

Energy Efficiency and Energy Governance: A Stochastic Frontier Analysis

J. Barrera-Santana,^{a,b} G. A. Marrero,^{a,b,c} and F.J. Ramos-Real^{a,b,d}*

The success in the implementation of Energy Efficiency (EE) policies may be conditioned by several factors, like the existence of regulatory failures or by an inadequate coordination between the government and the private sector. In this vein, the International Energy Agency states that the success of energy policies is closely related to the performance of energy governance. Unfortunately, the impact of such governance on the energy sector has been poorly analyzed due to the lack of suitable indicators. This paper uses the Energy Efficiency Governance Index (EEGI), recently developed by Barrera-Santana et al. (2020), to quantify, for the first time in the literature, the impact of energy governance on EE in a representative set of OECD countries between 2000 and 2015.

To this aim, we draw upon the Stochastic Frontier Analysis (SFA) framework, which provides a frontier that represents the optimal level of energy demand. The location of each country with respect to this frontier provides a relative measure of EE. We consider the EEGI as an explanatory factor of the EE level in the three SFA specifications most widely used in the literature: Battese and Coelli (1995), and Greene's fixed and random effects models (Greene, 2005a and 2005b). In order to overcome each of the particular econometric pitfalls of these methodologies, we have also considered several novel alternatives approaches (Chen et al. 2014; Belotti and Ilardi 2018).

The results indicate that the EEGI is positively correlated and very significant in explaining the EE in our set of OECD countries. Furthermore, in relation to the magnitude of this effect, we find that a change of 10% in the average EEGI score can contribute to increasing EE by 9.2% to 27%, depending on the estimated model and the initial EE level of the country. Concretely, the imposition of measurable targets and the adoption of extensive methods to evaluate the results seem to be the energy policies accounting the most positive and significant effect on EE.

Our work breaks new ground in the energy economics literature. First, we provide a comprehensive assessment of the effect of energy governance (and its elements) on EE in a broad set of OECD countries. We also examine the effect of specific energy policies. Secondly, this work also contributes to the definition and estimation of EE. Methodologically, we use novel SFA approaches, which overcome some of the problems raised by traditional methods. Furthermore, a comprehensive endogeneity analysis is conducted. This kind of analysis is relatively new and novel in the SFA framework, especially in the energy economics literature.

* Corresponding author: Universidad de La Laguna, La Laguna 38071, Spain. E-mail: jbarrers@ull.edu.es

^a Departamento de Economía, Contabilidad y Finanzas. Universidad de La Laguna, La Laguna, 38071, Spain.

^b Research Center of Social Inequality and Governance – CEDESOG. Universidad de La Laguna, 38071, Spain.

^c Instituto Universitario de Desarrollo Regional. Universidad de La Laguna, La Laguna, 38071, Spain.

^d Instituto Universitario de Investigación Social y Turismo. Universidad de La Laguna, La Laguna, 38071, Spain.