

# Rewiring Supply Chains Through Climate Policy

(by Benincasa, Carradori, Ferreira, Garcia-Appendini)

Discussion by: Lakshmi Naaraayanan

September 2024

# Conclusion

- Important and timely question
  - Relevance to public policy
- Compelling empirical exercise
  - *Impressive sets of results*
- Rigorous analysis
- Everyone should read!

# Big picture

- Decarbonization of the electricity sector
  - Competitiveness
  - Role of government


## BUSINESS

### Tesla to Halt Production in Germany as Red Sea Conflict Hits Supply Chains

Disruption related to attacks on ships by Houthi rebels raise risk of supply-chain crisis in Europe

By [William Boston](#) [Follow](#), [Costas Paris](#) [Follow](#) and [Benoit Faucon](#) [Follow](#)

Updated Jan. 12, 2024 1:45 pm ET

BERLIN—[Tesla](#) [TSLA -3.67%](#)  plans to halt production at its only large factory in Europe for two weeks because of a lack of parts, a sign of how the [fallout from recent attacks on ships in the Red Sea](#) is starting to ripple through the global economy.

Yemen-based, Iran-backed Houthi fighters have launched successive attacks on commercial ships navigating the crucial trade route in recent months,

# Role of environmental regulation(s)

- **Historical concern: Cross-country competitiveness**
  - Jaffe, Peterson, Portney, and Stavins 1995; Greenstone, List, and Syverson 2012
  - Recent work argues that it is context dependent: e.g., Dechezlepretre and Sato 2017
- **What we know from the literature**
  - **Where short-run costs are high, firms/country-industries produce less or substitute away** (Sato and Dechezlepretre 2015; Chen, Kahn, Liu, and Wang 2018; Curtis 2018)
  - **Firms and country-industries targeted by environmental regulations often see increased innovation** (Porter and Linde 1995; Aghion, Dechezlepretre, Hemous, Martin, and Van Reenen 2016; Du, Cheng, and Yao 2021; Liu, Tan, and Zhang 2021)
  - **Input substitution and production responses** (Criscuolo, Martin, Overman, and Van Reenen 2012; Curtis, Garrett, Ohrn, Roberts, and Suárez Serrato 2021; De Simone, Naaraayanan, and Sachdeva, 2024)

# Supply chains

- **Role of production networks:** e.g., Brummitt et al. 2017; Baqaee, 2018; Oberfield, 2018; Acemoglu and Tahbaz-Salehi, 2020; Acemoglu and Azar, 2020; Baqaee and Farhi, 2021; Kopytov et al. 2021; Elliott et al. 2022; Bui et al. 2022; Konig et al. 2022; Pellet and Tahbaz-Salehi, 2023; Grossman et al. (forthcoming); Grossman et al. 2023a; Grossman et al. 2023b.
- **Role of trade networks:** e.g., Chaney, 2014; Bernard et al. 2019
- **Micro network structure:** e.g., Bimpikis et al. (2018), Bimpikis et al. (2019), Amelkin and Vohra (2020)

# Organizing Framework

Cobb-Douglas production function

$$Q = AE^{\alpha_E} K^{\alpha_K} M^{\alpha_M} L^{\alpha_L} \quad \gamma \equiv \alpha_K + \alpha_E + \alpha_M + \alpha_L$$

$$P = \Lambda^{\frac{1}{\mu}} Q^{\frac{1-\mu}{\mu}}$$

$$V = \max_{E,K,M,L} \left\{ \Lambda^{\frac{1}{\mu}} Q^{\frac{1}{\mu}} - \sum_{X \in \{E,K,M,L\}} W_X X \right\} \quad Q^* = \left[ A \prod_{X \in \{E,K,M,L\}} \left( \frac{\alpha_X}{W_X} \right)^{\alpha_X} \frac{\Lambda^{\frac{\gamma}{\mu}}}{\mu^{\frac{\gamma}{\mu}}} \right]^{\frac{\mu}{\mu-\gamma}}$$

# What should we expect?

- Responses to cap-and-trade (increase in costs):
  - Increase prices (market power)
  - Reduce Other (market power/inefficiencies)
  - Reduce quantities (inefficiencies)
  - Substitute M1, M2, K, L (inefficiency or reoptimization!)
  - Absent pre-existing inefficiencies or market power, regulation will LIKELY cause profits to fall
- Potential adjustments (competitive, efficient firms):
  - Reallocation
  - Input substitution
  - Increase in abatement, reuse, and/or recycling
  - Reduced production

# My thoughts

- Benchmark quantification is going to be important
  - The null hypothesis is not a zero response to a (marginal + fixed?) cost shock -- will be useful to understand what is new
  - Large literature in trade thinking about supply chain disruptions and firm responses
    - commodity price movements (oil prices),
    - trade uncertainty,
    - natural disasters,
    - command-and-control regulations ....



# My thoughts

- The Nature of the Shock: Marginal Cost or Something Else?
  - Is the cap-and-trade program fundamentally a marginal cost shock to firms? Depends on input price --- Colmer et. al., 2024
- First vs. Second Moment
  - Does the regulation create first-moment effects (e.g., predictable higher costs) or second-moment effects (e.g., increased uncertainty)?

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**Thank you!**