Discussion of

The role of firms in green transition

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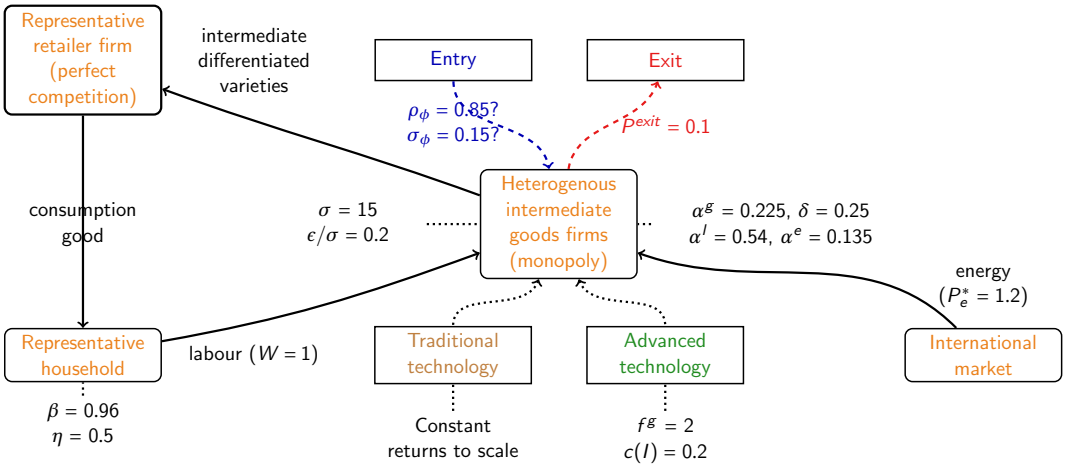
What this paper does

- General equilibrium model of firm dynamics to investigate the impact of environmental policy stringency (proxied by energy price) on green investment, productivity, and market concentration at the firm and aggregate level
- Calibrate the model using Portuguese data to match the empirical properties of firms

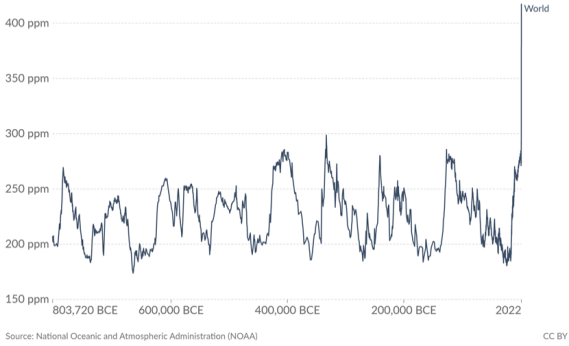
- Larger, more productive firms increase their green investments and expand their market power
- Smaller, financially limited firms fall behind due to high upfront cost of green technology

What this paper does: Model scheme



Why should we care?

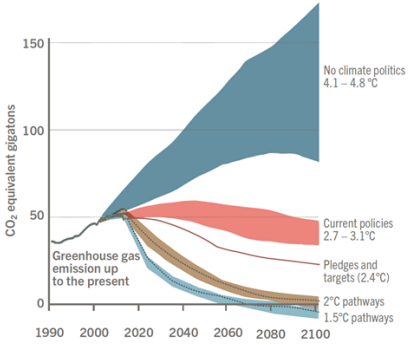
- Atmospheric concentrations of CO_2, the main agent of global warming, were relatively stable for >1 million years
- Since the Industrial Revolution, they have roughly doubled

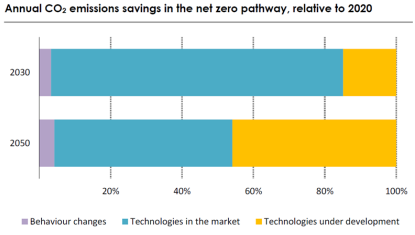


Why should we care? (cont.)

Need for 'net zero' by 2050 commonly accepted, but corporate investment in cleaner technologies remains insufficient

- Too little innovation: Missing green technologies (metallurgy, cement, air transport, etc.)
- Too slow diffusion: Slow spread and adoption of new technologies by firms





How does this paper differ from the existing literature?

1. Focus on green investment, which is a broader measure than green innovation:
   - Green innovation is measured by green patents; relatively few firms apply for patents, to some extent this is sector-specific
   - In addition to green innovation, green investment captures diffusion of green technologies, which are not necessarily patent-protected
   - Diffusion of green technologies is important for the ultimate goal of achieving net-zero emissions

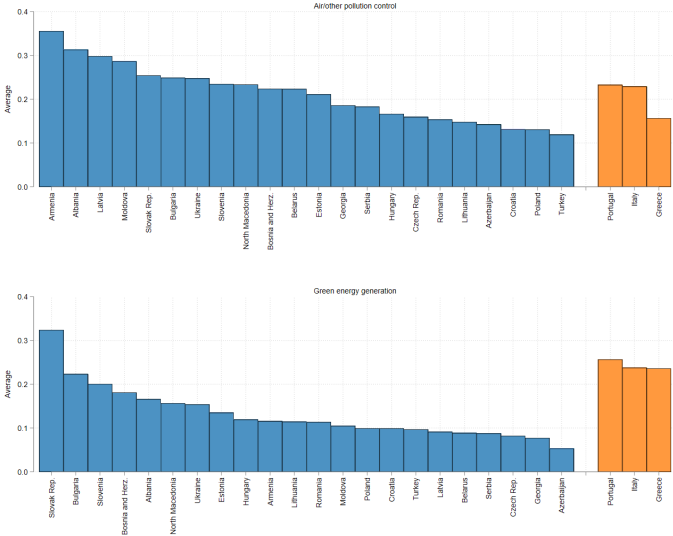
2. Trade-off between green transition and market concentration?
   - Important consideration in the context of, for example, CBAM, EU Deforestation Regulation – firms that adjust may be able to increase their market share, while those that do not may lose it

Model validation: Fraction of green investment (1)

Model matches the data relatively well on sales-markup regression and average markup, but substantially overestimates fraction of green investment (M: 15%, D: 9.22%):

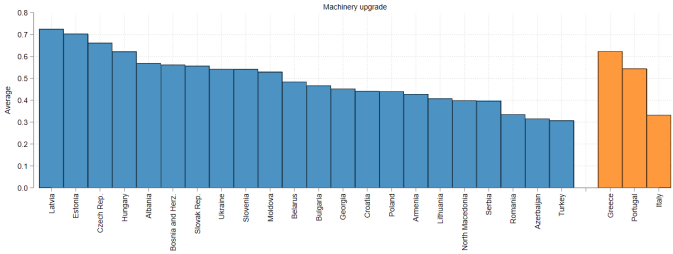
1. Green investment measurement:
   - Green investment is proxied by firms' investment in technologies to control pollution
   - But green investment is not only investments that explicitly target an increase in the firm's energy efficiency and/or a reduction in pollution or other negative environmental impacts
   - Green investment can also include machinery and vehicle upgrades (fixed assets with embedded greener technology) - environmental impact as a byproduct of achieving other objectives

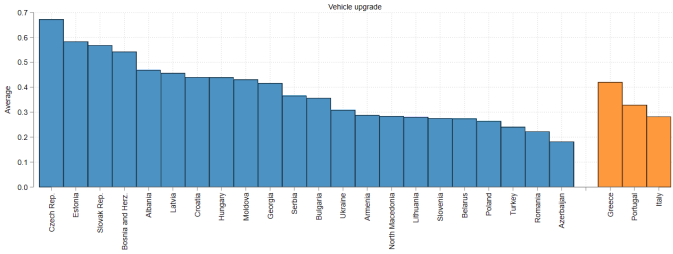
Green investment: Air/other pollution control and green energy generation



Notes: These figures show the percentage of firms that made investments in air and other pollution control and the percentage of firms that made investments in green energy generation in the last 3 years across countries included in De Haas, Martin, Muûls and Schweiger (2024).

Green investment: Machinery and vehicle upgrades



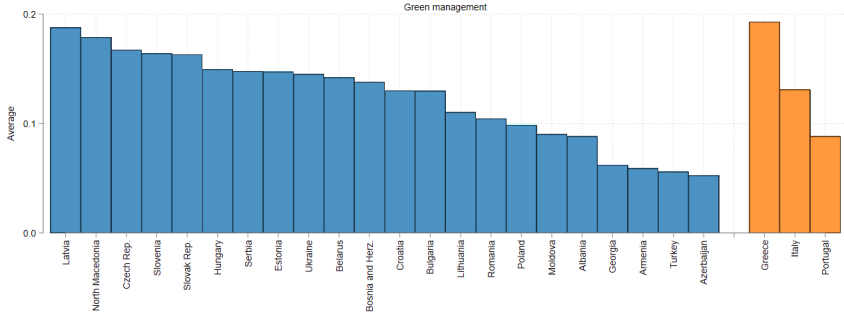


Notes: These figures shows the percentage of firms that made investments in machinery and vehicle upgrades in the last three years across countries included in De Haas, Martin, Muûls and Schweiger (2024).

Model validation: Fraction of green investment (2)

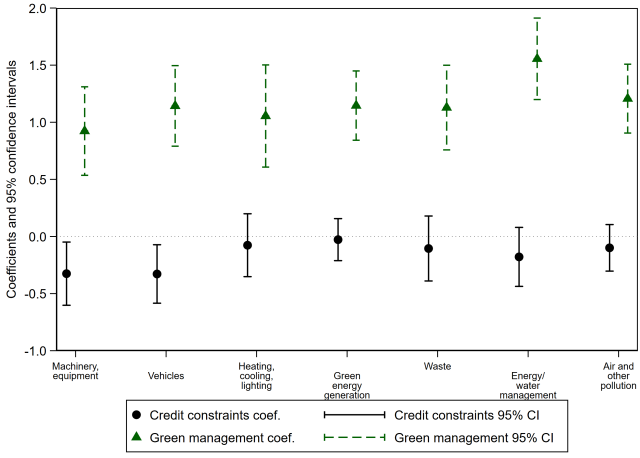
2. Even when carbon pricing is in place, organizational constraints can prevent firms from investing in green technologies (De Haas, Martin, Muûls and Schweiger, 2024)
   - Financial constraints - proxied by firm size by Ünsal and Özcan
   - Managerial constraints - green management practices (strategic objectives related to the environment and climate change, manager with an explicit mandate to deal with green issues, environmental targets, environmental monitoring)

Green management practices



Source: De Haas, Martin, Muûls and Schweiger (2024).

Firm-level credit constraints, green management and green investments



Source: De Haas, Martin, Muûls and Schweiger (2024).

Model validation: Sales share of investing firms

Model matches the data relatively well on sales-markup regression and average markup, but substantially overestimates sales share of investing firms (M: 35%, D: 17%)

- In the model, intermediate goods firms have a monopoly
- In reality, they usually don't have a monopoly and they also compete with imports from abroad
- But could things change in the future with CBAM and other EU environmental policies?

- Include possible explanations for why the model and the data do not match in this instance

Minor comments

- Consider moving "Intermediate goods producers" section before "Final goods producer"
- Consistency of notation: n or l for labour?
- How do the estimates of β (section 4.1.1) and γ (section 4.1.2) relate to the model parameters in Table 3, if at all?
- ρ_ϕ and σ_ϕ appear for the first time in Table 3 (calibrated parameters); where do they belong in the model?

Conclusions

- This paper and research agenda are interesting and important
- We need a better understanding of the determinants of firms' decisions to invest in green technology...
- ... as well as the impact of green transition on market concentration and consumer welfare
- Important questions for policymakers