

Clean Sweep: Electricity Liberalization and the Direction of Technological Change in the Electricity Sector

This paper examines the impact of liberalization on the direction of technological change in the electricity sector. To this end, I use data on electricity-related patents filed between 1990 and 2018 in combination with a set of patent-level quality indicators and an instrumental variable approach. The main idea behind the effect of interest is that liberalization allows new entrants in the electricity market, encouraging the development of more radical and exploratory innovations. Clean energy technologies have been shown to be more radical than dirty technologies and to benefit from the characteristics generally associated with radical innovations. Hence, this could shift technological change in the electricity sector from dirty technologies to cleaner alternatives. The analysis is divided into three parts. The first part, addresses the main research question of the paper by examining the impact of electricity liberalization on the direction of technological change in the electricity sector. To this end, I use a country-level panel dataset and focus on the number of clean and dirty patent families filed at the EPO. In the second part, two patent-level quality indicators are used as dependent variables to test whether electricity liberalization pushes electricity-related patents to use more a more diverse knowledge base. The unit of observation in this case is the patent. Finally, the third part provides suggestive evidence on the role played by incumbents and new entrants using a panel at the applicant-country. The results show that the electricity liberalization leads to less dirty innovations and more clean energy patents. The increase in clean energy patenting is driven by innovations in electricity storage, renewable energy and combustion technologies with mitigation potential. New entrants play a key role in the increase in clean energy patents, while incumbents are responsible for the decline in dirty innovations. The reform also affects the knowledge inputs used in the development of clean energy technologies and encourages the use of knowledge spillovers from other technological fields.