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Cost Efficiency of Belgian Banks During the 90s

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Abstract:

This paper aims to analyze the cost efficiency of Belgian banks for the period 1992-2000. Efficiency is measured with stochastic frontier approach. Our results are: (a) Efficiency level of Belgian banks is about 72%, meaning the existence of strong potential gains in cost efficiency for Belgian banks. (b) Efficiency of Belgian banks strongly increased between 1992 and 2000. (c) Commercial and saving banks have an advantage in efficiency relative to cooperative banks. (d) Efficiency of Belgian banks is around average of 4 EU countries (France, Germany, Italy, the Netherlands).

Jel Classification: G21.

Keywords: banking, Belgium, efficiency, stochastic frontier approach.

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Introduction

Major changes happened in the banking sectors in the European Union in the last decade. By cancelling legal barriers to entry for banks originated from EU countries, the legislation resulting from EU directives favoured competition on banking markets. Furthermore, the banking sectors in the EU were affected by a large movement of mergers and acquisitions which favoured banking concentration. The Belgian banking industry has for instance known a strong reduction of the number of operating banks from 151 banks in 1993 to 119 in 2000. Furthermore, there happened an expansion of foreign banks on the Belgian banking market, as foreign banks represented 53% of the total number of banks in 1993 (with 80 banks) and 62% in 2000 (with 74 banks) (BNB, 2004). Assessing how cost performance (i.e. the ability of banks to produce with minimum costs) of the Belgian banking industry was influenced by these changes is therefore of the highest interest.

This is indeed a major issue for four reasons. First, cost performance is a major determinant of the expansion of Belgian banks abroad in the European Union. Namely, now that legal barriers to entry have been cancelled, what matters in the decisions of Belgian banks to locate abroad is their ability to produce with lower costs than their competitors. In a similar line of reasoning, it provides relevant information on the potential bank mergers which may happen in the future. Indeed, the least efficient banks are the most likely banks to be acquired, while the most efficient banks are the most likely banks to acquire other banks.

Second, cost performance influences competitiveness of firms through financial costs. Namely, cost-efficient banks are able to provide banking services with lower prices, owing to their lower costs. This reduction of the prices of banking services then leads to a reduction of costs for firms.

Third, the evolution of cost performance informs about the impact of the process of banking integration and consequently about the gains of this process. Indeed banking integration was aimed to improve banking competition and therefore cost performance of banks. Fourth, several categories of banks coexist on the Belgian banking market with commercial, cooperative and saving banks. We may therefore wonder which category of banks has the highest cost performance. This would provide several relevant insights. It would notably help to know whether the cooperative banking industry should be promoted.

The aim of this study is therefore to make up for this loophole by estimating cost efficiency of Belgian banks. To do so, we use the methodology of frontier efficiency techniques. Over the last two decades, a large amount of empirical literature has been devoted to the application of frontier efficiency techniques to financial institutions. We can notably mention the recent works on cost efficiency of European banks by Vander Vennet (2002) and Weill (2005). These methods provide sophisticated performance measures, the efficiency scores, assessing managerial performance. These measures

have three advantages in comparison to usual performance indicators, such as cost or profitability ratios.

First, frontier efficiency techniques provide synthetic measures of performance. Indeed, unlike basic productivity measures (e.g. output per employee), the efficiency scores allow to include several input and output dimensions in the evaluation of performances. Second, efficiency scores are relative measures of performance. Namely, a cost frontier is estimated which allows the comparison of each company to the best-practice companies. It then directly provides a relative measure of performance. Third, efficiency frontiers take the scale effects into account. Indeed, with standard cost ratios for instance, the existence of scale economies may benefit to large companies in terms of performance. With cost efficiency scores, the scale effects are disentangled from the "pure" performance measures.

Despite the advantages of this methodology to assess bank performance, there was however no specific application on the Belgian banks since the seminal study of Gathon and Grosjean (1991), even if some cross-country comparisons provide some empirical elements on banking efficiency in Belgium. It is therefore of utmost interest to provide new recent evidence on cost efficiency of Belgian banks to assess the cost performance of the Belgian banking sector and the competitiveness of Brussels as a financial place.

Our study will estimate cost efficiency of Belgian banks for the period 1992-2000. Efficiency is measured with stochastic frontier approach, which is widely used in empirical literature on banking efficiency. This approach is based on econometric techniques, unlike data envelopment analysis (DEA) which uses linear programming tools. This work raises four fundamental questions.

Q1: How efficient are Belgian banks? As mentioned above, cost efficiency is a major determinant of the competitiveness of firms, as it influences the prices of banking services. Therefore, the assessment of cost efficiency of Belgian banks provides some insights on the potential gains for the Belgian economy which may come from the increase of cost performance of banks.

Q2: How does cost efficiency of Belgium banks evolve? This question helps to know the effects of European integration on the cost performance of banks. Following the motives of European authorities, we should have observed an increase in competition favoring a greater efficiency. However several papers have recently provided evidence tending to reject the view of an increasing competition in the EU banking sectors in the recent years (Weill, 2004; Fernandez de Guevara et al., 2005).

Q3: Are there differences in efficiency between commercial and cooperative banks? Several categories of banks coexist in the Belgian banking system. We can therefore wonder notably whether commercial banks outperform cooperative banks, to get information on the possible reforms of the banking system.

Q4: Are Belgian banks efficient relative to EU banks? This is a major element for the perspectives of the expansion of Belgian banks abroad in the EU, and of the entry of foreign banks in the capital of Belgian banks. Indeed, a gap in efficiency may constitute a motivation for the acquisition of a bank, as it has been shown by Vander Vennet (1996) in the context of EU mergers and acquisitions.

The structure of the paper is as follows. Section 1 provides a brief survey on efficiency in European banking. Section 2 outlines the methodology used for the cost efficiency measures. Section 3 describes the data and variables. Section 4 develops the empirical results, answering each question in the order they have been presented.

1. Efficiency of Belgian Banks : a Brief Survey

Literature on banking efficiency considerably increased in the 90s. Berger and Humphrey (1997) already mentioned 110 works applying efficiency frontiers to the banking industry. However Belgian banks have been investigated in only a few of these works. On the one hand, there is one country-specific study specifically devoted to the Belgian banking industry from Gathon and Grosjean (1991). On the other hand, several cross-country comparisons have been performed on the EU banking sectors, which include the Belgian one. In this section, we briefly present the results of these works.

Table 1 displays most studies providing results on efficiency of the Belgian banks, by describing the cross-country comparisons. It must first be observed that all studies do not compute cost efficiency as ours. Namely, some works estimate a production frontier which allows the assessment of technical efficiency, i.e. the ability of a bank to produce the maximal output for a given level of inputs. Cost efficiency measures how close a bank's cost is to what a best-practice bank's cost would be for producing the same bundle of outputs. It then takes technical efficiency into account, but also considers allocative efficiency, i.e. the ability of a bank to choose the optimal combinations of inputs for given input prices. Consequently, technical efficiency scores are lower than cost efficiency scores. Finally, some works also consider a broader concept: profit efficiency, which is the ability to have the maximal profit for a given level of outputs.

Several interesting remarks can be made. First, the average efficiency score for Belgian banks is between 70 and 80% in most cases. We can furthermore observe that the mean efficiency scores are relatively dispersed. This is not a surprising remark when we observe the variety of considered samples, time periods and frontier techniques. Second, efficiency of Belgian banks has been estimated with various techniques (parametric approaches such as the stochastic frontier approach and the distribution-free approach, or non-parametric techniques such as data envelopment analysis), and various frontier concepts (production, cost or profit frontier). This observation notably shows the lack of consensus in the literature about the best frontier technique to adopt.

Third, there is no consensus regarding the ranking of Belgian banks in efficiency terms in comparison with EU banks. While Altunbas et al. (2001) point out a lower level of efficiency for Belgian banks than the EU average, Lozano et al. (2001), Lozano et al. (2002), and Weill (2005) conclude the opposite. Moreover, Maudos and al. (2002) rather observe an efficiency level of Belgian banks in the average of EU banks.

Fourth, only a few studies have analyzed the evolution of banking efficiency of Belgian banks during the nineties. Altunbas et al. (2001) conclude to an increase in cost efficiency of 4.7 points on average for Belgian banks between 1989 and 1997. Weill (2005) observes an improvement of cost efficiency of 10.55 points between 1994 and 2000. Our study aims therefore to contribute to the existing literature by providing new estimates of cost efficiency scores of Belgian banks for the period from 1992 to 2000.

TABLE 1. SUMMARY OF STUDIES PROVIDING EFFICIENCY SCORES FOR BELGIAN BANKS

Article	Methodology	Results
Gathon and Grosjean (1991)	SFA, production frontier, 24 Belgian banks, 1983-88.	Mean technical efficiency: 67.6%
Altunbas et al. (2001)	SFA, cost frontier. Banks from all EU countries. 1989-97	Mean cost efficiency: 79%. Evolution of efficiency: 75.5% (Be: 73.1%) in 1989, 82.1% (Be: 77.8%) in 1997.
Lozano-Vivas et al. (2001)	DEA, production frontier, banks from 10 EU countries (24 Belgian banks), 1993.	Mean technical efficiency: from 15.99% (Pt) to 49.49% (Lu). Be: 42.20%.
Lozano-Vivas et al. (2002)	DEA with environmental variables, production frontier, banks from 10 EU countries (24 Belgian banks), 1993	Mean technical efficiency: from 33.10% (It) to 82.14% (Sp). Be: 79.32%.
Maudos et al. (2002)	DFA, cost and profit frontiers, banks from 10 EU countries (27 Belgian banks), 1993-96.	Mean cost efficiency (1% truncation): 65.9% for all countries (from 60.8% in It to 72.9% in At). Be: 67.5%. Mean profit efficiency (1% truncation): 27.7% for all countries (from 17.5% in Be to 36.1% in Lu).
Weill (2005)	SFA, cost frontier, banks from 12 European countries (62 Belgian banks), 1994 and 2000.	Mean cost efficiency: from 44.05% (Greece) to 73.28% (Neth.) in 1994, from 61.32% (Greece) to 80.63% (UK) in 2000. Be: 64.69% in 1994, 75.24% in 2000.

DEA: data envelopment analysis, DFA: distribution-free approach, SFA: stochastic frontier approach.

2. METHODOLOGY

Several techniques have been proposed in the literature to measure efficiency with frontier approaches. They mainly differ in the distributional assumptions used to disentangle inefficiency differences from random errors. We apply the stochastic frontier approach to estimate cost efficiency scores (Aigner et al., 1977), following the applications from Allen and Rai (1996), Altunbas et al. (2001) among others.[1]

This approach disentangles inefficiency from random error by assuming a normal distribution for the random error and a one-sided distribution for the inefficiency term. Other approaches include distribution-free approach, thick frontier approach, DEA (Data Envelopment Analysis). Distribution-free approach does not allow the assessment of evolution of efficiency, as it assumes that banking efficiency is stable over time. Thick frontier approach only provides average efficiency scores for the whole tested sample, whereas we aim here to compare banking efficiency across countries.

The basic model assumes that total cost deviates from the optimal cost by a random disturbance, v, and an inefficiency term, u. Thus the cost function is $TC = f(Y, P) + \varepsilon$ where TC represents total cost, Y is the vector of outputs, P the vector of input prices and e the error term which is the sum of u and v. u is a one-sided component representing cost inefficiencies, meaning the degree of weakness of managerial performance. v is a two-sided component representing random disturbances, reflecting bad (good) luck or measurement errors. u and v are independently distributed. v is assumed to have a normal distribution. We assume a gamma distribution for the inefficiency term u following Greene (1990). Following Jondrow et al. (1982), bank-specific estimates of inefficiency terms can be calculated by using the distribution of the inefficiency term conditional to the estimate of the composite error term[2]. The efficiency scores are then computed as the exponential of minus u for each bank, so that a bank with a null u has a efficiency score of 100%.

We estimate a system of equations composed of a Fourier-flexible cost function and its associated input cost share equations, derived using Shepard's lemma. We choose the Fourier-flexible form for the specification of the cost function, as it has been shown that this form dominates the conventional translog form (McAllister and McManus, 1993; Mitchell and Onvural, 1996). Indeed, as it includes trigonometric transformations for the variables, this form can globally approximate the underlying cost function over the entire range of data. It therefore constitutes a theoretical improvement on the translog form, which is a local approximation that does not perform well for observations far from the sample means.

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[1] We do not estimate profit efficiency, because this dimension of efficiency is influenced by market power. Therefore it provides worse information on managerial performance than cost efficiency.

[2] See Kumbhakar and Lovell (2000) for further details on Stochastic Frontier Analysis.

The FF form includes a standard translog form and first-, second- and third-order trigonometric terms. We adopt here the specification with only Fourier terms for the output quantities following Berger et al. (1997) and Altunbas et al. (2001).

For the application of the Fourier-flexible form, the scaling of data is also necessary. Normalization of bank outputs is adopted as follows:

$$Z_i = 0.2\pi + (1.6\pi) * \frac{lnY_i - lnY_{i,min}}{lnY_{i,max} - lnY_{i,min}} \tag{1}$$

Estimation of this system adds degrees of freedom and results in more efficient estimates than just the single-equation cost function. Since the share equations sum to unity, we solve the problem of singularity of the disturbance covariance matrix of the share equations by omitting one input cost share equation from the estimated system of equations. Standard symmetry constraints are imposed. Homogeneity conditions are imposed by normalizing total costs, price of labor, and price of physical capital, by the price of borrowed funds. Thus, the complete model is the following:

$$\begin{aligned}
\ln\left(\frac{TC}{w_3}\right) &= \beta_0 + \sum_m \alpha_m \ln y_m + \sum_n \beta_n \ln\left(\frac{w_n}{w_3}\right) + \frac{1}{2}\sum_m \sum_j \alpha_{mj} \ln y_m \ln y_j \\
&+ \frac{1}{2}\sum_n \sum_k \beta_{nk} \ln\left(\frac{w_n}{w_3}\right)\ln\left(\frac{w_k}{w_3}\right) + \sum_n \sum_m \gamma_{nm} \ln\left(\frac{w_n}{w_3}\right)\ln y_m \\
&+ \sum_k \left[\delta_k \cos Z_k + \theta_k \sin Z_k\right] + \sum_k \sum_{l=k} \left[\delta_{kl} \cos(Z_k + Z_l) + \theta_{kl} \sin(Z_k + Z_l)\right] \\
&+ \sum_k \sum_{l=k} \sum_{m=l} \left[\delta_{klm} \cos(Z_k + Z_l + Z_m) + \theta_{klm} \sin(Z_k + Z_l + Z_m)\right] + \varepsilon
\end{aligned} \tag{2}$$

$$S_n = \partial ln\left(\frac{TC}{w_3}\right) \Big/ \partial ln\, w_n = \beta_n + \sum_k \beta_{nk} ln\left(\frac{w_k}{w_3}\right) + \sum_m \gamma_{nm} ln\, y_m + \eta_n$$

where TC total costs, y_m m^{th} bank output (m=1,2), w_n n^{th} input price (n=1,2), w_3 price of borrowed funds, S_n input cost share[4] (n=1,2), η_n error term (η_n independent from ε). Indices for each bank have been dropped in the presentation for simplicity. The system of equations is estimated using Iterative Seemingly Unrelated Regression (ITSUR) estimation technique.

[3] S_n is equal to the expenses for the input n divided by total costs.

3. Data and Variables

Data come from the "Bankscope" database of BVD-IBCA. We use unconsolidated accounting data for 69 Belgian banks. We also use data for banks from 4 EU countries, including three major EU countries (France, Germany, Italy) and one main economic partner (the Netherlands). The choice of these countries therefore results on the one hand from their benchmark status for some of them. On the other hand, it is motivated by the fact that these countries may be the most concerned ones for the cross-country expansion of Belgian banks, or the entry of foreign banks in the Belgian banking industry.

Our sample includes commercial, cooperative and saving banks. We use an unbalanced panel for the period from 1992 to 2000[4]. We adopt the Tukey box-plot, to clean data: banks with observations out of the range defined by the first and third quartiles that are greater or less than one and half the interquartile range were dropped for each mean input price over the period.

For the definition of inputs and outputs, we adopt the intermediation approach proposed by Sealey and Lindley (1977). It assumes that the bank collects deposits to transform them, using labor and capital, in loans as opposed to the production approach, which views the bank as using labor and capital to produce deposits and loans. Two studies analyzed the influence that the choice of the treatment of deposits can entail regarding efficiency results (Wheelock and Wilson, 1995, Berger, Leusner and Mingo, 1997). Both concluded that the chosen approach has an impact on the levels of efficiency scores but does not imply strong modifications in their rankings.

Two outputs are included: loans, and investment assets. The inputs, whose prices are used to estimate the cost frontier, include labor, physical capital and borrowed funds.

As data on the number of employees are not available, the price of labor is measured by the ratio of personnel expenses to total assets, following Dietsch and Weill (2000) and Altunbas et al. (2001) among others[5]. The price of physical capital is defined as the ratio of other non-interest expenses to fixed assets. The price of borrowed funds is measured by the ratio of paid interests to all funding. Total costs are the sum of personnel expenses, other non-interest expenses and paid interest. Table 2 reports summary statistics for outputs, inputs, input prices and total assets.

[4] We choose an unbalanced sample, because the use of a balanced sample would result in overestimating cost efficiency. Indeed, we then would not take the banks gone into bankrupt and those being absorbed during this period into account.

[5] As observed by Maudos et al. (2001), this variable can be interpreted as labor cost per worker (personnel expenses / number of employees) adjusted for differences in labor productivity (number of employees / total assets), since it is the product of these ratios.

Table 2. Descriptive statistics : mean values for the period 1992-2000

	Belgium	France	Germany	Italy	Netherl.
Number of observations	476	1837	2220	2501	83
Outputs					
Loans	3,267,041.3	2,801,819.6	2,655,390.7	1,808,131.9	806,076.0
Investment assets	4,902,460.2	3,970,192.6	2,847,606.3	1,544,948.1	920,165.4
Input prices (in %)					
Price of labor	1.01	1.62	1.37	1.94	0.73
Price of physical capital	136.66	157.34	115.02	91.72	161.52
Price of borrowed funds	5.50	4.97	4.65	5.64	5.05
Other characteristics					
Total assets	8,597,784.7	7,519,201.3	5,759,868.2	3,720,512.8	2,066,294.5

All values are in millions dollars, except where indicated.

4. Results

This section presents the results, answering each question in turn. To this aim, we estimate a common cost frontier for five EU countries including Belgium. This estimation is performed for each year to allow the changes in the cost frontier over time.

4.1. Cost efficiency of belgian banks

This subsection presents the estimations for the efficiency scores of Belgian banks between 1992 and 2000. Table 3 displays the main descriptive statistics for Belgian banks for each year from 1992 to 2000. We observe that the mean cost efficiency over the period for Belgian banks is 72.27%. Median efficiency score over the period is very similar to 74.51%. These results are in accordance with the former works providing efficiency estimates for Belgian banks in cross-country comparisons, as we mentioned above that the average efficiency score for Belgian banks was then between 70 and 80%. The answer to question Q1 is therefore about 72%.

Consequently, we can point out that there are potential gains in cost efficiency for Belgian banks. As cost efficiency is a determinant of the competitiveness of firms, through its influence on the prices of banking services, we can therefore conclude that there are strong potential gains in competitiveness of Belgian firms following the increase of efficiency of Belgian banks.

We now turn to the analysis of the evolution of efficiency of Belgian banks between 1992 and 2000. Over the period, a strong improvement in banking efficiency happened from 61.28% in 1992 to 76.12% in 2000, which represents an increase of 14.84 points.

A deeper analysis of the yearly variations in efficiency shows in fact an irregular evolution, driven by a trend of increase. Indeed, four yearly increases in efficiency (1992-1993, 1994-1995, 1995-1996, and 1997-1998) alternate with two stagnations (1993-1994, 1998-1999) and two reductions (1996-1997, 1999-2000). Therefore, we can observe that the improvement in banking efficiency already happened between 1992 and 1996, while the second subperiod of our analysis, 1996-2000, was rather marked by a stability of banking efficiency. This may seem a surprising result, as one may have expected that banking integration in Europe would gradually accelerate the increase in efficiency through the competitive pressures.

Consequently, the answer to question Q2 is undoubtedly a strong improvement in cost efficiency between 1992 and 2000. Several explanations can be proposed for this evolution. The most intuitive one is probably the impact of increased competition in banking efficiency which favors banking efficiency. It is in accordance with the expectation of greater competition following the efforts of the EU authorities. This explanation however suffers from the fact that former studies point out reduced competition for the Belgian banking market over the period (Weill, 2004; Fernandez de Guevara et al., 2005). Therefore, increased competition cannot explain the observed improvement in banking efficiency.

The consolidation of the European banking industry with its numerous domestic mergers and acquisitions can also be suggested. The argument would be here that greater size of banks leads to enhanced cost efficiency owing to economies of scale. It might explain partly the improvement in cost efficiency, but one has to keep in mind the fact that we do not observe an increase of the average bank size in our sample of Belgian banks. Namely, the analysis of the means and the medians of total assets for banks shows rather a reduction of the bank size. We do not claim that this trend was observed for the full Belgian banking sector, as such trend might result from the limitations of the Bankscope database we use for the study, which does not contain all banks. Nevertheless, the absence of increased bank size strongly qualifies the explanation based on the role of economies of scale in the enhanced cost efficiency.

TABLE 3. EFFICIENCY SCORES FOR BELGIAN BANKS BETWEEN 1992-2000

Year	N	Mean	Median	Standard dev.
1992	28	61.28	63.14	11.16
1993	48	65.91	67.92	11.02
1994	63	65.02	67.88	13.28
1995	62	68.36	71.15	14.01
1996	69	78.64	81.53	9.33
1997	61	71.88	73.16	10.60
1998	54	81.65	83.11	6.75
1999	47	81.61	83.90	10.06
2000	44	76.12	78.79	11.48
Mean		72.27	74.51	
Variation		+14.84	+15.65	

All scores are in percentage.

The introduction of technical progress may also be suggested as a possible explanation to the improvement in cost efficiency. It must however be reminded that efficiency scores are relative measures of performance, and consequently any influence affecting similarly all banks does not exert an impact on efficiency scores. Nonetheless, we may consider that the introduction of technical progress was more important for the least efficient banks in the perspective of a catching-up process. Such hypothesis is supported by the reduction of technology costs for banks during the period of study which gradually favors the access to technology for all banks.

Finally, even if competition did not increase, managers of Belgian banks may have been influenced by the expectations of the single banking market in the EU. Indeed with the planned introduction of the Euro and the emergence of the cross-border mergers and acquisitions, bank managers may have considered this perspective with higher likelihood. Therefore, they should have increased efficiency to avoid sanctions coming from a hostile takeover or from the entry of new foreign competitors. This explanation is however partly qualified by the fact that, while the efforts of bank managers to have efficiency gains should have increased during the decade as the perspective of the single banking market gradually became more certain, the improvement in banking efficiency happened during the first half of the analyzed period, meaning from 1992 to 1996.

Therefore, we can consider that the introduction of technical progress but also to a lesser degree the efforts of bank managers in the perspective of the single banking market may have contributed to the observed rise in cost efficiency of Belgian banks.

Our following question is to know whether there exist differences in efficiency between categories of banks. Indeed, like a few other EU countries (e.g. France, Germany, Italy), Belgium has a banking industry with a significant share of banking assets owned by cooperative banks and saving banks. This characteristic of the banking industry can therefore be considered either as an advantage or a drawback, depending on the relative performance of cooperative and saving banks in comparison to commercial banks. Indeed, theoretical literature suggests the outperformance of commercial banks because of the better control of private shareholders to control bank managers. However empirical literature tends to find a cost efficiency advantage for cooperative and saving banks relative to commercial banks (Lang, 1996, for Germany; Dietsch and Weill, 1999, for France; Altunbas et al., 2001, for Germany).

Our results are displayed in table 4. We first observe that commercial and saving banks have very similar efficiency levels. Furthermore, these both categories clearly outperform cooperative banks. Indeed, cooperative banks are the least efficient banks for every year of our analysis. This finding is important in the perspective of the reforms of the Belgian banking system. At first glance, these results provide support in favor of the privatization of cooperative banks, as this may improve the efficiency of cooperative banks. However, the fact that saving banks are as efficient as commercial banks suggests that private ownership is not a necessary condition to have the best performance. Therefore, the

interpretation of the differences in efficiency between categories of banks is not linked with the nature of the ownership. The gap in efficiency may be the result of differences in activities or in the internal organization of banks. However, a deeper analysis would be requested to discriminate between these views.

TABLE 4. MEAN EFFICIENCY SCORES BY SPECIALIZATION

Year	N	Commercial banks	N	Cooperative banks	N	Saving banks
1992	21	64.87	4	42.98	3	60.54
1993	24	70.74	16	59.60	8	64.00
1994	33	68.99	18	56.49	12	66.90
1995	32	69.85	22	65.49	8	70.32
1996	31	79.82	23	76.20	15	79.93
1997	30	72.19	17	71.28	14	71.95
1998	27	81.49	15	79.10	12	85.16
1999	24	80.82	15	80.50	8	86.07
2000	21	74.86	14	73.23	9	83.59
Mean		73.74		67.21		74.27
Variation		+9.99		+24.23		+13.73

All scores are in percentage.

Therefore, the answer to question Q4 is that Belgium is around average of the investigated EU countries. While France and the Netherlands outperform Belgium, Belgian banks have a greater efficiency than German and Italian banks. Next to the observation of relatively small cross-country differences in efficiency and of the reduction of these differences during the 90s, this conclusion supports the view of limited cross-border expansion motivated by an advantage in efficiency.

4.2. AN EFFICIENCY COMPARISON OF BELGIAN BANKS WITH EU COUNTRIES

We now turn to the relative degree of efficiency in comparison to other EU countries. This is a major question because of the perspectives of expansion in the EU in the near future. Indeed, an advantage in efficiency may contribute to favor the expansion of Belgian banks abroad, while on the opposite a weaker efficiency for Belgian banks may motivate the entry of foreign banks on the Belgian market.

To this aim, next to Belgium, we consider the three major countries of the Eurozone (France, Germany, Italy) and the Netherlands, because of its economic and geographic proximity to Belgium which make this country an interesting benchmark for our investigation. This focus on Eurozone countries is motivated by the fact that the implementation of the single currency may have increased the opportunities of the expansion of banks abroad, due to the suppression of the exchange rate risk. A cost frontier was estimated for each year to allow the changes in the production frontier over time.

Table 5 reports information on the efficiency scores for each country and each year. Several conclusions emerge. First, the efficiency of Belgian banks is around average of the analyzed countries. Namely, the mean efficiency of Belgian banks is 72.27% over the period. This means that Belgian banks are more efficient than Italian (67.34%) and German banks (70.16%), but less efficient than French (74.39%) and Dutch banks (76.89%). It is furthermore of utmost interest that the cross-country differences in banking efficiency are rather limited. Second, the investigation of the evolution shows that both countries with the lowest efficiency levels in 1992, Italy and Belgium, have the greatest improvements in efficiency during the period. This suggests a process of convergence in banking efficiency among the EU countries, even if this trend cannot be generalized to all countries, as Dutch banks improve more their efficiency than German banks in spite of a greater efficiency in 1992. Third, the evolution in efficiency across EU countries shows similarities. Namely, all countries improved their efficiency between 1992 and 1996, before suffering from a reduction between 1996 and 1997 offset by an increase between 1997 and 1998. The evolution then diverges across countries between 1998 and 2000.

TABLE 5. MEANS EFFICIENCY SCORES FOR BELGIUM AND 4 EU COUNTRIES

	Belgium	France	Germany	Italy	Netherlands
1992	61.28	66.84	62.11	52.15	72.21
1993	65.91	69.04	69.41	60.53	80.54
1994	65.02	68.78	65.07	58.63	70.29
1995	68.36	72.16	68.65	62.87	73.07
1996	78.64	79.51	76.09	71.84	78.90
1997	71.88	71.98	67.35	64.87	71.88
1998	81.65	80.41	75.13	76.79	79.02
1999	81.61	82.65	76.82	81.90	81.13
2000	76.12	78.10	70.82	76.49	84.96
Mean	72.27	74.39	70.16	67.34	76.89
Variation	+14.84	+11.26	+8.71	+24.34	+12.75

All scores are in percentage.

Therefore, the answer to question Q4 is that Belgium is around average of the investigated EU countries. While France and the Netherlands outperform Belgium, Belgian banks have a greater efficiency than German and Italian banks. Next to the observation of relatively small cross-country differences in efficiency and of the reduction of these differences during the 90s, this conclusion supports the view of limited cross-border expansion motivated by an advantage in efficiency.

Conclusion

This study has provided new empirical evidence on the efficiency of Belgian banks in the line of Gathon and Grosjean (1991). Following this seminal paper, we have applied the stochastic frontier approach to assess the cost performance of Belgian banks. This is a fundamental question for the Belgian economy, as cost performance of banks exerts an impact on the competitiveness of firms through financial costs. Furthermore, cross-country differences in cost efficiency influence the firm decisions to extend abroad.

We have investigated this issue by answering four questions about the cost efficiency of Belgian banks. (1) *Belgian banks have a mean efficiency of 72%*. This finding supports the view of high potential gains in cost efficiency for Belgian banks, which could favor the competitiveness of Belgian firms through the reduction of the prices of banking products. (2) *Efficiency of Belgian banks strongly increased between 1992 and 2000*. The improvement was particularly important between 1992 and 1996.

(3) *We observe differences in efficiency between categories of banks with an advantage in efficiency for commercial and saving banks relative to cooperative banks*. This conclusion provides ambiguous elements regarding the possible reforms of the banking system in terms of bank ownership, as neither commercial banks, nor saving banks outperform the other category of banks.

(4) *The comparison of banking efficiency between Belgium and 4 EU countries (France, Germany, Italy, the Netherlands) leads to the conclusion that Belgium is around average in banking efficiency*. Therefore, the lack of a clear advantage or disadvantage in efficiency for Belgian banks relative to other countries' banks tends to suggest limited cross-border expansion motivated by differences in efficiency between Belgium and EU countries. Further research is however needed to provide more evidence on these findings.

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