INVESTMENT IN LOW CARBON TECHOLOGIES: ASSESSMENT OF EUROPEAN MIX EVOLUTION WITH WORLD MODEL DNE21+ COMBINED TO INVESTMENT PREFERENCE INDICATOR

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Overview

In a context of growing climate concerns, investments in low-carbon technologies are needed to pursue climate change mitigation. In particular, emission reductions are expected from the electricity sector through the diffusion of low-carbon technologies such as wind and solar power. Europe has agreed upon a set of ambitious goals in the EU Energy Climate Package. At the same time, the European electricity market is undergoing a deep structural change with the liberalization process, affecting companies' statuses and strategic decisions. Against this background, the issue is how to achieve them by triggering the desired low-carbon investments.

Methods

The paper aims at providing new insight on the issue of investment in low carbon electricity technologies by confronting two different methodologies. World model DNE21+ is an inter-temporal linear programming model that assesses global energy systems and global warming mitigation through refined modeling of technologies and costs. It allows assessing the diffusion of low carbon technologies on global level according to assumptions over costs, technical progress and policies (Sano, Akimoto, et Wada 2014).
On the other hand, an investment model based on Design Structure Matrix assesses technology preferences from a power company's point of view and according to the company's specificities through the calculation of the Investment Preference Index IPI (Shoai Tehrani, Bocquet, et Tomoda, 2014). The confrontation of both models in this paper consists in enriching the macroeconomic approach of world model DNE21+ by including key drivers found in the IPI microeconomic approach, and in particular by sharpening the modeling of risk associated to each technology through inputs such as financing options and governments incentives.

Results

Under a harmonized assumptions framework, the impact of different climate policy scenarios on the electricity sector is assessed. As a result, investment choices are displayed through the evolution of generation mix in the countries within the European scope. The comparison of DNE21+ simulations with and without including IPI-related drivers allows identifying sensitivity of investments to these drivers. It appears to be stronger for countries and companies holding to the pre-liberalization integrated electricity sector pattern.

Conclusions

Confronting the methodologies allows providing new insight about investment behavior by taking into account both a global environment with multiple sector dependencies and multiple company profiles. Analyzing the differences between simulation results reveals different facets of policy effects when applied in different contexts, from which we deduce policy recommendations where as to diminish risk and ensure competitiveness for investing companies according the specificities of each country.

References

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