

AHP ANALYSIS TO EXPLORE RELATIVE SIGNIFICANCE OF FOREIGN DIRECT INVESTMENT IN RENEWABLE ENERGY SECTORS IN DEVELOPING COUNTRIES

Alexander Ryota Keeley, Kyushu University, keeley.ryota.alexander.416@m.kyushu-u.ac.jp
Ken'ichi Matsumoto, Nagasaki University, +81(0)95-819-2735, kenichimatsu@nagasaki-u.ac.jp

Overview

According to the latest figures provided by FDintelligence (2017), the renewable energy sector is the third largest sector regarding the amount of foreign direct investment (FDI). Under pressure to rapidly increase energy generation capacities to address growing demand, to meet energy access challenges, and to foster economic development in a sustainable manner, many developing countries are increasingly facilitating the development of renewable energy. At the 21st Conference of the Parties of the United Nations Framework Convention on Climate Change, the importance of private financing for developing countries, especially FDI, was recognized. In the midst of the transition to cleaner energy systems that is occurring worldwide, enhancing the enabling environment for FDI in renewable energy, in particular wind and solar energy, could greatly facilitate competition in the electricity market, and advance the transition safely and efficiently. To do so, understanding the determinants of FDI in these sectors in developing countries and clarifying the determinants' relative significance would provide criteria for prioritizing policies and actions for policymakers. Therefore, this study aims to clarify the relative significance of the determinants of FDI in wind and solar energy in developing countries using the analytical hierarchy process (AHP).

Methods

To set the priorities among the determinants that have been identified, experts in decision-making positions in companies that have conducted FDI in solar and wind energy in developing countries were asked to fill out questionnaires formulated to provide input for the prioritization process. The responses were analyzed using the AHP to finalize the prioritization process. The AHP is a tool used for decision making and determining the significance of a set of criteria and sub-criteria of multi-criteria problems. The AHP is very suitable for complex social issues in which intangible and tangible factors cannot be separated. The AHP has been applied in various fields, and it has been employed in a number of cases related to renewable energy. Most of the literature that applied the AHP to cases related to renewable energy used the method to determine the best renewable energy to deploy in a certain region or environment. Few cases applied the AHP to examine the relative significance of determinants of FDI in wind and solar energy. The AHP is a subjective method that does not require a large sample but is useful for research focusing on a specific issue where a large sample is not mandatory. Thus, when only the relevant experts are selected as respondents, the AHP is suitable to be conducted with a small sample.

In this study, the questionnaire was sent to experts in decision-making positions in multinational companies that have conducted FDI in solar and wind energy. The companies were identified based on the power plant database provided by GlobalData (2017). To exclude small-scale investment that could have different characteristics, only companies that had been involved in wind and/or solar energy projects in developing countries with more than 1 MW capacity were selected. The questionnaire was sent to 86 companies, at which the authors were able to contact experts in decision-making positions directly via email and/or phone, and 21 questionnaires were returned (a response rate of 24.4%). Through evaluating the consistency ratio of the questionnaires, 19 were shown to have acceptable consistency and were used for further analysis.

The determinants focused here were selected based on our literature review of the determinants of FDI in the wind and solar energy sector in developing countries and semi-structured interviews with experts in the area (Keeley and Matsumoto, 2018). In total, 18 determinants were identified and these determinants were classified into four categories: institutional environment, macroeconomic environment, natural conditions, and renewable energy policies.

Results

First, among the four broad categories, wind and solar energy policies were the most important determinants (40%). Macroeconomic environment and natural conditions were 25% and 21%, respectively. Institutional environment was evaluated as the least important determinant (14%).

Observing the sub categories, among the institutional determinants, an efficient and transparent administrative procedure was perceived as being the most important as the determinant (46%). The development of wind and solar energy projects requires various permits and licenses, involving various ministries and stakeholders, such as local communities. Obtaining permits and licenses can be a slow and unclear process especially in some developing countries, which is why transparent and smooth administrative procedures are deemed an important determinant. Political risk and effective law enforcement follow at 30% and 23%, respectively. Among the macroeconomic determinants, exchange rate volatility was the strongest determinant, with a weight of 60%. This is because of the long-term payback period for wind and solar energy projects, and the role of wind and solar energy investment as a low-volatility investment in many companies' investment portfolios. Access to local financing and labor costs were much less important compared to exchange rate volatility, 26% and 14%, respectively. Among the natural conditions determinants, natural resources and access to land were very important, 42% and 58%. Among renewable energy policies, regulatory support policies and economic support policies were important, 44% and 36%, respectively. Political support policies were perceived to have the least important role (20%).

Finally, through multiplying each determinant's weight by the weight of the category of the determinant, the relative significance of each determinant was calculated. The results (Fig. 1) show that exchange rate volatility had the highest weight among the determinants (15%), followed by access to land (12%), priority access to the electricity grid (11%), natural resources (9%), feed-in tariff (7%), and an efficient and transparent administrative procedure (7%). This final result highlights which factors are important for enhancing attractiveness for FDI in wind and solar energy, and the priorities (relative significance) between the determinants.

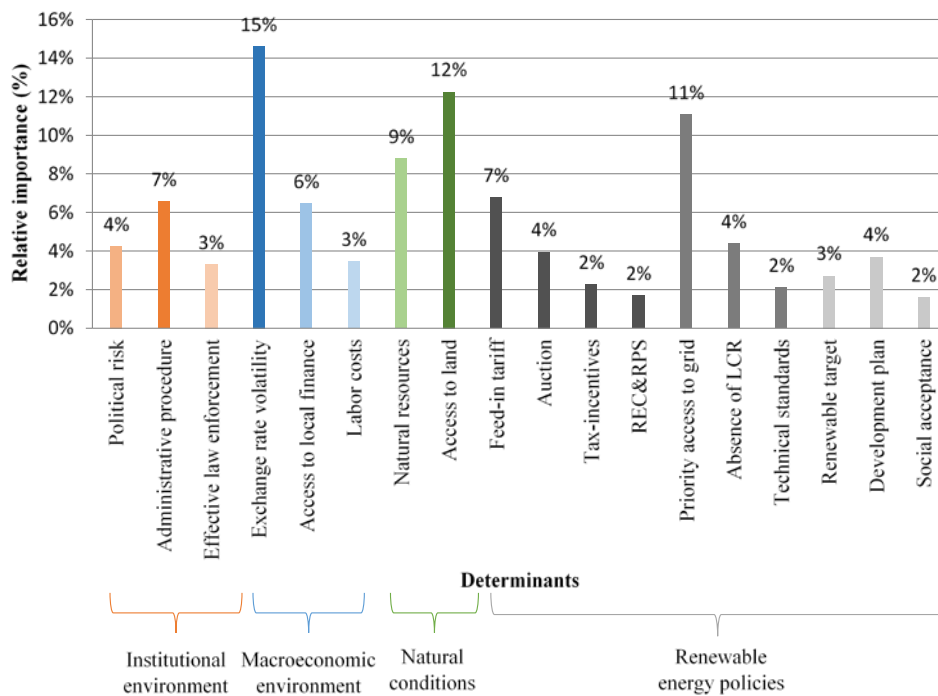


Fig. 1 Relative significance of the determinants

Conclusions

Based on the questionnaires conducted with 21 experts active in the field of FDI in solar and wind energy, the relative significance of the determinants was clarified. For attracting FDI in wind and solar energy sectors, in addition to the traditional determinants of FDI (including natural conditions, an institutional environment, and a macroeconomic environment), renewable energy support policies have been shown to have equivalent or stronger influence on decision making regarding FDI, supporting the results of quantitative studies. This study broke down the renewable energy support policies into more detail and provides experts' opinions on the relative importance of each policy. The study further shed light on another important point that some of the traditional determinants also have very strong influence as determinants of FDI in wind and solar energy. The relative significance of the determinants clarified through this study offers criteria for prioritizing policies and actions for policymakers. There is a broad range of public interventions to reduce investment risks or increase investment returns. Furthermore, some of the traditional determinants, such as exchange rate volatility risk, can also be hedged through properly designed renewable energy support policies.