Incentive Regulation, Efficiency Improvements and Productivity Growth in Electricity Distribution Utility: A Norwegian Case

The electricity industry has undergone a restructuring process the last 25 years. Competition has been introduced among generators and often also among retailers. System operation, transmission and local distribution are viewed as natural monopolies and various regulatory models and schemes have been put in place. Regulation of natural monopoly in the Norwegian electricity distribution networks was introduced in 1991 when the sector was reformed. Imposing regulation is intended to ensure that distribution utilities are cost efficient so as to keep electricity prices low, ensure secure supply and good quality services to consumers. To mitigate the negative effects associated with rate-of-return regulation (Averch & Leland 1962) that was initially introduced, regulatory policies have been shifting towards incentive regulation using revenue caps or full yardstick competition (Shleifer 1985).The latest policy currently in force in Norway was introduced in 2007 and was revised in 2012. A change to incentive regulation is expected to enhance efficiency improvements and productivity growth. Studies by Miguéis et al. (2012), Edvardsen et al. (2006) and Førsund and Kittelsen (1998) have attempted to analyse the impact of regulatory policies on productivity using Data Enveloping Analysis (DEA) and nonparametric Malmquist index (MI). However, the use of parametric approaches on panel data to examine the change in productivity over time with change in regulation is less frequent. Therefore, this paper attempts to search for empirical evidence in support of the postulate that a change to incentive regulation is associated with improvements in efficiency and productivity. It investigates changes in efficiency, technical change and change in scale as sources of changes in productivity. Compared to previous studies, this study has two advantages: (1) it uses a more updated panel dataset (2004-2012) that spans two regulatory regimes allowing estimates to provide a comparison of performance before and after a change in regulation – this analysis has been lacking; and (2) it uses Stochastic Frontier Analysis (SFA), which enables to account and control for the effects of both observed and unobserved heterogeneity in the operating environment on variations in efficiency and productivity of firms.

This paper uses three output variables -amount of energy delivered, number of customers, lengths of voltage line operated, and three input variables -total operating costs, capital expenditure and system energy losses. Composite geographical variables, portion of underground cable and annual growth in the number of customers are included are included to account for variation efficiency and productivity due to differences in the operating environment.