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ENERGY INNOVATION AT THE COUNTRY LEVEL: THE ROLE OF CROSS-COUNTRY KNOWLEDGE SPILLOVERS

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OVERVIEW

The main objective of the paper is to explore the role of cross-country knowledge spillovers in energy innovation. The analysis examines the country-level patenting activity in renewable energies. Special attention is given to knowledge spillovers stemming from countries that are technological leaders.

Most theoretical studies have represented technological change in the energy sector as driven mainly by innovation activities and climate policy actions that are undertaken in the home country (e.g. [1], [2], [3]). Namely, [4] have examined the effect of public energy R&D and other climate policies on the patenting activities of advanced countries in a set of renewable energies. They have found that policy instruments have a different effectiveness in different technological fields.

Our paper is an attempt to continue along this line of analysis, by adding international knowledge spillovers to the determinants of a country's energy innovation. First of all, we claim that public energy R&D carried out abroad positively affects the home country patenting activity in renewable energies, the greater the linkages among countries. Secondly, we hypothesize that these knowledge spillovers are greater whenever they stem from countries that are technological leaders in renewable energy technologies considered.

Cross-country knowledge spillovers (measured by the intensity of international trade, the presence of foreign multinational enterprises and/or other cross-country linkages) have been already recognized to have a significant impact on a given country's innovation activity (e.g.[5]), also in the energy sector (e.g.[6], [7], [8]). Additionally, the few empirical studies on international linkages and energy technological change focus on the diffusion of new technologies rather than on the innovation stage (e.g.[9]). In another environmentally-friendly sector (i.e. air control systems), [10]uses patent data to show that the innovation activity of advanced countries benefits from earlier foreign patents, although foreign innovative activities do not substitute for domestic innovation. For the same technologies, [11]find that countries that are more open to international trade are more likely to adopt environmental regulations, and to provide access to environmental technologies developed in other countries.

METHODS

Econometric analysis is conducted using patent data on a panel of industrialized countries over the 1980-2006 period. Specifically, energy innovation is proxied by patent count in different renewable energy sources ([12]). As far as our explanatory variables, data on renewable energy R&D budgets come from the IEA energy database ([13]), while cross-country knowledge spillovers have been modeled as the sum of R&D in renewable energies conducted in other countries weighted by trade flows between countries (relevant data come from the UN Comtrade database). Additionally, in order to take into account the role of international technological leadership in renewable energies, we relied on the RTA (revealed technology advantage) index ([14]).

RESULTS

Our preliminary results seem to confirm our hypotheses, thus paving the way to further exploration along this line of research.

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