# Banking performance and technological change in non-core EU countries: A study of Spain and Portugal

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## Abstract

The purpose of this paper is to investigate the cost efficiency of banks operating in two "non-core" EU countries, Portugal and Spain, over a number of years. Specifically, the paper aims to examine the extent to which banks' efficiency is influenced by their portfolio orientation and scale of operation. Data envelopment analysis is used to identify banks' levels of performance over time in both countries. In order to decompose banks' total factor productivity change into technological, scale efficiency and pure efficiency changes, the Malmquist index method is applied. Banks operating in both countries have improved their performance over time and savings banks and large banks, in particular, have tended to outperform other types of banks. Banks operating in Spain tend to perform better than in Portugal and Spanish-owned banks perform better than their Portuguese-owned counterparts. The improvements in performance revealed have mainly been due to technological change. Bankscope is a well-respected data source and has been the basis of many studies of performance in international banking. Unfortunately, owing to data deficiencies, around 20 per cent of the banks operating in Portugal and Spain were not included. Practical implications - If Portuguese banks are to be competitive internationally, there is considerable need for efficiency improvements. The paper provides insights into the dynamics of the Portuguese and Spanish banking systems. The results should be of interest to management in banking and bank regulators in Europe, and economists and others studying bank performance trends. The research reported may shed light on some of the challenges facing the banking sectors of the "new" EU states (such as Poland and Hungary).

**Introduction**

In recent years, greater competition in EU banking has been driven by technological change (TC), internationalisation and globalisation of financial services, higher demand for banking services and deregulation and privatisation of the industry (Casu *et al.*, 2004; Maudos *et al.*, 2002). These changes can be expected to have had an important impact on the business and management of European banks and particularly on the cost structure, revenues and their overall efficiency.

The effect of these drivers of changes may be expected to have been particularly important in "non-core" EU countries such as Portugal and Spain, especially since, until the second half of the 1980s banks in these two countries were generally regarded as being uncompetitive relative to banks in neighbouring countries (Dutta and Doz, 1995; Vivas, 1997). Inefficiency has been popularly associated with overstaffing and an excess number of branches (Solsten and Meditz, 1990). However, with the opening of the banking industry to private investment, an increase in competition, the abolition of administrative interest rates and bank credit ceilings in the mid-1980s, and the European single market for financial services initiative, it is likely that the banking industry will have experienced some profound changes in performance over the last decade or so.

This paper investigates the performance of banks in Portugal and Spain during the period 1992-2003, and specifically looks at the extent to which efficiency has been influenced by portfolio orientation and scale of operation. It also examines how total factor productivity (TFP) in the two banking sectors has changed over these years and analyses whether the changes found have mainly been due to TC or whether there have been other contributory factors. Finally, the paper assesses differences in performance between banks that operate in the two countries to shed light on where inefficiencies are greatest. These results may have some implication for banks in other "non-core" EU countries, particularly those which have recently joined.

The paper is structured as follows. The next section discusses the existing literature on banking performance. This is followed by a description of the methodology used to assess performance in the banking sectors and an overview of the data. The next section discusses the empirical results, and the final section concludes by summarising the main findings and identifies some of the important implications for the future of banking business in the two countries. This section also provides suggestions for future research on bank performance.

**Literature review**

Many studies have been published in recent years concerning the investigation of banking performance and have used a variety of parametric and non-parametric approaches to test for efficiency. Among the non-parametric approaches, data envelopment analysis (DEA) has proven to be a popular technique for measuring and comparing performance. The technique has been employed in a wide range of studies such as those by Bauer *et al.* (1998), Berger and DeYoung (1997), Berger and Humphrey (1997), Miller and Noulas (1996), Rezvanian and Medhian (2002), Halkos and Salamouris (2004) and Kao and Liu (2004), all of which have been concerned with the performance of commercial banks. Athanassopoulos (1997), Schaffnit *et al.* (1997) and Drake and Howcroft (1994) have also used DEA to investigate the relative performance of bank branches. Finally, Figueira *et al.* (2006, 2008) have looked at the effects of ownership on the performance of banks in Latin America and Africa, respectively, while Mercan *et al.* (2003) have investigated the performance of Turkish banks on the basis of efficiency scores obtained from DEA.

We use DEA in this paper and analyse both the level of bank efficiency and changes in total output relative to inputs by employing a Malmquist TFP index. Some important applications of this technique to the measurement of productivity change in banking include Berg *et al.* (1992), Grifell-Tatjé and Lovell (1997), Wheelock and Wilson (1999), Alam (2001) and Casu *et al.* (2004). The study by Berg *et al.* (1992) examined productivity growth in the Norwegian banking system, while Grifell-Tatjé and Lovell (1997) looked at the Spanish banking industry. Wheelock and Wilson (1999) and Alam (2001) investigated US commercial banking and Casu *et al.* (2004) concentrated on an analysis of productivity change across European banks.

Other studies have used a variety of other methods to estimate efficiency levels and productivity change in the banking system, such as Berger and Humphrey (1992), Humphrey and Pulley (1997) and Stiroh (2000). There have also been some recent studies of Portuguese and Spanish banking. Mendes and Rebelo (2003) and Pinho (2000) have analysed the deregulation process in Portugal and concluded that it has helped increase the degree of competition in the banking sector and that banks have become more efficient. Canhoto and Dermine (2003) have examined banking efficiency in Portugal by specifically analysing the performance of "old" banks versus "new" banks, created as a result of deregulation. Their study suggests that technical efficiency (TE) has increased significantly over time across both groups of banks and also that "new" banks have outperformed "old" banks in terms of efficiency. Studies that have explored efficiency differences within the Spanish banking industry, particularly since

deregulation, include those by Salas and Saurina (2003), Tortosa-Ausina (2002) and Fuentelsaz *et al.* (2002). They have all found that regulatory changes have had important effects on banks' risk-taking behaviour and that liberalisation has increased competition and efforts to raise efficiency levels. Prior (2003) has focused particularly on Spanish savings banks and concludes that their improvement in terms of cost efficiency has mainly been due to improvements in capacity utilisation. Also, Cuesta and Orea (2002) test whether merged savings banks have tended to be more efficient than non-merged ones and have claimed that there are differences between the two. However, the superiority in terms of performance of the merged banks has only been apparent in the longer term.

As is the case with the Portuguese banking sector, Spanish banking has gradually become more competitive. Grifell-Tatjé and Lovell (1997), using a Malmquist index measure, have compared commercial banks, which dominate the sector, with savings banks over the period 1986-1993. Their study reports that commercial banks have had a slightly lower rate of actual productivity growth, but a somewhat higher growth of productivity potential. They attribute this finding to managerial differences, differences in technical progress and the adverse impact of diseconomies of scale in the case of commercial banks.

This paper differs from but builds on these earlier studies of Portuguese and Spanish banking by specifically examining the cost efficiency of banks during the period 1992-2003 and by investigating the extent to which their efficiency is influenced by portfolio orientation and by scale of operation. The paper reported here is concerned with the impact that the processes of privatisation and deregulation have had in respective banking systems and assesses whether or not the comparative performance patterns found earlier have been maintained. We focus on commercial and savings banks and include a variety of other categories of banks. It is worth noting that the two countries have similar political and economic backgrounds, are close culturally and historically, and therefore an understanding of differences in performance that result from the study may provide some new insights into understanding the sources of banking efficiency more generally. Such insights can be expected to have relevance for some of the "new" EU countries (such as Poland and Hungary).

The following section concentrates on the description of the methodology used to analyse banking efficiency in the paper.

**Methodology**

This section briefly describes the non-parametric methodological approach followed and discusses the measurement of the inputs and outputs used in the analysis. The approach used to analyse banking efficiency is composed of two complementary techniques: DEA and a Malmquist index, which were implemented using Coelli's (1996) software package DEAP. The following is a short description of these techniques.

Data envelopment analysis

Initially, we use DEA, which is based on linear programming, by using piece-wise linear technology, in order to obtain an efficiency frontier (Coelli *et al.*, 1998). The efficiency of each bank in the sample is established by measuring its position in relation to comparable frontier banks - frontier banks are considered to be those which have a relative efficiency score of 100 Thanassoulis, 2001). The main advantage of DEA measurement relates to the fact that it does not require an a priori specification of the functional form to measure relative performance, which is particularly important when dealing with different countries where the functional form may be expected to differ. Moreover, there is no need to make distributional assumptions about the inefficiency term. In this paper, we use an input-oriented variable returns to scale (VRS) DEA model, in which banks minimise the use of inputs given a certain amount of outputs produced. The choice of a VRS model relates to the fact that it is more appropriate to benchmark each bank against banks of similar size. Thanassoulis (2001) provides a detailed explanation of the differences between constant returns to scale and VRS models in this context.

Malmquist index

The second approach adopted relates to the measurement of changes in total output relative to total inputs and is based on the concept of TFP. The approach was first developed by Malmquist (1953) and discussed by Shepard (1970), Caves *et al.* (1982), Grosskopf (1993) and Färe *et al.* (1994a, b, 1997). The Malmquist TFP index can be described as a way of measuring the change in productivity between two data points by estimating the ratio of the distances of each data point relative to a common technology (Casu *et al.* 2004). Based on DEA analysis, the Malmquist index provides information on the sources of productivity change. In a multi-input multi-output context, an output (input) distance function is equivalent to the maximum proportional expansion (contraction) of the output (input) vector, given inputs (outputs). The distance functions, which constitute the Malmquist index allow for changes in productivity to be divided into two components: changes in TE and TC. TC reflects improvements or deterioration in the

performance of the best-practice banks, while TE change is associated with the convergence or divergence of the remaining banks towards their best-practice counterparts. In other words, TC is associated with a shift outwards of the efficiency frontier and TE with a movement towards the frontier. Moreover, TE can be decomposed into pure efficiency (PE) change and scale efficiency (SE) change. PE change is obtained by calculating the efficiency change using constant returns to scale technology relative to VRS technology while SE reflects changes in performance resulting from the application of these two technologies to the same data set. For a more detailed explanation of the Malmquist methodology see Coelli *et al.* (1998).

The following section provides an overview of the data and specifies the particular input and output variables used in this paper.

**Data overview**

The data employed cover the period 1992-2003. Information has been drawn from the Bankscope data base, which contains balance sheet and income statement data for banks in a large number of countries and is published by the London-based International Bank Credit Analysis Ltd Details of treasury bill rates for each country have been obtained from Datastream. After excluding a number of banks due to gaps in the data, the final sample of Portuguese and Spanish banks is as reported and described in Table I. The sample is around four-fifths of the total number of banks and total asset value in each banking system in any one year and may be deemed therefore to be sufficiently large to provide a reasonably representative assessment of national performance.

Table I shows that since 1992, the number of banks in the banking systems of the two countries has increased significantly from 15 in Portugal and 21 in Spain to a peak of 48 in Portugal in 1999 and 148 in Spain in 1997. Total asset values have also grown significantly. However, after a period of expansion, a tendency towards concentration within the industry has emerged as evidenced by the gradual decline in the number of banks operating in these markets towards the end of the 1990s, together with a continuing expansion of the value of assets held.

**Table I - Data on the number and amount of assets included in the sample**

| | Portugal | | Spain | |
| --- | --- | --- | --- | --- |
| | **Number of banks** | **Total assets (in $ billions)** | **Number of banks** | **Total assets (in $ billions)** |
| 1992 | 15 | 54 | 21 | 264 |
| 1993 | 20 | 93 | 24 | 340 |
| 1994 | 21 | 109 | 28 | 378 |
| 1995 | 28 | 159 | 36 | 428 |
| 1996 | 43 | 266 | 145 | 1,274 |
| 1997 | 43 | 314 | 148 | 1,439 |
| 1998 | 45 | 314 | 146 | 1,463 |
| 1999 | 48 | 435 | 132 | 1,344 |
| 2000 | 37 | 271 | 135 | 1,415 |
| 2001 | 33 | 261 | 138 | 1,431 |
| 2002 | 30 | 316 | 138 | 1,711 |
| 2003 | 26 | 360 | 130 | 2,238 |

Table II provides a summary of the statistics of the variables used in the DEA analysis. The input variables consist of labour expenses, capital expenses, interest costs and other non-labour costs. Labour expenses include all costs associated with personnel dominated by wages. Capital expenses are a proxy for the opportunity cost of bank financing and were calculated as the total interest charges on fixed assets. The interest rate used for this purpose is the treasury bill rate for each country. Interest costs mirror the expense of banks raising loanable funds in the money market and other non-labour costs include all operational costs, except labour costs. The output variables reflect the main activities of banks, namely the making of loans and investments in other earning assets.

**Table II – Summary statistics of the variables used (in $ thousands)**

| | **Mean** | **Median** | **Maximum** | **Minimum** | **SD** |
| --- | --- | --- | --- | --- | --- |
| *Banks operating in Portugal* | | | | | |
| Labour costs | 83,032.07 | 16,334.15 | 1,091,185 | 100.4621 | 147,352.1 |
| Capital costs | 714,668.5 | 123,066.3 | 15,616,461 | 291.9989 | 1,503,478 |
| Interest costs | 322,047.5 | 101,238.5 | 2,822,658 | 176.258 | 500,231.2 |
| Other non-labour costs | 76,537.21 | 20,795.66 | 1,143,849 | 233.345 | 139,999.4 |
| Loans | 3,902,236 | 721,036.1 | 62,107,224 | 793.1612 | 7,984,639 |
| Other earning assets | 2,681,150 | 877,027.2 | 23,066,737 | 7,836.046 | 4,272,230 |
| *Banks operating in Spain* | | | | | |
| Labour costs | 145,403.8 | 27,301.37 | 5,114,170 | 4.316883 | 494,730.1 |
| Capital costs | 1,255,572 | 189,923 | 48,813,818 | 5.861821 | 4,321,535 |
| Interest costs | 430,137.5 | 62,901.86 | 19,814,458 | 17.61755 | 1,668,326 |
| Other non-labour costs | 105,754.1 | 20,843.22 | 4,335,817 | 3.500175 | 392,265.7 |
| Loans | 5,833,837 | 1,101,869 | $2.18 \times 10^8$ | 44.80224 | 18,294,797 |
| Other earning assets | 4,261,520 | 657,799.6 | $1.6 \times 10^8$ | 100.4621 | 15,007,488 |

Table II provides evidence that, on average, Spanish banks tend to have higher costs across all categories of inputs, but their outputs, in the form of loans and other earning assets, are also higher.

**The empirical results**

The DEA results

Starting with the DEA analysis, Table III presents a summary of the results. The figures reported are derived from the VRS DEA model. In total, 13 different frontiers were considered, i.e. one for each year (12 years) and one frontier which takes into consideration all the banks across the whole period (1992-2003). For 1992, the sample is composed of a total of 36 banks across both Portugal and Spain and by 1996, the number had increased to 188, a fivefold rise over four years. The results, which encompass all banks show that there is an important difference between the average efficiency of banks when one frontier for all years is used and when different frontiers are calculated for each year. Banks operating at the beginning of the 1990s have, on average, higher DEA scores than in later years. This result may be explained as follows. At this time, most of the banks were still state-owned and competition was less intense (Canhoto, 2004; Salas and Saurina, 2003). It is to be expected, therefore, that banks in general were less cost focused and their levels of performance did not vary significantly. In consequence, all of the banks operated close to the efficiency frontier, which is populated by relatively efficient firms (i.e. banks). Later, as more banks entered the market and competition became more intense, some banks seem to have performed better and responded more efficiently to the industry and market signals than others. As a consequence, there is a higher dispersion in relative performance among banks during the 1990s. This result suggests that some banks have managed to perform relatively well, while others have become relatively less efficient. Hence, we see a pattern over the years - the average DEA score falls and variability in the results increases. Moreover, we can also identify an increase in the overall performance of the industry as soon as some banks start to exit the market from 1999 onwards, when the number of banks began to fall. It would seem reasonable to conclude that these were probably weaker banks that could no longer compete in an increasingly competitive market place.

In making comparisons between Portuguese and Spanish banks, Table III suggests that Spanish banks, on average, perform better than Portuguese banks over the entire study period, with the exception of 1995. Even though the trend in performance of the banking industry in each country appears similar, according to our results Spanish banks were around 10 per cent more productive than Portuguese banks.

## Table III – DEA efficiency scores 1992-2003

| | All years | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *All banks* | | | | | | | | | | | | | |
| av | 42.3 | 93.65 | 89.05 | 88.77 | 81.62 | 81.69 | 74.92 | 77 | 81.69 | 81.21 | 79.74 | 72.36 | 74.49 |
| sd | 22.97 | 9.56 | 13.62 | 12.75 | 21.23 | 15.51 | 17.7 | 20.78 | 17.67 | 21 | 20.3 | 21.77 | 23.62 |
| *Banks operating in Portugal* | | | | | | | | | | | | | |
| av | 32.14 | 89.67 | 84.73 | 82.36 | 82.15 | 81.27 | 69.99 | 67.23 | 73.82 | 68.65 | 70.51 | 58.37 | 57.97 |
| sd | 19.71 | 12.34 | 14.95 | 14.19 | 21.06 | 16.74 | 19.93 | 25.87 | 20.49 | 24.18 | 24.33 | 23.4 | 25.44 |
| *Banks operating in Spain* | | | | | | | | | | | | | |
| av | 45.54 | 96.49 | 92.65 | 93.59 | 81.22 | 81.81 | 76.35 | 80.01 | 84.56 | 84.04 | 81.95 | 75.4 | 77.8 |
| sd | 23 | 5.73 | 11.51 | 9.16 | 21.65 | 15.18 | 16.8 | 18 | 15.68 | 18.83 | 18.65 | 20.24 | 21.88 |
| Total number of banks | 1,610 | 36 | 44 | 49 | 64 | 188 | 191 | 191 | 180 | 172 | 171 | 168 | 156 |
| Number of banks in frontier | 44 | 22 | 23 | 20 | 21 | 35 | 27 | 33 | 49 | 49 | 43 | 35 | 33 |
| as a percentage of total no. banks | 2.73 | 61.11 | 52.27 | 40.82 | 32.81 | 18.62 | 14.14 | 17.28 | 27.22 | 28.49 | 25.15 | 20.83 | 21.15 |
| *Number of banks with score* | | | | | | | | | | | | | |
| ≥ 90% < 100 | 32 | 4 | 2 | 5 | 14 | 29 | 18 | 31 | 25 | 29 | 28 | 11 | 20 |
| As a percentage of total no. banks | 1.99 | 11.11 | 4.55 | 10.20 | 21.88 | 15.43 | 9.42 | 16.23 | 13.89 | 16.86 | 16.37 | 6.55 | 12.82 |

Note: av stands for average and sd stands for standard deviation

**Table IV – DEA scores: one frontier for all years, results by bank specialisation and size**

| | 1992-2003 | | | 1992 | | | 1997 | | | 2002 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | All | Portugal | Spain | All | Portugal | Spain | All | Portugal | Spain | All | Portugal | Spain |
| *All banks* | | | | | | | | | | | | |
| av | 42.30 | 32.14 | 45.54 | 18.66 | 14.41 | 21.70 | 33.54 | 28.53 | 34.99 | 54.15 | 45.89 | 55.94 |
| sd | 22.97 | 19.71 | 23.00 | 9.52 | 1.95 | 11.52 | 15.24 | 12.87 | 15.60 | 21.48 | 24.48 | 20.43 |
| No. | 1,610 | 389 | 1,221 | 36 | 15 | 21 | 191 | 43 | 148 | 168 | 30 | 138 |
| | | | | | | | | | | | | |
| *By specialisation* | | | | | | | | | | | | |
| Commercial | | | | | | | | | | | | |
| av | 38.44 | 31.54 | 41.07 | 18.05 | 14.17 | 21.45 | 32.11 | 28.55 | 33.48 | 50.91 | 51.52 | 50.78 |
| sd | 23.36 | 19.68 | 23.34 | 10.01 | 1.78 | 12.84 | 16.29 | 14.11 | 16.94 | 23.87 | 24.80 | 23.85 |
| No. | 912 | 252 | 660 | 30 | 14 | 16 | 105 | 29 | 76 | 86 | 15 | 71 |
| Cooperative | | | | | | | | | | | | |
| av | 48.97 | 35.39 | 51.30 | - | - | - | 34.04 | 25.64 | 34.60 | 58.55 | 45.00 | 60.64 |
| sd | 21.11 | 11.45 | 21.54 | - | - | - | 16.73 | - | 17.16 | 13.90 | 7.27 | 13.63 |
| No. | 116 | 17 | 99 | | | | 16 | 1 | 15 | 15 | 2 | 13 |
| Investment | | | | | | | | | | | | |
| av | 29.88 | 25.19 | 42.57 | - | - | - | 29.36 | 22.59 | 47.39 | 31.47 | 27.18 | 37.92 |
| sd | 21.49 | 15.81 | 28.89 | - | - | - | 24.37 | 6.93 | 46.17 | 16.39 | 15.07 | 17.48 |
| No. | 111 | 81 | 30 | | | | 11 | 8 | 3 | 15 | 9 | 6 |
| Real estate | | | | | | | | | | | | |
| av | | 42.68 | 35.54 | 29.93 | - | 29.93 | 40.60 | 29.89 | 51.31 | 62.49 | 62.49 | - |
| sd | 13.41 | 16.24 | 7.98 | - | - | - | 15.15 | - | - | - | - | - |
| No. | 14 | 8 | 6 | 1 | | 1 | 2 | 1 | 1 | 1 | 1 | |
| Savings | | | | | | | | | | | | |
| av | 51.28 | 56.37 | 50.97 | 20.65 | - | 20.65 | 35.72 | 41.39 | 35.40 | 64.33 | 69.95 | 64.03 |
| sd | 19.20 | 19.92 | 19.14 | 5.96 | - | 5.96 | 7.51 | 8.89 | 7.39 | 11.73 | 26.47 | 10.70 |
| No. | 443 | 25 | 418 | 4 | | 4 | 55 | 3 | 52 | 50 | 3 | 47 |
| *By size* | | | | | | | | | | | | |
| <$1 billion assets | | | | | | | | | | | | |
| av | 32.33 | 23.80 | 35.12 | 14.72 | 14.37 | 15.00 | 28.17 | 20.78 | 29.93 | 41.52 | 39.59 | 41.97 |
| sd | 20.63 | 15.57 | 21.32 | 2.59 | 1.30 | 3.34 | 16.75 | 9.79 | 17.64 | 21.98 | 28.59 | 20.54 |
| No. | 528 | 130 | 398 | 16 | 7 | 9 | 57 | 11 | 46 | 53 | 10 | 43 |
| ≥$1 billion assets | | | | | | | | | | | | |
| av | 47.16 | 36.32 | 50.58 | 21.82 | 14.46 | 26.73 | 35.82 | 31.19 | 37.27 | 59.97 | 49.04 | 62.27 |
| sd | 22.49 | 20.27 | 22.08 | 11.75 | 2.48 | 12.99 | 14.00 | 12.84 | 14.09 | 18.63 | 22.27 | 17.03 |
| No. | 1,082 | 259 | 823 | 20 | 8 | 12 | 134 | 32 | 102 | 115 | 20 | 95 |

**Notes:** av stands for average, sd stands for standard deviation and "-" is used when no bank is included in a category and/or country; note that medium and long term credit banks were also initially considered in the analysis, however these were later excluded due to the limited amount of banks in this category.

Table IV focuses on a single efficiency frontier for the whole period of analysis and presents the DEA results according to bank specialisation and size. In the interests of brevity, we have chosen to only report the results for the initial year, one year in the middle of the period and one year towards the end of the period rather than figures for each year (the results for all other years are available on request from the authors). These results provide an overview of how performance of banks has evolved throughout, between 1992 and 2002. Note that we have chosen not to use 2003 as the last year of data, as it can be expected to be subject to statistical adjustment later by Bankscope.

The results in Table IV show that throughout the period, banks have indeed become more efficient, as denoted by the increase in the DEA scores as we move from 1992 towards 2002. Moreover, Spanish banks seem to have performed consistently better than Portuguese banks and the gap in efficiency between the two banking systems does not seem to have decreased over time. Turning to the performance of banks by specialisation or category, over the whole period, savings banks have outperformed the other types of banks in terms of productivity, with the exception of medium and long-term credit banks, for which the number of banks available is small and therefore the results may not be reliable. After savings banks, the next best relative performers were cooperative banks and then commercial banks.

Table IV also presents the performance results by size. As can be seen, banks with at least $1 billion in total assets performed consistently better than the others banks, suggesting that better performance is associated with scale of operation - this is a result which we discuss further below. Turning to banks by country, Spanish banks seem to have been more cost efficient than Portuguese banks throughout the study period and this pattern applies across all categories of banks, except for savings banks, where Portuguese banks appear to have been more efficient than their Spanish counterparts. This trend is visible both when we consider the whole period and when selected years are taken into account. Central to the success of Portuguese savings banks is the fact that these banks have been very efficient in attracting savings from emigrants (which have grown to about 20 per cent of total deposits in Portugal), by using special transfer arrangements. Such a strategy has even been singled out by the Organization for Economic Cooperation and Development as a model which should be pursued by other banks which seek emigrants' remittances to build national wealth (The Banker, 2005).

The Malmquist index results

Table V provides the results using a Malmquist index and with a decomposition of TFP growth of banks operating in Portugal and Spain into TE change and TC. The table covers two sub-periods: from 1992 to 1995, in which 33 banks were considered, and the sub-period 1996-2003, which includes 115 banks. The reason for using two sub-periods is because of the rapid growth in the number of banks since the mid-1990s. Calculation of a single Malmquist index for the whole period would have necessitated involving a substantially smaller number of banks in the analysis because of the lesser number of banks at the beginning of the period.

**Table V - Malmquist index results, 1992-2003**

| Years | Origin | TFP change | TC | TE change | SE change | PE change |
|---|---|---|---|---|---|---|
| *Banks operating in Portugal* | | | | | | |
| 1992-1995 | All (13) | 1.127 | 1.087 | 1.037 | 1.014 | 1.022 |
| | Portuguese (7) | 1.118 | 1.067 | 1.048 | 1.009 | 1.038 |
| 1996-2003 | All (20) | 1.091 | 1.210 | 0.905 | 0.972 | 0.931 |
| | Portuguese (19) | 1.057 | 1.075 | 0.983 | 0.988 | 0.995 |
| *Banks operating in Spain* | | | | | | |
| 1992-1995 | All (19) | 1.064 | 1.080 | 0.986 | 0.989 | 1.000 |
| | Portuguese (5) | 1.159 | 1.208 | 0.959 | 1.000 | 0.959 |
| | Spanish (14) | 1.068 | 1.020 | 0.887 | 0.963 | 0.921 |
| 1996-2003 | All (96) | 1.173 | 1.189 | 0.986 | 0.999 | 0.987 |
| | Portuguese (2) | 1.080 | 1.132 | 0.954 | 0.996 | 0.958 |
| | Spanish (79) | 1.174 | 1.186 | 0.990 | 1.002 | 0.988 |

**Notes:** TFP change = TC x TE change and TE change = SE x PE change; note that TFP change is not shown separately for foreign banks operating in Portugal due lack of adequate data for period considered.  For the same reason, the TFP change of foreign banks (other than Portuguese) operating in Spain has also been excluded from this table

Concentrating first on "all" banks operating in Spain and Portugal, as shown in this table, TFP change was higher than one in both countries throughout the two sub-periods. This suggests that, on average, banks in both countries experienced gains in total productivity each year. However, it seems that banks operating in Portugal experienced higher productivity growth than those operating in the neighbouring country during the first half of the 1990s, while the trend was reversed during the second half of the decade. Examining the decomposition of TFP change into TC and TE change, the predominance of the TC is noticeable across both countries and both sub-periods, being particularly clear in the period 1996-2003. This finding suggests that the efficiency frontier for the combined banks shifted outwards over time as a result, primarily, of new technology. In other words, the main factor responsible for the increased performance of

banks in Portugal and Spain between 1992 and 2003 was TC rather than improved TE. Improvements in best practice (captured by the Malmquist index as part of TC) can also be related to public policies pursued by the government. For example, as suggested by Goddard *et al.* (2001) the Spanish government has, in the 1990s, provided incentives for the creation of what is described as "national champions", in order for the Spanish banking system to be able to face up to competition from banks of other EU countries.

Investment in organisational improvements related to banks' management seems to have contributed to productivity growth in banks operating in Portugal only in the first sub-period. Table V shows a PE change of 1.022 for banks operating in Portugal between 1992 and 1995, but only 0.931 in the second time period. In contrast, the impact of such investment was insignificant for banks operating in Spain throughout the period, with the figure for PE change remaining at or below 1.0 in both time periods.

Even though the best-performing banks achieved considerable efficiency gains in both countries, the low values reported for TE change imply that the remaining banks have struggled to catch up with trends in best-practice banks and that the diffusion of best-practice technology may not have improved overall, suggesting a widening of the dispersion in managerial efficiency. Such results lead to the conclusion that only a few banks (which operate on or close to the frontier) have managed to internalise most or all of the potential benefits which have emerged as a consequence of the changes in the financial sector in Europe during the 1990s. This conclusion is consistent with findings reported in Casu *et al.* (2004) on productivity change in European banking.

The Malmquist index results also identify a difference between PE change and SE change. The results suggest that on average banks in Spain were operating on a scale that was not efficient in both sub-periods and in Portugal especially in the second sub-period, a finding consistent with our earlier comment on the importance of size in banking. This finding suggests that some banks are operating at sub-optimal scale, implying a case for greater concentration in banking in the two countries through mergers and acquisitions. Such a result deserves further and more detailed analysis, although this is beyond the scope of this paper, given data limitations.

Turning now to the other results in Table V which distinguish the performance of domestically-owned banks, the table illustrates that in Spain, Spanish-owned banks have had higher overall productivity gains relative to Portuguese-owned banks operating in Spain since 1996. From this table, under the category "banks operating in Spain", it can be seen that after the initial period of privatisation and liberalisation of markets, when the Portuguese banks seem to have benefited from TFP gains (1992-1995), the Spanish

banks have recently been performing much better, playing a key role in enhancing best practice and taking better advantage of economies of scale. Unfortunately, there are too few Spanish-owned banks operating in Portugal to produce a comparable, meaningful statistical analysis of the banking sector in Portugal.

Finally, a comparison of the performance of Spanish banks operating in Spain with Portuguese banks operating in Portugal confirms that, even when operating within their national boundaries, the performance of Portuguese banks has improved at a slower rate than the performance of their Spanish counterparts. This leads us to conclude tentatively that the differences in performance across Spanish and Portuguese banks do not derive from general economic and social reasons associated with the national operating environment for banks, but rather from strategic and operational decisions taken by Portuguese banks, whether undertaking business in Portugal or Spain.

**Conclusions**

This paper has investigated productivity performance in Portuguese and Spanish banking over the period from 1992 to 2003 using DEA and a Malmquist index approach. The results confirm that the banking industry in the two countries has witnessed important changes during the 1990s. The number of banks increased substantially, followed thereafter by a small decrease, as a result of greater competitive pressures that seem to have forced less efficient banks out of the market. The trend in performance in the two banking sectors was similar in both countries. On average, banks became more efficient and a higher dispersion in performance between banks emerged, as some banks responded better to the more competitive business environment than others. Savings banks tended to outperform banks which concentrated on other areas of business (due in part to an increasingly less restrictive regulation, which previously affected the savings banks more than banks in other categories and also due to the fact that a lot of mergers and acquisitions took place in the savings sector) and larger banks seem to have performed better than smaller banks. Moreover, Spanish banks were consistently more cost efficient than Portuguese banks across the period studied and this gap in efficiency does not seem to have decreased over time.

In addition to a DEA analysis of levels of performance over time, a second set of results was presented decomposing TFP change into TC, SE and PE changes, using the Malmquist index method. These results suggest that the increased performance of banks in Portugal and Spain during the 1990s was mainly due to TC and not other efficiencies (such as superior management or organisation). Also, there is evidence that some banks responded more positively and productively to the opportunities offered by new

technology than other banks, as reflected in the greater dispersion in bank performance over time in the initial DEA results. In addition, Spanish-owned banks appear to have a better productivity performance than Portuguese-owned banks when operating in Spain, suggesting that they are better managed.

The paper provides insights into the dynamics of the Portuguese and Spanish banking systems between 1992 and 2003. The results should be of interest to management in banking, policy makers and bank regulators in Europe, and economists and others studying bank performance trends internationally. Given that Spain and Portugal are two "non-core" members of the EU, the research reported here may shed light on some of the challenges facing the banking sectors of the "new" EU states (such as Poland and Hungary).

However, some caution is necessary in interpreting the results. As with all statistical analyses, the results depend upon the data inputted. Bankscope is a well-respected data source and has been the basis of many studies of performance in international banking. Unfortunately, due to data deficiencies, we were unable to include around 20 per cent of the banks operating in Portugal and Spain during the period studied. However, we have no substantive reason to believe that these banks will have performed differently to the banks that were included in our sample. Finally, the results are statistical and although we have been able to comment on the importance of size, TC and management, in particular, future research could usefully expand on the implications of the results for bank strategies and provide detailed reasons for the differences in performance across the Portuguese and Spanish banking systems discovered in this paper.

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