Discussion of: *Financing the Adoption of Clean Technology* by A. Lanteri and A. Rampini

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Summary

- **Aim:** Understand the drivers of firms' decisions to adopt clean technologies.
- **Question:** What are the equilibrium patterns of clean-technology *adoption* when firms are *heterogeneous* in their financial *resources*?
  - → Paper addresses this question by
    1. providing *empirical evidence* on investment in energy-efficient capital. (data on commercial ships)
    2. developing a novel *general equilibrium model* of firm dynamics and clean technology adoption with financial constraints.

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- **Results:**
  - → If interior solution: investment in clean capital must require more financial resources, because *clean capital must be more expensive*.
  - → $\Rightarrow$ financially constrained firms optimally invest in dirty new technologies as well as in older technologies which generates a *positive relation between firm size and energy efficiency*.

Comments/Suggestions

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- I'll focus my discussion on:

  1. Is commercial shipping the right sector for empirical evidence?
  2. Relationship between firm size and investment in clean capital in the literature
  3. Role of price of energy in the GE model.
  4. Minor points

Comment 1a: Is shipping representative?

- Can we generalize this evidence from such a specific sector to the whole economy?
- What about sectors where a more complex production structure makes transitioning to clean capital more difficult?
- *Hard to abate* industries: steel, cement, and petrochemicals.
  - → Each uses carbon as an integral part of their process, and altogether account for about 30% of the world's greenhouse gas emissions. (IPCC (2022))

Comment 1b: First best benchmark in GE model

- Without financial constraints, firms are indifferent to investing in the two types of capital $\Rightarrow$ all firms would invest only in clean capital.
- What would happen if, for some firms, it's cheaper to continue using less sustainable capital even in the absence of financial constraints?

Comment 2: firm size and investment in clean capital

- Looked at the relationship between age/size of firms and investment in new/clean capital in the literature.
- Noailly and Smeets, 2015: *innovative clean firms tend to be rather small and lack long-standing relationships with banks, which renders securing debt financing more difficult*.
- Could this be a sector specific result? Otherwise more evidence to support this prediction of the model is needed in my view.

Comment 3: The role of price of energy

- There's no role for the price of energy in the firms' investment choices here. It's the units of energy needed to operate the capital that matter.
- Possible extensions (for future research)
  1. Endogenise p_e
  2. Cross-country comparison between energy producers (low p_e) and importers (high p_e)
  3. Allowing for two types of energy (renewable vs fossil) and their relative price to change.

Comment 4: Minor points

- In this model, cleaner capital uses less energy. There's no consideration of emissions. It would be good to see an extension where cleaner capital produces fewer emissions.
- Consider using the GE model to produce more in-depth quantitative analysis: policy counterfactuals, optimal policies, carbon tax, etc.
- Related paper by Campiglio et al. (2023) on *innovation in clean technology and endogenous financing costs* you might want to look at.