Discussion of: Transition to Green Technology along the Supply Chain
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Research Question

Which policies should we use to promote the transition to green technologies / solve the climate problem?

Summary of answers

- Sector-specific ("vertically targeted") policies should be used (beyond carbon taxes)
- But: devil is in the detail. Subsidies for clean tech might backfire.

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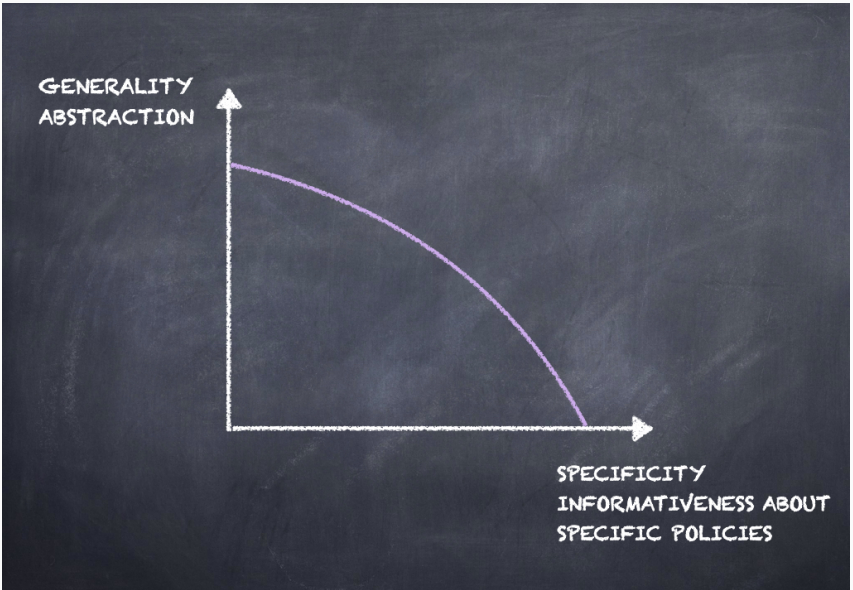
Model of complementarities in tech adoption ("electrification") across vertical supply chain

- Electrification is subject to a sunk cost, but gives higher labor productivity ($\Rightarrow$ larger scale)...
- $\Rightarrow$ yields higher demand for intermediate inputs
- $\Rightarrow$ increased incentives for electrification upstream
- ... also leads to lower prices for inputs downstream (one period later)
- Irreversibility in electrification

The PPF in economics research



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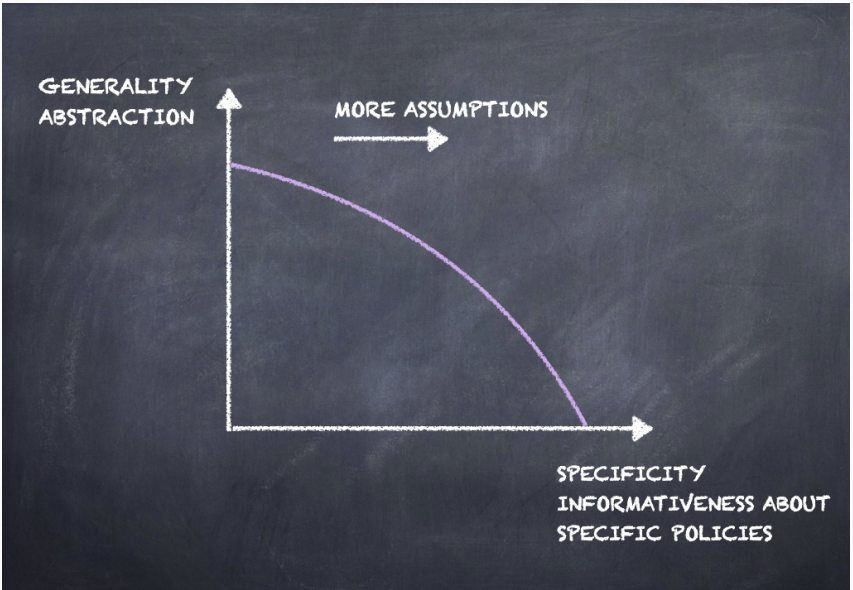

What do we get out of the model?

We get some general results:

1. A result about potential multiplicity of steady states

   Proposition 2. *For given carbon tax τ, there may exist multiple steady-states over a non-empty open set of parameters whenever $N \geq 2$. There exists a unique steady-state when $N = 1$.*

2. A result that optimal policy generally involves sector-specific ("industrial") policies

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- Result 1 (potentially multiple steady states) is not too surprising in a model with scale economies (Murphy-Shleifer-Vishny 1989, Rodriguez-Clare 1996, Ciccone Restud 2002)
- Result 2 (on sector-specific policies) is standard in models of I-O networks with distortions or external economies: social marginal product of subsidies varies across sectors (Liu 2019, Boehm-Oberfield 2023, Buera-Trachter 2023)

Both results are not directly related to the environmental externality: could have the same with households consuming all goods.

What do we get out of the model?

We get a discussion of some special cases ("examples")

1. Small subsidies can make a big difference (cf. Ciccone 2002)
2. Intervention in one sector only in no-electrification steady state
3. Horizontal misallocation
4. Backfiring industrial policy

Comments:

- Interesting
- Would be good to have more clarity on which model assumptions drive which results.
- But still very abstract. In order to make them useful, would need to have careful discussion why the above assumptions are satisfied in a particular application (cars, hydrogen, solar, etc).
- Otherwise we're only learning something about the model, not about reality.

Electrification

- Model ties several things together in clean/dirty dimension
  - environmental externality
  - scale economies
  - intermediate input intensity
  - nonhomotheticity

  Do they belong together? Hard to judge—depends on which real-world situations/choices we want to talk about.
- Electrification has a one-off fixed (sunk) cost, and gives benefits (lower production cost) forever.

  In that sense, it's more an innovation than a technology choice (which might be reversed if input costs are dropping)

Static vs Dynamic Coordination Failures

When sector i electrifies in period t,

- upstream sector is receiving additional demand immediate $\rightarrow$ higher incentives to electrify
- downstream sector is assumed to benefit only (through lower input prices) in period $t+1$.

This avoids a potential static coordination failure (multiple equilibria).

- Why have no static coordination failure, but emphasize the dynamic one (multiple steady states)? Uniqueness of *equilibrium* is fragile anyway (common factors etc)
- The (somewhat arbitrary) timing assumption has implications for whether you want to subsidize upstream or downstream industries

A caveat about innovation or adoption subsidies

A key assumption for the successful use of sector-specific innovation/adoption subsidies is that the impact on incentives in other industries (via demand/supply channels and spillovers) are known.

This almost certainly cannot be true, at least not for technologies that have not been researched.

Example: GenAI/LLMs have been made feasible only because of developments in GPU technology. These GPU technologies were developed entirely because of the demand from video games.

In hindsight, we should have subsidized the video game industry in order to advance GenAI/LLM developments. But of course we didn't know that at the time.

Do we now know which technologies lead us to emissions-reducing technologies, and which ones lead us into an adoption trap?