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DO MERGERS REALLY INCREASE EFFICIENCY? A COST EFFICIENCY ANALYSIS OF ELECTRICITY DISTRIBUTORS IN THE US

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Overview

Starting in the mid-1990s, the US experienced a substantial merger¹ wave in the electricity industry with more than 70 since then and a value of more than 180 bn US-\$ for the period 1994-2002. (Edison Electric Institute, as cited in Kwoka and Pollitt 2005, p. 33). At the same time the European Union is also undergoing a significant electricity industry consolidation. The driving forces of this notable reconstructing of the electricity industry are eclectic.

The analysis of mergers is strongly related to industrial organization because these models encourage antitrust agencies to assess the anticompetitive effect of a decreasing number of firms. The paper of Farrell and Shapiro (1990) analyzed the welfare effect of horizontal mergers in a Cournot setting and found that under some circumstances the anticompetitive effect can be more than compensated by cost savings that are due to learning effects or generated by economies of scale. Thus, mergers are welfare enhancing if the efficiency gains at least cancels out the anticompetitive effect. Although this argument is well established in theory, evidence so far is scarce.

Although there exists a broad literature dealing with efficiency measurements in the electricity distribution sector, only the recent paper of Kwoka and Pollitt (2005) analyses the effects of mergers and acquisitions on efficiency. They used the non-parametric Data Envelopment Analysis (DEA) for estimating technical efficiency scores for US distributors and applied a two stage procedure on data of the federal energy regulator FERC for 78 investor-owned utilities (IOUs) covering the eight years 1994-2001. Thereby, efficiency is calculated in a first stage and in a second stage, a Tobit regression is estimated to assess several merger effects on efficiency. Beside an inconsistency problem, the procedure used does not account for data noise. In contrast, we apply the parametric Stochastic Frontier Analysis (SFA) on an extended data set from the US to estimate cost efficiency and merger effects on efficiency simultaneously in a one stage procedure.

Methods

We assess the cost efficiency (CE) using the parametric, stochastic frontier technique SFA in a cost function framework. This allows for random unobserved heterogeneity among the different firms by using two error terms (stochastic and inefficiency errors) but a specification of a functional form is needed. The cost efficiency is the product of technical efficiency (TE) and allocative efficiency (AE); the first term describes the efficiency in the use of production technology, while the second term displays the efficiency in production factor allocation. A translog (transcendental logarithmic) function is chosen for estimating the cost function because its flexible form places no restrictions on the elasticity of substitution at the outset and the economies of scale are allowed to differ with the level of output. The variables of the cost function are the total costs, two outputs (the quantity of electricity delivered and the number of customers), and two input prices (price of capital and labor); a time trend and a network density variable are included in addition. Following Battese and Coelli (1995) in our models specification, a second equation is estimated to assess the effects of structural variables on cost efficiency. These variables are dummies that indicate the time path of the merger for the buying and the acquired firm, as well as a time trend that indicates the industry-specific change of efficiency over time.

Afterwards, we calculate the correlation of the estimates of different models as well as the scale efficiency of the different groups of firms.

Results

We applied the parametric stochastic frontier analysis on a panel data set of 109 investor owned utilities from the US covering the years 1994-2001. Cost efficiency and merger effects on efficiency are estimated simultaneously in a one stage procedure following Battese and Coelli (1995).

The estimation results of the cost function show relatively low cost elasticities with respect to the electricity delivered. The cost elasticities of the output 'number of customers' lie in the range of 80% to 100% that is in line with the literature. The results indicate that mergers change efficiencies of the merging parties' significantly. The buying firms were bad cost performer in the pre-merger period (more inefficient compared to the control group of non-merging utilities) and gain from merging by increasing efficiency, thus becoming a good cost performer in the post-merger period. In contrast, the acquired firms were average cost performer (as inefficient as non-merging firms) prior to a merger and they loose in terms of efficiency, thus becoming a bad performer. Hence, the overall effect of the merged firm remains ambiguous. We cannot confirm cost savings of a merger and their magnitude but we can state that economies of scale seem not to be a determining factor.

The improvement by merging suggests that these firms have shifted technology and processes from sellers to buyers. The parametric approach we applied does not allow the channels to investigate by which the efficiency can be transferred from one company to another.

Conclusion

Our study enriches the discussion of efficiency improvements by horizontal integration in the US electricity distribution industry. The results indicate a contrary picture of gains from merging. On the one hand, the buying firms increase their efficiency while, on the other hand, the acquired firms suffer from merging on form of decreasing cost efficiency. These interesting findings raise the question of the channel by which the firms shift technology a processes from sellers to buyers.

There are other issues that can be addressed in further research. Beside the implementation of further structural parameter to improve the cost function, such as transformer capacity, the line length and quality, it might be of interest to decompose the cost inefficiency into its components of technical and allocative efficiency to reveal the sources of cost inefficiency more intensively. Concerning the merger issue, the rising number of convergence mergers combining electricity and natural gas businesses raises the question of economies of scope.

References

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¹ The term merger and acquisition will be used in this paper equivalently, meaning that one firm ('buyer') is acquiring ('seller') another firm.