Does the Shale Gas Revolution Hinder Clean Energy Innovation?

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EXECUTIVE SUMMARY

This paper examines the impact of the U.S. shale gas revolution, after by the Energy Policy Act (EPAct) of 2005, on technological innovation in the electricity sector. Using a difference-in-differences methodology and a dataset of 337,009 patent applications from 134 countries spanning 1978 to 2018, the authors investigate shifts in innovation activity across green, renewable, and fossil-fuel technologies.

The study finds that the shale gas boom significantly redirected innovation away from clean energy technologies:

1. Decline in Green Innovation: The ratio of green to fossil-fuel electricity patents decreased by 1.60 in North America, with similar declines observed when compared to European countries and highly innovative "Top Green" nations. The share of green to total electricity innovation also showed a consistent, albeit smaller, decline.
2. Impact on Renewable Technologies: The ratio of renewable to fossil-fuel patents dropped significantly, though the effect on renewable technologies as a share of total innovation was less pronounced.
3. Rise in Fossil-Fuel Innovation: The share of fossil-fuel electricity patents increased, reflecting a shift in innovation in the energy sector.

These findings suggest that the shale gas revolution encouraged patenting in fossil-fuel-related electricity generation technologies relative to green-focused innovations. Robustness checks, including alternative samples and synthetic control analyses, support these conclusions.

The paper contributes to the literature on energy policy and innovation by demonstrating how major policy shifts can redirect technological development.

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