



# Does environmental heterogeneity affect the productive efficiency of grid utilities in China?

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Xiao-Yan Liu

Li-Qiu Liu

Bai-Chen Xie

Michael G. Pollitt

**Abstract** China's electricity industry has experienced a reform whereby the generation sector is being opened up to competition but the transmission and distribution sectors are still regulated. Efficiency and benchmarking analyses are widely used for improving the performance of regulated segments, and the impact on efficiency of observable environmental factors, together with unobservable characteristics, has gained increasing attention in recent years. This study uses alternative stochastic frontier models combined with input distance functions to study the productive efficiency of 29 grid firms of China over the period 1993–2014 and investigates the effect of observed environmental factors and unobserved heterogeneity. The results indicate that efficiency is sensitive to model specification and illustrates the presence of observed and unobserved heterogeneity. The number of customers, power delivered and network length are demonstrated to have positive impacts on the utilities' efficiency while adverse environmental conditions harm the operation of grid utilities, but policy regulations may offset the negative impact. Finally, we suggest that there is room for efficiency improvement in the distribution grid, which could be encouraged by incentive regulation, even taking due account of environmental heterogeneity.

**Keywords** Grid industry; Efficiency estimation; Stochastic frontier analysis; Environmental heterogeneity; China

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Contact [xiebaichen@126.com](mailto:xiebaichen@126.com)  
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