



# State-Level Electricity Generation Efficiency: Do Restructuring and Regulatory Institutions Matter in the US?

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The United States electricity sector has been historically dominated by large, vertically integrated, and heavily regulated utilities until recent decades, with firms exercising monopoly in their local service area while firms are subject to control in the form of rate of return regulation. The US officially began electricity market restructuring with the enactment of the Federal Energy Policy Act of 1992 and FERC Order No. 888 in 1996 in which both legislations facilitate the restructuring process by permitting independent private and other participant entry into wholesale market with the aim of inducing competition in the market. This paper examines the impact of deregulation and the political support for it on the electric power industry using a consistent state-level electricity generation dataset for the US contiguous states from 1997-2014. Recent analyses of productivity growth suggests that institutional factors are important and we wish to study the role of deregulation as a state-level institutional change through two measures: (a) restructuring and (b) the political support for it, measured by the majority political affiliation of public utility commissions. The state public utility commission (PUCs) regulate the electric power industry and set the retail rates for electricity, based on the cost of service.

To unravel the extent of the contribution of restructuring to electricity generation in the United States as well as its influence in shaping production efficiency, we adopt stochastic production



frontier models in order to investigate the impact of restructuring on technical inefficiency in electricity generation and its marginal effect. Specifically, we adopt a general-to-specific estimation approach involving five different models which are based on a number of variable restrictions in the specific models against the general model. The general model, Wang model, allows the determinants of the inefficiency to be parametrized as a function of the distribution of both the mean and the variance of the inefficiency. Also, we examine the non-monotonic marginal effects of deregulation and other exogenous factors on the technical efficiency. Estimating these models enhances the robustness of our results as failure to model the exogenous factors appropriately may lead to biased estimation of the production frontier.

Overall, our finding shows the importance of restructuring in the electricity generation industry as the result suggests a compelling evidence of positive impacts of restructuring on technical efficiency across the models estimated. We also find that the political affiliation within the state public utility commissions affects the level of technical inefficiency. Performance seems improved as when the majority of the state commissioners on a public utility commission are Republican as they are positioned to influence some political decisions that could potentially support restructuring policy in order to promote competition among the electric power generator. In particular, restructuring through deregulation and continued support for it work together to improve efficient performance is a statistically significant way. Our finding shows that the efficiency scores of this segment were low, indicating wide inter-state differences within the segment, although, other models find higher efficiency scores. The marginal effects are found to show linear effects on technical inefficiency, indicating that the exogenous variables are monotonic i.e. strictly either strictly efficiency-enhancing or efficiency-impeding across observation percentiles. The results of marginal effects show that deregulation has a mean reducing impact on production inefficiency of 8.4 per cent for the whole sample, which indicates an increased electricity generation output by same size due to deregulation.

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