Do Fossil Fuel Taxes Promote Innovation in Renewable Electricity Generation?

Discussion – Céline Nauges (TSE)

Firm-level data vs. Country data

- Appropriate because firms make the decision to innovate …

… but

- **Selection issues**: entry/exit; decision to innovate; decision on the type of innovation

- **Measurement error/endogeneity issue**: average of prices and subsidies calculated across all countries where firms are located (choice of location is endogenous and may depend on country-specific policies; firms may innovate in specific countries only)

- **Omitted variables**: few firm-specific variables used as controls

Long time-series

- Data cover years 1963 to 2011
- Long-term properties of the data should be tested (stationarity of main variables of interest; breaks)
- Non-stationary variables may lead to spurious regressions if variables follow similar trends; standard assumptions for asymptotic analysis may not be valid
- Check literature on panel data with long time-series: Levin, Lin and Chin (JofEc, 2002); Im, Pesaran and Chin (JofEc, 2003); Hadri (Econ J, 2000) etc.
- Risk of serial correlation in the error term

Model specification & identification

- Reduced-form model where innovation depends on prices for coal, natural gas, oil, and electricity; a fossil fuel tax; and research subsidies

… but …

- High colinearity between prices so difficult to separate their effects
- Fossil fuel tax cannot be identified separately from prices
- Innovation might be triggered by:
  - Policies that provide direct support to innovation (support to R&D)
  - Policies that change the relative price of renewable energy vs. fossil fuels
  - Policies that increase demand for electricity generated from renewables

Subset of policies

- Other policies that may impact innovation include feed-in-tariffs, fiscal exemptions, voluntary programs etc.

- By considering only a subset of those policies, identification of their effects is likely to be measured with error, especially if they have been used in combination with other policies.

- Country fixed effects cannot solve this problem.

- Ex: Johnstone et al. (ERE, 2010) considered six different policies and showed that tradable energy certificates and feed-in-tariffs do impact on innovation.

The role of storage

- *From Fossil Fuels to Renewables: The Role of Electricity Storage* (Lazkano, Nøstbakken and Pelli), forthcoming in EER

- Same data; also based on a directed technological change model; but three types of innovation: i) **storage**, ii) conventional, and iii) renewable

- Main result: "Our empirical results confirm that the development of new storage technologies promotes innovations in both conventional and renewable technologies. Hence, electricity storage not only benefits renewables, by mitigating the intermittency problem, but also encourages the development of efficiency-improving fossil-fuel technologies".

- If storage matters, why disregarding it in the latest paper?