



Does Weather Have an Impact on Electricity Distribution Efficiency? Evidence from South America

EPRG Working Paper 1404

Cambridge Working Paper in Economics 1424

Karim L. Anaya and Michael G. Pollitt

Taking into consideration that electricity markets are exposed not only to different regulatory environments but also to different geographical conditions, this study aims to answer the question about the convenience of including weather variables in the benchmarking models by evaluating the influence of weather on the firms' efficiency.

This paper evaluates a more integrated approach of regulation when doing international comparisons and represents the first cross-country study in the South American region in which quality and weather variables have been included in the analysis. A total of 82 electricity distribution firms operating in Argentina, Brazil, Chile and Peru have been analysed for the period 1998-2008. Stochastic frontier analysis (SFA) is the method selected. Even though there is no special preference in using parametric or non-parametric methods, SFA was selected in this study mainly due to its capability to split the error term into two different components. Cost models and cost-quality models are analysed.

Weather data are collected from 429 meteorological stations. NASA provided lightning data (flash rate) collected from 3,423 coordinates. The use of a geographic information system enabled the identification of the meteorological stations and flash rate coordinates that corresponded to each firm. The selection of weather variables in this paper is supported not only by the impact that these have on efficiency changes but also by the number of firms affected. This study allows us to identify the countries (and also the firms) that are exposed to less favourable weather conditions and vice versa.

Based on statistical hypothesis testing and nested models, this paper concludes, that the inclusion of weather in the production function (input distance function) is the preferred option. The results suggest that on average within the cost models there is a significant increase in efficiency when weather is incorporated into the production function. The country-level analysis indicates that firms from Brazil and Peru are those which operate in less favourable weather conditions. Under the cost-quality models the effect of weather on the average efficiency score is much lower.

This suggests that firms have internalised the effect of weather and have adapted their networks taking into account the environment in which they operate. The company-level analysis indicates that weather affects an important number of firms regarding technical efficiency and their respective rankings. This fact confirms to some extent the appropriate selection of weather variables. Thus, regulators are recommended to invite these specific firms and to make a case for deciding the appropriate adjustment of their respective efficiency scores and rankings.

Contact	k.anaya@jbs.cam.ac.uk
Publication	March 2014
Financial Support	TSEC 1