Routledge
Taylor & Francis Group

Deregulation and productivity changes in banking: evidence from European unification

Alexander G. Kondeas[a], Steven B. Caudill[b,*], Daniel M. Gropper[b] and Jennie E. Raymond[c]

[a]*Division of Business, Greensboro College, 815 West Market Street, Greensboro, NC 27401–1875, USA*
[b]*Department of Economics, College of Business, 415 West Magnolia Ave, Lowder Business Building, Suite 203, Auburn University, Auburn, AL 36849, USA*
[c]*Federal Home Loan Bank, Atlanta, Georgia, USA*

Over the 1990s European banking markets became increasingly deregulated as European unification progressed. National borders become less relevant, and product line restrictions diminished, increasing competitive pressures on institutions to operate more efficiently. A stochastic frontier cost function is estimated for commercial banks across 15 nations in the European Union (EU) to obtain a better understanding of how banks adapted in this period of rapid change in the competitive environment. It is found that the banking systems in all individual countries became more efficient. Country rankings according to productivity changed little over the sample period, and productivity differences between banking systems narrowed. These results suggest that the policy of reducing restrictions and harmonizing regulations was consistent with promoting banking efficiency across the EU.

I. Introduction

Over the 1990s European banking markets experienced extraordinary changes in their regulatory and competitive environments, as the historic movement toward European unification progressed. With the European Union (EU) allowing banks chartered in any member country to establish branches in any other member country, even the retail banking markets became more integrated. Border constraints were effectively reduced if not abolished, while the distinctive differences in product lines between various types of financial institutions were largely eliminated. Summaries of these changes in the EU are provided by Murphy (2000), while some background on regulatory developments globally are provided in Barth *et al.* (2003) and Barth *et al.* (2004).

This study examines the operations of institutions in the EU banking industry during this period of extraordinary change, comparing cost structures across 15 national banking systems to determine if this period of massive regulatory change promoted increased efficiency, as has been found in some studies of financial services deregulation in the USA (for example, see Black and Strahan, 2001; Gropper and Hudson, 2003). It is found that the regulatory changes were consistent not only with improved efficiency in the banking sectors of these EU countries, but also that differences in efficiency diminished between these systems over this time period.

*Corresponding author. E-mail: caudisb@auburn.edu

II. Previous Studies of Banking Efficiency in EU Countries

A large number of individual EU country studies of banking productivity have been performed, using a variety of methods, and covering a variety of country-specific issues. For brevity, these studies are simply listed in Table 1, along with several multicountry studies. There have been several interesting international comparisons for EU banks in recent years, and the most relevant of these are briefly discussed here. In one of the earlier cross-country studies, Allen and Rai (1996) compared cost efficiency using data on 194 banks for 1988–1992. They found input inefficiency to outweigh output inefficiency, while smaller banks in all countries exhibited significant economies of scale. The countries with the greatest overall inefficiencies were France, Italy, UK and USA. Altunbas and Molyneux (1996) found evidence of scale economies available to banks in several EU countries, as well as scope economies for banks in Germany, and they suggested that there was potential for cost reductions as the EU's single market programme unfolded. Pastor *et al.* (1997) in their study of productivity, found that the most productive

banking systems belonged to Austria, Italy, Germany, and Belgium, while the least productive systems were found in the UK, France, Spain and USA. Berger and Humphrey (1997) compiled a review of 130 studies, examining 21 countries. They concluded that, in general, cost efficiency was more important than market concentration for determining bank profitability.

Several studies of European banking have found cost reductions over the 1990s, including Altunbas *et al.* (2001), Carbo *et al.* (2003), and Fries and Taci (2005). Fries and Taci (2005) examined ownership and country transition stage effects on bank productivity, and found that privatized banks with majority foreign ownership tended to be the most efficient. In addition, early stages of country reform were associated with cost reductions, while costs tended to rise in later transition stages. Bonin *et al.* (2005) also found that strategic foreign ownership of privatized banks in transition countries was associated with increased efficiency. Schure *et al.* (2004) reviewed data from European banks in the mid-1990s, and found that changes in the competitive environment resulted in reduced costs; however, they found no evidence of productivity convergence across countries over this time period.

Table 1. Listing of selected studies of European banking productivity by country

Country/Area	Author
Belgium	Tulkens (1993)
France	Dietsch and Lozano-Vivas (2000)
Germany	Lang and Welzel (1996, 1998)
Greece	Vassiloglou and Giokas (1990)
	Athanassopoulos (1997)
Italy	Favero and Papi (1995)
	Resti (1997)
Portugal	Soares de Pinho (1994)
Spain	Grifell-Tatje and Lovell (1996, 1997)
	Lozano-Vivas (1997)
	Pastor (1999)
	Maudos (1998)
United Kingdom	Drake (2001)
	Drake and Weyman-Jones (1992, 1996)
	Drake and Howcroft (2002)
Norwegian countries	Berg *et al.* (1992)
	Berg *et al.* (1993)
France, Germany, Italy, and Spain	Altunbas and Molyneux (1996)
Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Switzerland, UK and USA	Allen and Rai (1996)
Austria, Belgium, France, Germany, Italy, Spain, UK and USA	Paston *et al.* (1997)
Fifteen EU countries	Pastor (2002)
Fifteen EU countries	Schure *et al.* (2004)
Eleven transition countries	Bonin *et al.* (2005)
Fifteen post-communist countries	Fries and Taci (2005)

Table 2. EU national banking cost structure rankings

1989	1990	1991	1992	1993	1994	1995
Germany	Germany	Germany	Germany	Germany	Germany	Germany
Denmark	Denmark	Denmark	Denmark	Belgium	Denmark	Denmark
Belgium	Italy	Italy	Austria	Austria	Belgium	Austria
Austria	Austria	Belgium	Belgium	UK	Austria	Belgium
Italy	Belgium	Austria	UK	Denmark	Luxemburg	France
Luxemburg	France	UK	Italy	Luxemburg	UK	Luxemburg
France	UK	France	France	France	France	UK
UK	Luxemburg	Luxemburg	Luxemburg	Italy	Italy	Italy
Spain	Spain	Spain	Spain	Spain	Spain	Spain
Greece	Greece	Greece	Greece	Portugal	Portugal	Greece
Portugal	Portugal	Portugal	Portugal	Greece	Greece	Portugal

In this paper this literature is added to by not only providing additional estimates of efficiency changes as these shifts in the competitive environment occur, but also by examining whether productivity is converging or diverging over this time period. It is found that not only was the pattern one of increased efficiency, but that the least efficient banks were closing the gap between themselves and the most efficient banks; overall bank efficiency was converging over this time period.

III. Empirical Model

Bank efficiency is examined using the stochastic frontier approach (SFA) introduced by Aigner *et al.* (1977), Battese and Corra (1977), and Meeusen and van den Broeck (1977). Frontier efficiency measures are based on the estimation of a cost function having the popular transcendental logarithmic (translog) cost functional form, as developed by Christensen *et al.* (1973), and Diewert (1974). While the translog does have limitations, it has a lengthy history in the efficiency literature (for examples, see Ferrier and Lovell, 1990; DeYoung and Hasan, 1998; Altunbas *et al.*, 2001), and is used here. Information for this study was obtained from the Bank Scope data service offered from IBCA (International Bank Credit Analysis), Reuters, Ltd. The seven year period from 1989–1995 was examined; this captures the era in European banking that began with the Second Banking Directive, which was adopted in 1989 and went into effect in January 1993.

The 'intermediation' approach is adopted in modelling bank production. Basically, the intermediation approach treats deposits as inputs that are the 'raw material' to produce loans, as opposed to the production approach which treats deposits as outputs. There are three outputs in the cost function: Loans, Investments, and Commissions. The three input prices in the cost function include capital, labour and deposits. The dependent variable is total cost, which is the cost associated with the production of bank output.

IV. Estimation Results

Several different models are estimated and tested in this study in order to fully examine the best practice cost functions among these 15 EU banking systems; the results are available from the authors on request. Among the statistically significant country dummy coefficients there is a pattern in performance throughout the sample period. As shown in Table 2, Germany, Belgium, Denmark, and Austria top the most productive list year after year, with Germany always first. On the other hand, Spain, Greece and Portugal occupy the last three positions in every year in the sample, indicating that these are the countries with the least productive banking systems.

However, to examine the issue of productivity convergence, regression methods are required. To this end, the standard deviation, variance, and range for each group of the country dummy coefficients are calculated and then regressed against a time variable. With the standard deviation as the dependent variable, the following regression model is obtained:

$$SD = \underset{(6.30)}{0.438} - \underset{(2.28)}{0.035}T$$

$$\text{Adj. } R^2 = 0.51$$

with the absolute value of the *t*-ratios given in parentheses. The negative and statistically significant coefficient on the time trend provides evidence consistent with productivity convergence

in EU banking. If the variance is used as the dependent variable instead of the standard deviation, the same result is found.

The range provides another measure of the dispersion in the country coefficients. Given the results, the range is the difference between the dummy variable coefficients for the most productive banking system (Germany) and least productive, which was either Portugal or Greece, depending on the year. With the range as the dependent variable in a regression with time as the independent variable, the results are as follows:

$$SD = \underset{(6.39)}{-1.756} - \underset{(2.13)}{0.131}T$$

$$Adj. \, R^2 = 0.48$$

The negative and significant coefficient on the time trend variable further indicates that the range of productivity differentials between countries decreased over this time period, indicating that banking productivity in the EU was converging as the deregulation process unfolded.

V. Conclusion

As the EU proceeded through the process of integration and deregulation in banking in the early 1990s, the European banking market became more competitive. The productivity ranking results indicate that Germany had the most productive banking system in the EU for every year in this time period. Other countries whose banking systems were generally more productive than the average were Denmark, Belgium, and Austria, while Spain, Greece, and Portugal consistently had the least productive banking systems. In addition, while there were some changes, particularly with the UK, the productivity rankings of countries were fairly consistent over time.

Finally, and perhaps most importantly, it was found that productivity differentials between banks in these 15 EU countries were narrowing over this time period. These results suggest that the EU policy of reducing restrictions and harmonizing regulations was consistent with promoting banking efficiency across the EU, and that the banking institutions that survived took advantage of the opportunities in the less regulated, more competitive environment to reduce costs and improve productivity. This evidence suggests the success of the EU policies with regard to banking regulation, and these findings add to the literature documenting the efficiency improvements possible when regulatory barriers are reduced or eliminated.

References

Aigner, D., Lovell, C. and Schmidt, P. (1977) Formulation and estimation of stochastic frontier production models, *Journal of Econometrics*, **6**, 21–37.

Allen, L. and Rai, A. (1996) Operational efficiency in banking: an international comparison, *Journal of Banking and Finance*, **20**, 655–72.

Altunbas, Y. and Molyneux, P. (1996) Economies of scale and scope in European banking, *Applied Financial Economics*, **6**, 367–75.

Altunbas, Y., Gardener, E. P. M., Molyneux, P. and Moore, B. (2001) Efficiency in European banking, *European Economic Review*, **45**, 1931–55.

Athanassopoulos, A. D. (1997) Service quality and operating synergies for management control in the provision of financial services: evidence from Greek bank branches, *European Journal of Operational Research*, **98**, 301–14.

Barth, J., Caprio, G. and Levine, R. (2003) Bank regulation and supervision: what works best?, *Journal of Financial Intermediation*, **13**, 205–48.

Barth, J., Dopico, L., Nolle, D. and Wilcox, J. (2004) An international comparison and assessment of the structure of bank supervision, in *Financial Regulation: A Guide To Structural Reform* (Eds) D. Arner and J. J. Lin, Sweet and Maxwell, Hong Kong, pp. 57–92.

Battese, G. E. and Corra, G. S. (1977) Estimation of a production frontier model: with application to pastoral zone of Eastern Australia, *Australian Journal of Agricultural Economics*, **21**, 169–79.

Berg, S. A., Forsund, F. and Jansen, E. (1992) Malmquist indices of productivity growth during the deregulation of Norwegian banking 1980–89, *Scandinavian Journal of Economics*, **94**, S211–28.

Berg, S. A., Forsund, F., Hjalmarsson, L. and Suominen, M. (1993) Banking efficiency in the Nordic countries, *Journal of Banking and Finance*, **17**, 371–88.

Berger, A. and Humphrey, D. (1997) Efficiency of financial institutions: International survey and directions for future research, *European Journal of Operational Research*, **98**, 175–212.

Black, S. E. and Strahan, P. (2001) The division of spoils: rent-sharing and discrimination in a regulated industry, *American Economic Review*, **91**, 814–31.

Bonin, J., Hasan, I. and Wachtel, P. (2005) Bank performance, efficiency and ownership in transition countries, *Journal of Banking and Finance*, **29**, 31–53.

Carbo, S., Gardener, E. and Williams, J. (2003) A note on technical change in banking: the case of European savings banks, *Applied Economics*, **35**, 705–19.

Christensen, L. R., Jorgenson, D. W. and Lau, L. J. (1973) Transcendental logarithmic production frontiers, *The Review of Economics and Statistics*, **40**, 28–45.

DeYoung, R. and Hasan, I. (1998) The performance of de novo commercial banks: a profit efficiency approach, *Journal of Banking and Finance*, **22**, 565–87.

Diewert, W. E. (1974) Application of duality theory, in *Frontiers of Quantitative Economics*, Vol. II (Eds) M. D. Intriligator and D. A. Kendrick, North-Holland, Amsterdam, pp. 106–71.

Dietsch, M. and Lozano-Vivas, A. (2000) How the environment determines banking efficiency: a comparison between French and Spanish industries, *Journal of Banking and Finance*, **20**, 985–1004.

Drake, L. (2001) Efficiency in UK banking, *Applied Financial Economics*, **11**, 557–71.

Drake, L. and Weyman-Jones, T. (1992) Technical and scale efficiency in UK building societies, *Applied Financial Economics*, **2**, 1–9.

Drake, L. and Weyman-Jones, T. (1996) Productive and allocative inefficiencies in UK building societies: a comparison of non-parametric and stochastic frontier techniques, *Manchester School*, **64**, 22–37.

Drake, L. and Howcroft, J. (2002) An insight into the size efficiency of a UK bank branch network, *Managerial Finance*, **28**, 24–36.

Favero, C. and Papi, L. (1995) Technical efficiency and scale efficiency in the Italian banking sector: a nonparametric approach, *Applied Economics*, **27**, 385–95.

Ferrier, G. and Lovell, C. A. K. (1990) Measuring cost efficiency in banking: econometric and linear programming evidence, *Journal of Econometrics*, **46**, 229–45.

Fries, S. and Taci, A. (2005) Cost efficiency of banks in transition: evidence from 289 banks in 15 post-communist countries, *Journal of Banking and Finance*, **29**, 55–81.

Grifell-Tatje, E. and Lovell, C. A. K. (1996) Deregulation and productivity decline: the case of Spanish savings banks, *European Economic Review*, **40**, 1281–303.

Grifell-Tatje, E. and Lovell, C. A. K. (1997) The sources of productivity change in Spanish banking, *European Journal of Operational Research*, **98**, 365–81.

Gropper, D. and Hudson, C. (2003) A note on savings and loan ownership structure and expense preference: a re-examination, *Journal of Banking and Finance*, **27**, 2003–14.

Lang, G. and Welzel, P. (1996) Efficiency and technical progress in banking empirical results for a panel of German cooperative banks, *Journal of Banking and Finance*, **20**, 1003–23.

Lang, G. and Welzel, P. (1998) Technology and cost efficiency in universal banking: a thick frontier analysis of the German banking industry, *Journal of Productivity Analysis*, **10**, 63–84.

Lozano-Vivas, A. (1997) Profit efficiency for Spanish savings banks, *European Journal of Operational Research*, **98**, 382–95.

Maudos, J. (1998) Market structure and performance in Spanish banking using a direct measure of efficiency, *Applied Financial Economics*, **8**, 191–200.

Meeusen, W. and van den Broeck, J. (1977) Efficiency estimation from Cobb–Douglas production functions with composed error, *International Economic Review*, **18**, 435–44.

Murphy, N. B. (2000) European union financial developments: the single market, *FDIC Banking Review*, **13**, 1–18.

Pastor, J. (1999) Efficiency and risk management in Spanish banking: a method to decompose risk, *Applied Financial Economics*, **9**, 371–84.

Pastor, J. (2002) Credit risk and efficiency in the European banking system, *Applied Financial Economics*, **12**, 895–911.

Pastor, J., Perez, F. and Quesada, J. (1997) Efficiency analysis in banking firms: an international comparison, *European Journal of Operational Research*, **98**, 396–408.

Resti, A. (1997) Evaluating the cost efficiency of the Italian banking system: what can be learned from the joint application of parametric and nonparametric techniques, *Journal of Banking and Finance*, **21**, 221–50.

Schure, P., Wagenvoort, R. and O'Brien, D. (2004) The efficiency and the conduct of European banks: Developments after 1992, *Review of Financial Economics*, **13**, 371–96.

Soares de Pinho, P. (1994) Economies of scale and scope and productive efficiency in Portuguese banking: a stochastic cost frontier approach, PhD Thesis, City University Business School, London, UK.

Tulkens, H. (1993) On FDH efficiency analysis: some methodological issues and applications to retail banking, courts, and urban transit, *Journal of Productivity Analysis*, **4**, 183–229.

Vassiloglou, M. and Giokas, D. (1990) A study of the relative efficiency of bank branches: an application of Data Envelopment Analysis, *Journal of the Operational Research Society*, **41**, 591–97.