model for each country and then compared the results.

On the basis of the system of equations in (1) and (2), we estimate multi-product economies of scale (MSE) according to the following specification:

$$MSE = TC(Y, P) / \sum_{j=1}^3 Y_j MC_j = 1 / \sum_{j=1}^3 \omega_{cyj} \quad (3)$$

where $j = 1, 2, 3$ denotes each of the three types of outputs, MC_j is the marginal cost with respect to the j -th output, and $\omega_{cyj} = \partial \ln TC / \partial \ln Y_j$ is the cost elasticity of the j -th output. A bank is operating with economies or diseconomies of scale according as $MSE > / < 1$

(respectively). The formula for the elasticities (following Drake, 1992, p. 213), derived from the differentiated translog, is:

$$\omega_{cyj} = \alpha_j + \sum_{k=1}^3 \sigma_{jk} \ln Y_k + \sum_{i=1}^3 \delta_{ji} \ln P_i \quad (4)$$

We then proceed to estimate economies of scope (SC) based on the following:

$$SC = \frac{TC(Y_1 - 2\varepsilon_1, \varepsilon_2, \varepsilon_3) + TC(\varepsilon_1, Y_2 - 2\varepsilon_2, \varepsilon_3) + TC(\varepsilon_1, \varepsilon_2, Y_3 - 2\varepsilon_3)}{TC(Y_1, Y_2, Y_3)} \quad (5)$$

where $\varepsilon_j = 1\%$ of Y_j for each available bank/year output observation. This is a common empirical approach to get around the difficulty that the logarithm of a zero output is not defined: we reduce each of the three outputs in turn by 2 per cent, while we hold the remaining two outputs at 1 per cent of their values. A bank is operating with economies or diseconomies of scope according as $SC > /< 1$ (respectively).

In this framework, the impact of foreign bank participation is modelled in three ways. First, the foreign dummy coefficient, η , models any absolute differences in cost efficiency. If, as is usually hypothesized, $\eta < 0$ and significant in equation (1), this implies that foreign banks have an absolute cost advantage over domestic banks³. This sheds light on the question of whether foreign ownership is an important factor in reducing banks' total costs. The second measure of foreign bank participation emerges from the estimates for economies of scale and scope. We estimate economies of scale and scope for all banks and separately for domestic and for foreign banks. These measures give information about the position on the cost curve that domestic and foreign banks choose, and therefore shed light on whether foreign banks are more scale- or scope-efficient than domestic banks. Of course, one reason why banks may have an inefficient scale may be the size of the market which is outside the control of individual banks. However, the economies of scope measure is less ambiguous, and the impact on scope economies of differences in product mix may help shed light on the argument that foreign banks tend to cherry-pick business rather than to improve competitive efficiency in the whole banking market. Third, we estimate different cost functions for

different economies in Central and Eastern Europe, on the grounds that the different national banking markets are sufficiently different as to warrant a separate treatment (eg. in methods of privatisation, regulation, and patterns of saving, lending, and money transmission). This allows us to compare the impact of foreign banks across different countries. Overall therefore, we would argue that our framework provides a multi-dimensional assessment of the impact of foreign banks on banking efficiency in Central and Eastern Europe.

3.2 Measurement

The empirical variables in the translog cost function and the related cost share equations fall into three groups: total cost, outputs, and input prices. Total costs consist of operating costs and interest costs. We specify inputs and outputs using the intermediation approach, viewing banks as financial intermediaries employing inputs, consisting of labour, capital and deposits, to produce outputs consisting of loans, other earning assets and non-interest income. This approach is preferred in many studies, because it captures the varied nature of modern banking firms; see Berger and Humphrey (1991).

Table 1 about here

The variables and their empirical counterparts are shown in table 1. The three types of outputs that enter the analysis are loans, other earning assets and non-interest income (Y_1 , Y_2 , Y_3). The first two are preferred in more recent efficiency studies and generally cover the bulk of the banking business, especially within the traditional view of banks as deposit collectors and loan makers. Non-interest income is included as the third output in line with the recent banking literature, which points out that banks are turning to alternative, fee-based, activities and markets (for example, Hunter, Timme and Yang, 1990, p.513; and Drake, 1997, p.12). Off-balance sheet activities by banks arguably constitute a natural response to increased competition in markets where entry barriers and inter-industry segmentations have been significantly eroded during the last decade. An intriguing feature of the banking systems of

Central and Eastern Europe, which partly explains the rapid developments there, is that they are very much exposed to pressures and tendencies typical of the mature neighbouring markets. There is, therefore, little doubt that the off-balance sheet component of the banks' business should be included in a well-specified model of banks in European transition economies⁴.

The variables for inputs and their prices are measured in accordance with the concept of the multi-product, multi-input banking firm. In an attempt to better encompass various aspects of the production process in banking in transition economies, the input prices reflect the three types of inputs that are considered relevant: labour, capital and deposits.

3.3 The data

We started by collecting bank-specific data using the universe of all banks in all European transition countries, as reported in the *BankScope* database as at 25-28 June 2001. There were many missing observations, both across time and banking units. The short commercial banking history of Central and Eastern Europe has been marked by bank mergers⁵, bankruptcies or privatisation deals, and this may partly explain why observations were often missing in *BankScope*. However, the main reason for the gaps in the data was the irregular reporting practices of banks in the region.

We retrieved from *BankScope* data relevant to the translog functional form used in this paper. For each bank, data availability was checked for the period 1995-1999. If there were no observations for one year, it was assumed that the bank did not exist at the time (not an unrealistic assumption in view of the short and unstable banking history of the region); thus, data were left missing for the respective bank/year. If there was at least one entry for a certain year, this was taken as evidence that the bank existed at the time (which does not necessarily mean the bank was fully functioning). The missing observations were then attributed to reporting failure or that the bank was not fully operational in that year⁶.

The main problem with the data concerned personnel expenses and the number of employees which were missing in many cases. If a bank existed and functioned in some way, it would surely have had employees and expenses. Unfortunately, for the countries of Central and Eastern Europe, employee-related data are among the least reported statistics. (Data for some countries are totally missing as in the case of Bulgaria.) Therefore, the following country-by-country procedures were followed. Where the data were missing, the number of employees was estimated using the authoritative International Labour Organisation (ILO, 2001) database. The country figures from that database were taken, subject to certain limitations. The ‘total employment by economic activity’ criterion was applied. As the ILO convention for most countries has been changed since 1996, the current one (ISIC Rev.3 ‘J’ which covers financial intermediation in total, not only banks) was chosen. The relevant figures were averaged over the years 1996-1999 (which coincides approximately with the our sample period) and the industry figure was obtained (assuming dominance of banking over other financial activities) as 90 per cent of the average annual ILO figure for each country. To get the missing number of employees, each bank was assigned a ‘bank/year weight’ (as a ratio of total fixed assets for that bank/year to total fixed assets for all banks and all years; in all cases taking only the sample banks). As a rule, the total fixed assets data were available everywhere. In the very few cases where that was not the case, the number of employees and personnel expenses were left blank (assuming the existence of that bank was a legal rather than a practical fact). However, due to the few missing observations on personnel expenses, the final dataset was necessarily unbalanced. Hence, we ended up with an unbalanced panel data set for 9 countries: Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland and Romania, within the period 1995-1999⁷. Even so this amounted to a large sample for this kind of research with a total of 273 banks.

Our analysis was in some respects shaped by the limitations of the data set. Unavailability of banking data has always obstructed research into Central and Eastern Europe. In this context, this study is perhaps the pioneering and almost certainly the most comprehensive one in the area. However, some theoretical and practical considerations are worth noting. The units of

the panel data set are ‘banks’, as filtered from the original database. According to the definitions used by *BankScope*, banks fall into a number of categories, but for analytical convenience and to reflect the reality of the banking sector in European transition economies, we selected only three categories: commercial banks; savings banks; and cooperative banks. Banks were classified as foreign or not according to the *BankScope* convention. Specifically, a bank is classified as foreign if it has shareholders settled in foreign countries holding altogether a minimum of 51 per cent of the ordinary share capital; added to that number are banks which have at least 1 foreign shareholder when the percentage of ownership was not available; also, a foreign bank may include local shareholders if they hold altogether less than 50 per cent of the bank’s share capital. Technically, this classification may differ from national legal or regulatory specifications (such as local branches of foreign banks *versus* non-branch domestic entities whose shareholders are predominantly foreign). Another important consideration is that *BankScope* classifies banks as being foreign or not at the time the database is last updated. This means that no historical observations were available for the foreign dummy. This is a significant drawback, within the context of the analysis, as Central and Eastern Europe has experienced many different forms of foreign banks’ penetration, including the privatisation of existing banks. A bank may have been domestic in the early years of observation, but foreign today. Thus, each bank was assigned an ownership dummy of 1 (foreign) or 0 (domestic) across units, according to these criteria, but the dummy did not vary over time. Clearly this is an important limitation of the research. However, the relatively short maximum time-period of each bank’s data (5 years) would suggest that it may not be too severe⁸.

In some instances, the same bank appeared more than once in *BankScope*, due to the application of different consolidation codes or accounting standards. In such cases, we used only the unconsolidated statements, as this is the most widely used format in the database as a whole. This procedure is consistent with the assumption that because the financial markets in the sample countries were underdeveloped, banking accounted for the bulk of the financial sector. Likewise, we used only variables reported under the international accounting standard

(IAS). When the same bank appeared in *BankScope* more than once due to different consolidation and accounting formats, priority was given to the unconsolidated reporting criterion.

The number of banks included in the dataset for each country is reported in Table 2⁹. In each of the nine markets; it can be seen that foreign banks increased in number during the five-year period. However, those numbers are not perfectly correlated with either the size of the markets, or the number of domestic banks. Turning to the length of the dataset, annual data for five consecutive years (1995-1999) were extracted. *BankScope* contained data for 1993-2001, but in the case of Central and Eastern Europe, relatively little data was available outside the period 1995-1999.

Table 2 about here

4. Empirical Results

The system of the total cost function and the two share equations with all symmetry and regularity conditions was estimated for each country using SUR. The estimates satisfy the usual diagnostic tests and provide a sensible econometric model of bank costs. Given the rapid pace of change in Central and Eastern Europe this is a satisfactory finding. The details of the parameter estimates and diagnostics are omitted from the paper to save space¹⁰, as the main interest in the results concerns the estimates of scale and scope economies and the role of foreign banks. We therefore turn next to our findings on these issues.

4.1 Absolute differences in cost-efficiency (η)

Estimates of the foreign-domestic dummy (η) are given in table 3 and, *prima facie*, would appear to challenge the ideas, both that ownership matters, and that foreign banks are generally more cost-efficient than domestic banks. The estimated values of η are generally small and insignificant. In only half of the countries (Croatia, Czech Republic, Lithuania and

Romania) does foreign ownership seem to be associated with an absolute reduction in costs ($\eta < 0$) and only in one case (Lithuania) is that cost reduction significant (at the 0.05 level). The definite conclusion therefore, is that foreign ownership was not an immediate factor in reducing costs in banks in Central and Eastern Europe.

Table 3 about here

4.2 Economies of scale

Economies of scale were estimated separately for each observation (ie. separately for each bank-year) and over all outputs and input prices following equation (3). In presenting summary statistics we of course distinguish between domestic and foreign-owned banks and we report our results in a format that facilitates comparisons with other European studies following similar methodology (see Mendes and Rebelo, 1999). This adds to the significance of the current study, considering the shortage of European bank efficiency literature, and the non-existence of a study on the European transition economies. Table 4 summarises the results on economies of scale.

Table 4 about here

These results suggest that, on average, banks in Central and Eastern Europe have exhibited small or negligible economies of scale and are effectively operating at or close to scale-efficient levels. With the exception of the Czech Republic, all the mean and median economies of scale measures are close to unity for both domestic and foreign banks, and in no case are the means significantly different from unity. In the case of the Czech Republic, there is a relatively wide variation in the economies of scale measures so that, although the means are high, they are, nevertheless, not significantly different from unity¹¹. In terms of the traditional analytical pattern of the U-shaped cost curve for scale efficiency, all but one of the

median and mean measures exceed unity suggesting that all the Central and Eastern European banking markets are on the downward-sloping part of their average cost curves, close to the scale-efficient level of output.

Turning to a comparison between domestic and foreign banks, the mean economies of scale measure for foreign banks is generally somewhat greater than that for domestic banks (dom – for < 0). However, this difference is significant only for Croatia and Romania, and in the case of Latvia, domestic banks exhibit a significantly greater economies of scale measure. Moreover, it could be argued that the main impact of foreign banks is unlikely to be on every existing bank in the host country. The least efficient domestic banks are less likely to improve than are those which are already operating closer to international standards. To check this point we recalculated the t tests for Croatia, Romania, and Latvia excluding one quartile of the sample: the lowest for Croatia and Romania, the highest for Latvia (determined by the sign of the difference between the means: dom - for). The right-most column of table 4 shows that this eliminates the significant difference between domestic and foreign banks for Croatia and Latvia (but not Romania). This is not to claim that there “really” is no difference between domestic and foreign banks in these two economies, but that the source of the difference appears to lie mainly in a group of domestic banks operating at a significantly different scale from other domestic and foreign banks in the economy. The overall conclusion, therefore, is that foreign banks are not systematically more scale efficient than the average domestic bank in our sample European transition economies.

4.4 Economies of scope

Economies of scope were estimated separately for each observation (ie. separately for each bank-year) and over all outputs and input prices following equation (5). The presentation of results in table 5 follows that for economies of scale. There is substantially more evidence of economies of scope than economies of scale, with all the measures exceeding unity and, apart from the Czech Republic, all significantly greater than unity. This result may be consistent with the argument that banking markets in the transition economies are still developing. It

may be that during the early stages of development of the banking market, banks have to produce a more varied output mix in order to remain in the market. Certainly, the data suggest that multi-product banking firms do have a cost advantage over more specialised banks.

Table 5 about here

However, when we turn to a comparison between domestic and foreign banks, we again find few significant differences: only in Croatia, Bulgaria, and Latvia. Following our procedure for economies of scale, we re-performed the t tests on these countries omitting the relevant outlying quartile of domestic banks, and again we see in the right-most column of table 5 that this eliminates the significant difference between domestic and foreign banks for Croatia and Latvia (but not Bulgaria). These results again suggest that there is no evidence of a systematic difference in efficiency (in this case in economies of scope) as between domestic and foreign banks. These results also cast some doubt on the cherry-picking hypothesis. If indeed, foreign banks cherry-pick the best business, we would expect to see some more differences in the economies of scope measures as between domestic and foreign banks. Of course, our input and output measures are relatively aggregated and cherry-picking may occur at a more disaggregated level. However, at our level of aggregation, it is difficult to see much support for the hypothesis.

5. Conclusions

This paper has attempted to fill a serious gap in the literature by pioneering the modelling of bank efficiency in Central and Eastern Europe, and by using the largest feasible sample of banks in order to explore the scale and scope dimensions of bank efficiency. A central finding of our paper is that it contests the widespread belief that foreign banks are more efficient than their domestic counterparts. The empirical results suggest that banks in Central and Eastern Europe are scale efficient for the sample period, 1995 to 1999, and that they

enjoy significant economies of scope. There is virtually no evidence in our data that foreign banks are more efficient than the average domestic bank in any of the nine European transition economies: in terms of an absolute cost advantage, or in terms of economies of scale or scope.

A shortlist of future research priorities includes the estimation of product-specific scale economies, scope economies for subsets of products and, most important of all, X-efficiency, as more data become available.

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Table 1: Variables used in the estimation of the cost function

Variable		Empirical/Observable Variables
Total costs	TC	interest expenses + operating expenses (operating expenses = commissions + fees + trading expenses + personnel + other admin costs + other operating costs)
Outputs		
Loans	Y_1	total customer loans
Other earning assets	Y_2	total other earning assets
Non-interest income	Y_3	commissions + fees + trading income + other operating income + non-operating income
Inputs		
Labour	IN_1	number of employees
Capital	IN_2	fixed assets
Deposits	IN_3	deposits + money market funding + other funding
Input prices		
Labour	P_1	total personnel expenses/number of employees
Capital	P_2	(other admin expense + other operating expenses)/total fixed assets
Deposits	P_3	interest expense/(deposits + money market funding + other funding)
Foreign/domestic	F	1-0 Dummy

Table 2: Number of banks analysed

Country		Domestic (Foreign)						Total					
		1995	1996	1997	1998	1999	Total	1995	1996	1997	1998	1999	Total
Bulgaria	BG	10 (5)	10 (7)	12 (7)	13 (8)	12 (9)	17 (9)	15	17	19	21	21	26
Croatia	CR	27 (5)	32 (5)	37 (8)	32 (7)	32 (7)	37 (8)	32	37	45	39	32	45
Czech Republic	CZ	21 (7)	22 (8)	22 (8)	17 (8)	11 (7)	24 (8)	28	30	30	25	18	32
Estonia	EE	10 (0)	11 (0)	11 (0)	4 (0)	4 (0)	12 (0)	10	11	11	4	4	12
Hungary	HU	18 (12)	19 (13)	18 (13)	14 (12)	12 (12)	20 (14)	30	32	31	26	24	34
Latvia	LV	14 (4)	14 (5)	17 (7)	17 (6)	4 (6)	21 (7)	18	19	24	23	10	28
Lithuania	LT	8 (1)	9 (2)	9 (2)	8 (2)	7 (2)	11 (2)	9	11	11	10	9	13
Poland	PL	27 (13)	31 (17)	29 (17)	24 (17)	21 (17)	35 (18)	40	48	46	41	38	53
Romania	RO	5 (3)	8 (3)	8 (6)	15 (13)	13 (12)	16 (14)	8	11	14	28	25	30
Total		140 (50)	156 (60)	163 (68)	144 (73)	109 (72)	193 (80)	190	216	231	217	181	273

Table 3: Effects of ownership: absolute differences in cost efficiency

	BG	CR	CZ	EE	HU	LV	LT	PL	RO
η	0.1072 (0.2183)	-0.0013 (0.1209)	-0.0325 (0.045)	0 (0)	0.0676 (0.038)	0.0588 (0.0888)	-0.2201** (0.109)	0.1074 (0.057)	-0.1494 (0.0947)

Note: ** denotes significantly different from zero at the 5% level

Table 4: Economies of scale for domestic and foreign banks in Central and Eastern Europe

	No of bank-years			Range			Median				Mean and T test				
	total	domestic	foreign	total	domestic	foreign	total	domestic	foreign	dom -for	total	domestic	foreign	dom-for	dom(Q) -for
BG	78	44	34	0.1386	0.1386	0.1277	1.0742	1.0746	1.0742	0.0004	1.0697	1.0668	1.0733	-0.0065	
t											0.74	0.74	0.74	-0.30	
CR	163	133	30	0.2435	0.2141	0.4690	1.2797	1.2797	1.2823	-0.0026	1.3241	1.3062	1.4034	-0.0972	-0.0267
t											1.30	1.59	0.97	-1.94**	-0.52
CZ	100	64	36	0.9766	1.1238	0.4573	1.2025	1.2348	1.1869	0.0480	4.5928	6.7483	0.7608	5.9875	
t											0.10	0.13	-0.05	0.81	
EE	38	38	0	0.2180	0.2180	na	1.1241	1.1241	na	na	1.1670	1.1670	na	na	
t											0.72	0.72			
HU	72	43	29	0.3770	0.3451	0.3555	1.0874	1.0978	0.9384	0.1594	1.2786	1.4103	1.0833	0.3270	
t											0.19	0.22	0.29	0.95	
LV	85	62	23	0.0908	0.0926	0.0495	1.1047	1.1302	1.0659	0.0643	1.1148	1.1266	1.0831	0.0434	0.0148
t											1.69	1.75	2.03**	2.72**	1.35
LT	45	38	7	0.4237	0.3416	0.8101	1.2127	1.1958	1.4515	-0.2557	1.4338	1.4214	1.5007	-0.0793	
t											0.46	0.42	1.02	-0.20	
PL	160	102	58	0.1727	0.1856	0.1291	1.0337	1.0244	1.0368	-0.0124	1.0311	1.0284	1.0360	-0.0076	
t											0.25	0.21	0.35	-0.38	
RO	56	31	25	0.3041	0.2250	0.2369	1.0473	0.9645	1.1197	-0.1553	1.0655	1.0061	1.1391	-0.1330	-0.0956
t											0.39	0.04	0.86	-3.16**	-2.19**

Notes

The economies of scale measures are calculated from equation (3)

No of bank-years gives the total number of observations in each category

Range is the interquartile range of the sample

Median and **Mean** are calculated in the usual way for each sample

Dom-for is the difference between the medians or means of domestic and foreign banks

Dom(Q)-for is the difference between the means of domestic and foreign banks when the sample excludes domestic banks in the lowest (dom-for<0) or highest (dom-for>0) quartile by economies of scale

T test (t) is a test against the null that the economies of scale measure is unity in the sample (total, domestic and foreign); or that the difference between the domestic and foreign means is zero (dom-for, dom(Q)-for) . ** denotes significant at the 5% level.

na: not applicable

Table 5: Economies of scope for domestic and foreign banks in Central and Eastern Europe

	No of bank-years			Range			Median				Mean and T test				
	total	domestic	foreign	total	domestic	foreign	total	domestic	foreign	dom -for	total	domestic	foreign	dom-for	dom(Q) -for
BG	78	44	34	0.1728	0.1252	0.1069	1.9493	1.8869	2.0241	-0.1372	1.9354	1.8909	1.9930	-0.1022	-0.0550
t											7.38	7.36**	8.95**	-3.83**	-2.31**
CR	162	132	30	0.0678	0.0626	0.0740	2.2404	2.2350	2.2714	-0.0364	2.2410	2.2353	2.2663	-0.0310	-0.0105
t											21.65**	24.10**	16.97**	-2.73**	-1.03
CZ	100	64	36	4.8831	7.7287	4.0995	7.6908	7.2567	7.8223	-0.5656	6.9285	6.6522	7.4196	-0.7675	
t											0.32	0.25	1.16	-0.20	
EE	38	38	na	0.1146	0.1146	na	1.8823	1.8823	na	na	1.8732	1.8732	na	na	
t											12.84**	12.84**			
HU	72	43	29	0.2887	0.3198	0.1087	3.0581	3.0808	3.0539	0.0269	3.1878	3.2194	3.1410	0.0783	
t											5.32**	4.38**	10.74**	0.79	
LV	85	62	23	0.0613	0.0686	0.0586	2.0295	2.0229	2.0429	-0.0200	2.0187	2.0106	2.0404	-0.0297	-0.0018
t											16.65**	16.68**	17.72**	-2.03**	-0.17
LT	45	38	7	0.1785	0.1604	0.2528	2.4270	2.4324	2.2778	0.1546	2.4686	2.4943	2.3294	0.1649	
t											6.56**	6.73**	6.97**	1.84	
PL	160	102	58	0.0441	0.0473	0.0343	2.1736	2.1693	2.1750	-0.0058	2.1708	2.1686	2.1745	-0.0059	
t											38.06**	35.73**	43.71**	-1.17	
RO	56	31	25	0.0879	0.0940	0.0570	1.9299	1.9546	1.9252	0.0293	1.9402	1.9527	1.9247	0.0279	
t											15.88**	14.74**	19.02**	1.79	

Notes

The economies of scope measures are calculated from equation (5)

No of bank-years gives the total number of observations in each category

Range is the interquartile range of the sample

Median and **Mean** are calculated in the usual way for each sample

Dom-for is the difference between the medians or means of domestic and foreign banks

Dom(Q)-for is the difference between the means of domestic and foreign banks when the sample excludes domestic banks in the lowest (dom-for<0) or highest (dom-for>0) quartile by economies of scope

T test (t) is a test against the null that the economies of scope measure is unity in the sample (total, domestic and foreign); or that the difference between the domestic and foreign means is zero (dom-for, dom(Q)-for). ** denotes significant at the 5% level.

na: not applicable

Endnotes

¹ By the end of the 1990s, the share of banking assets under foreign control in Central Europe had reached more than 50 percent (Mathieson and Roldos, 2001, p. 17).

² A formal derivation of the translog cost function from a translog production function using duality theory can be found in several places, for example: Diewert (1972), Cornes (1992) and Coelli, Rao and Battese (1999).

³ Note that we do not consider different slope coefficients for domestic and foreign banks. Different slope coefficients would suggest that domestic and foreign banks use completely different cost technologies whose relative advantage is practically difficult to compare, since it will depend on the precise point on the different cost functions on which each bank is operating. The usual argument about foreign banks is based primarily on the hypothesis of a direct cost advantage. The clearest way to test this hypothesis is with the simple shift dummy (F) which we employ.

⁴ Banks in Central and East European markets exhibit patterns which are similar to those of more developed markets in that non-interest income is increasingly becoming an important business and revenue source. However, we did not undertake sensitivity analysis to find out what happens if non-interest income is not included as an output.

⁵ We were not able to adjust the BankScope data in order to tease out periods of mergers and acquisitions (M&A) in Central and East European banks. Given that M&A activity is only one method of foreign bank entry, our data incorporates the information in an aggregate manner. Further research is necessary to shed light on how M&A activities feature in foreign bank entry.

⁶ Fee and trading expenses are not reported by banks in most countries of the sample, apart from Estonia, Latvia and Lithuania. Such expenses are either not captured by local accounting conventions, or are not incurred. Where such expenses were missing, we assumed they were zero.

⁷ We did not carry out a sensitivity test to find out what happens if the ILO conventions were not just used in case the employee data were missing but instead for all observations. In any event, the panel was not completely balanced even after all the adjustments and the inclusion of ILO data.

⁸ It is also possible that domestic banks that were taken over by foreign banks within the sample were, before the time of takeover, already qualitatively different from those that remained domestically owned throughout.

⁹ Given that there are no foreign banks in the sample for Estonia, we could have easily removed the country from the analysis. However, we bear in mind that this paper not only looks for the comparisons between foreign and domestic banks, but also analyses bank efficiency in Central and Eastern Europe in general.

¹⁰ The parameter estimates and diagnostics are available from the authors on request.

¹¹ Some of the economies of scale measures for the Czech Republic are implausibly high or low, suggesting that for this country there may be some particular problems with the data. However, similarly anomalous findings are not unusual even in the limited European bank efficiency research (see Altunbas and Molyneux, 1996, p. 371).