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Market structure and the efficiency of European insurance companies: A stochastic frontier analysis

Paul Fenn [a,*], Dev Vencappa [a], Stephen Diacon [a], Paul Klumpes [b], Chris O'Brien [a]

[a] Centre for Risk and Insurance Studies, Nottingham University Business School, Jubilee Campus, Wollaton Road, Nottingham NG8 1BB, UK
[b] Tanaka Business School, Imperial College, London, UK

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Abstract

This paper is motivated by the progressive liberalisation of the European insurance market in recent years. It uses stochastic frontier analysis to estimate Flexible Fourier cost functions for European insurance companies. Separate frontiers are estimated for life, non-life and composite companies. We adopt a maximum likelihood approach to estimation in which the variance of both one-sided and two-sided error terms is modelled jointly with the frontiers. This approach allows us to simultaneously control for the impact of heteroskedasticity on the estimation of scale economies as well as estimating the effect of firm size and market structure on *X*-inefficiency. The study draws on Standard & Poor's Eurothesys data set of financial reports for the period 1995 to 2001. This provides technical and non-technical accounts at year-end for life, non-life and composite insurance businesses in 14 major European countries. Our estimates suggest that over this period most European insurers were operating under conditions of decreasing costs (increasing returns to scale), and that company size and domestic market share were significant factors determining *X*-inefficiency. Larger firms, and those with high market shares, tend to have higher levels of cost inefficiency.

JEL classification: G21

Keywords: Competition; Cost efficiency; Insurance; Stochastic frontier analysis

1. Introduction

There is a growing interest and concern about the international competitiveness and efficiency of European financial institutions in general and insurance companies in particular. Over the past 15 years the European Union has gradually deregulated the financial services sector through a series of banking and insurance directives with a view to creating a single European market in financial services. For the first time, true price and product competition in both life and non-life insurance were introduced in European retail insurance markets.[1] The directives implemented the concept of the "single passport" whereby, from 1994, an insurer can do business in all EU countries provided that it is licensed in one EU country. The consequence of deregulation has been an unprecedented wave of mergers and acquisitions (M&As) of European financial institutions. From 1990 to 2002 there were 2595 M&As involving European insurers of which 1669 resulted in a change in control.[2] The presumption behind the creation of a single market is that increased competition across national boundaries will drive down costs through reduced X-inefficiency, and consolidation through M&As will further reduce costs as a consequence of scale economies. However, a corollary of the latter is that the increasing size of companies within their national markets will permit a

* Corresponding author. Tel.: +44 (0) 115 951 5254; fax: +44 (0) 115 951 5262.
E-mail address: paul.fenn@nottingham.ac.uk (P. Fenn).

[1] See Cummins and Weiss (2004, pp. 217).

[2] Cummins and Weiss (2004, pp. 232).

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degree of local market power and this may have unintended consequences for efficiency.[3]

In spite of these dramatic changes in European financial markets, there has been little research to date on the economic impact of these developments.[4] This is particularly true for the insurance market, where some of the more dynamic changes in market structure have been taking place. Rees and Kessner (2000) assess the direct effects of deregulation on the efficiency of German and British life insurance companies and find some (relatively modest) evidence which suggests that lighter regulation, competition and the risk of bankruptcy caused a significantly higher proportion of firms to achieve efficiency levels closer to those of the most efficient firms. Using DEA analysis, Cummins and Rubio-Misas (2006) find that consolidation in the Spanish insurance industry over the period 1989–1998 led to significant improvements in efficiency and to price reductions in both life and non-life insurance. Cummins and Weiss (2004) use an event study approach to identify the impact of European insurance mergers and acquisitions during the period 1990–2002 on shareholder value, and find clear gains from cross-border M&A transactions, but ambiguous results in relation to within-border transactions.

The objective of this paper is to model and measure cost efficiency in the European insurance sector using stochastic frontier analysis (SFA), and to explore variations in efficiency in relation to firm size and market structure. A principal advantage of SFA in the estimation of cost frontiers lies in its potential to discriminate between measurement error (''two-sided'' error) and systematic inefficiencies (''one-sided'' error) in the estimation process. However, the means by which this is achieved is inevitably sensitive to distributional assumptions, both in relation to the frontier itself and the stochastic nature of the error terms.

We address these issues in two ways. The functional form assumed in our estimation is the Flexible Fourier, which has been shown to be particularly suitable where the size distribution of firms is highly skewed towards large numbers of small units. Second, we recognise the potential for estimation bias due to heteroskedasticity in both the one- and two-sided errors by modelling these explicitly as functions of firm size and market share (see Kumbhakar and Lovell, 2000). This simultaneously addresses the frontier estimation bias due to heteroskedasticity[5] and measures systematic variations in efficiency due to size and dominance. This approach has considerable advantages over the more usual approach to estimating the impact of exogenous influences on (in)efficiency, in which the efficiency scores are used as dependent variables in a second stage regression.

We apply this methodology using a panel from Standard's & Poor's Eurothesys data set for the period 1995 to 2001, consisting of year end technical, non-technical and balance sheet accounts from insurance businesses in 14 major European countries. Separate frontiers are estimated for life, non-life and composite firms. Efficiency scores are obtained and scale economies estimated.

This paper is structured as follows. Section 2 reviews hypotheses relating to the impact of competition and market structure on efficiency. Section 3 discusses the methodology behind estimation. Section 4 describes the data and Section 5 discusses the results. A concluding section follows.

2. Competition and efficiency

2.1. Hypotheses

The rationale behind the explicit link between market structure and efficiency was first proposed by Hicks (1935), who argued that monopoly power gives managers a quiet life free from competition. This allows them to appropriate their share of monopoly rents through discretionary expenses or a reduction in their efforts (*X*-inefficiency). However, it was not clear why the existence of monopoly rents would encourage owners of monopolistic firms to turn a blind eye on slack managerial effort as opposed to a competitive market. This has given rise to complementary theories suggested by Liebenstein (1966) and Demsetz (1973). Liebenstein (1966) in particular provides an explanation as to why *X*-inefficiencies exist inside firms and why they are reduced by product market competition, which induces a challenge-response mechanism that reduces the managerial slack. The intuition is that the existence of imperfections in the internal organisation of firms impact on the level of information asymmetries between owners and managers. Incomplete labor contracts make the effort of managers at least partially discretionary, since the production function is not wholly known and owners cannot therefore check the level of effort exerted by managers. Competition potentially reduces such *X*-inefficiencies in two ways. First, to avoid the personal cost of bankruptcy of the organisation, managers now have incentives to increase their work efforts. Secondly, the entry of other firms in the market enables owners to judge the performance of their organisation vis-à-vis the rivals and therefore have a better judgement of the level of effort exercised by managers and have the power to make changes in management if necessary. Managers being aware of this have an additional incentive to increase their effort and reduce inefficiency. A few studies have formal-

[3] There are a number of reasons why firms retain advantages in their home markets in spite of deregulation. Differences in taxation and contract law, cultural heterogeneity, and informational advantages have all been cited as reasons for weak cross-border competition (see Cummins and Rubio-Misas, 2006, fn 6; Muller-Reichart, 2005).

[4] Some recent contributions relating to the banking sector include Kraft et al. (2002), and Schure and Wagenvoort (1999).

[5] This bias can be significant (see Kumbhakar and Lovell, 2000, Ch 7). Previous studies have attempted to reduce the problem by means of normalising all scale-related variables with respect to a given input or output variable (e.g. Berger and Mester, 1997). We believe it is preferable to model the nature of the heteroskedasticity explicitly.