Trade and Environmental Outcomes of Environment-Related Technical Measures

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Background and motivation

- Slight decline in global emissions: 47.5 Gt CO2eq in 2020 (**-4.5%** w.r.t. 2019)
- and growth in emissions embodied in traded goods: **from 4 to 9 bln t CO2eq** in 1995-2021

- Diverse interventions to reduce emissions…
  - pricing mechanisms (carbon tax, emission trading): optimal but challenging (*Jakob et al., 2022*)
  - provisions in trade agreements (*Borchert et al., 2021*): **5 times larger** btw 1995 and 2021
  - international (*Victor & Sabel, 2022*) and voluntary sustainability standards (*Fiorini et al., 2019*)

- …and low coordination efforts in unilateral policies (*Santeramo et al., 2023*):
  - TBT increasingly adopted for environmental purposes: **from 156 to 1,094 in 2010-2020**

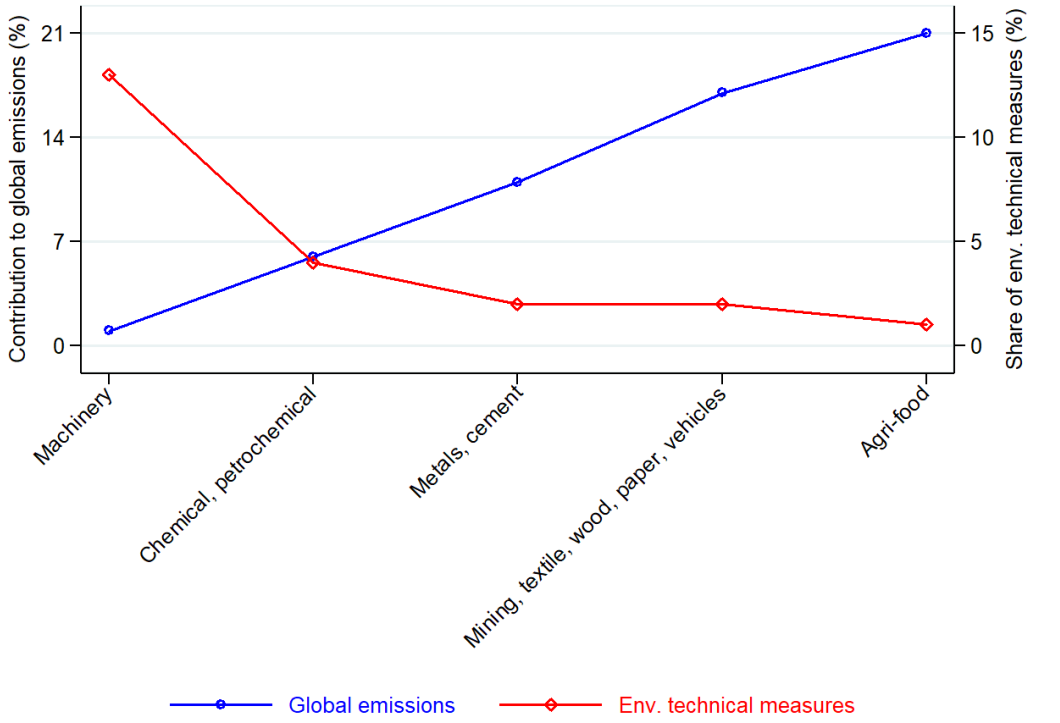
Background and motivation

Unilateral TBT:

- more and more adopted for environmental purposes (*Santeramo et al., 2023*)
- differ substantially across countries (*Possada et al., 2022*)
- lower on dirty than on clean sectors: environmental bias (*Shapiro, 2021*)

- apply to domestic market and trading partners (*Hoekman and Nicita, 2018*)
- should avoid trade obstacle (*TBT Agreement*)

Fig. Sectors' contribution to global emissions and share of env-TBT



Sources: WTO TBT IMS and OUR WORLD IN DATA

Our questions and approach

RQ1: Which are the effects of env-TBT on domestic emissions?

- Overall effects
- by source of emissions: different types of pollution are correlated (*Copeland et al., 2023*)
- by sector: dirty industries are more upstream (*Shapiro, 2021*)

RQ2: Which are the effects of env-TBT on trading partners?

- Overall and sectoral effects on trade and trade embodied emissions:
  dirty industries are more exposed to trade (*Shapiro, 2021*)
- Decomposition of effects for new and incumbent partners:
  pollution emission rates differ substantially across countries (*Copeland et al., 2023*)

Application

Coverage: 66 countries (*j*), 24 sectors (*s*, ISIC REV. 4), 2010-2020 (*t*)

Empirical model (*Yue, 2022*): correlate environmental and trade outcomes to env-TBT

$$\boldsymbol{V}_{jst} = \alpha_{js} + \alpha_{st} + \beta TBT_{jst}^{env} + \gamma TBT_{jst}^{other} + \delta AVE_{jst} + \zeta \boldsymbol{X}_{jt} + \varepsilon_{jst}$$

Outcomes:

- Domestic emissions (RQ1)
- Imports and related embodied emissions (RQ2)

Application

Decomposition (*Hummels & Klenow, 2005*): decompose values into intensive and extensive margins

$$\boldsymbol{V}_{jst} = \underbrace{\left(\frac{\sum_{I_{jst}} \boldsymbol{V}_{ijst}}{\sum_{I_{js(t-1,t)}} \boldsymbol{V}_{ijst}}\right)}_{\substack{\boldsymbol{EM}_{jst} \\ new\ partners}} \times \underbrace{\left(\sum_{I_{js(t-1,t)}} \boldsymbol{V}_{ijst}\right)}_{\substack{\boldsymbol{IM}_{jst} \\ flows\ from \\ remaining\ partners}}$$

- New partners: value-weighted count of current exporters w.r.t partners that export in two consecutive years
- Incumbent partners: partners that export in two consecutive years

Application

Empirical model (*Yue, 2022*):

$$\boldsymbol{V}_{jst} = \alpha_{js} + \alpha_{st} + \beta TBT_{jst}^{env} + \gamma TBT_{jst}^{other} + \delta AVE_{jst} + \zeta \boldsymbol{X}_{jt} + \varepsilon_{jst}$$

Proxies for TBT:

- Presence of TBT
- Number of TBT
- Inventory measures (*Disdier & Fugazza, 2020*):
  - Frequency index: share of HS6 products with at least one TBT
  - Prevalence score: average number of TBT

Effects on domestic emissions (RQ1)

- Env-TBT negatively correlated with domestic emissions (CO2 main contributor)

	Presence	Number	Frequency	Prevalence
Total GHG	-4.8%	-4.4%	-2.3%	-4.5%
CO2	-5.1%	-4.9%	-2.4%	-4.9%
CH4	n.s.	-1.3%	n.s.	-1.3%
N2O	-4.5%	-2.3%	n.s.	-2.3%

- Saved amount: 4 million t CO2eq on avg. per year
- Valued b/w 320 and 360 million EUR
  - ✓ In 2023, daily EU ETS carbon pricing b/w:
    - 80 and 90 EUR/t CO2eq
    - w/ min 77.39 EUR/t CO2eq (on Jan 6) and max 100.34 EUR/t CO2eq (on Feb 21)

Effects on domestic emissions (RQ1)

- Reduction effect correlated w/level of regulations

Total GHG	Presence	Number	Frequency	Prevalence
Agriculture	n.s.	-1.6%	n.s.	-1.6%
Manufact.	-4.5%	-3.3%	-2.1%	-3.4%

- Manufacturing (clean) sector more regulated than agricultural (dirty) sector
  - sectoral regulations dependent on domestic strategies (cross-country heterogeneity)
  - domestic strategies driven by need to reduce emissions level or protect strategic sectors?
  - environmental protection or hidden green protectionism?

  (*political economy analysis in progress*)

Effects on trading partners (RQ2)

- Zero avg. effects on trade
  - heterogeneous effects across countries and sectors (*Santeramo et al., 2023*)

- Negative effects for more regulated sectors
  - no effects at the entry
  - less trade from incumbent partners
    - ✓ TBT create obstacle to trade
    - ✓ unilateral measures w/ spillover effects on trading partners

Tab. Effects on trade

	Pres.	Numb.	Freq.	Preval.
All partners				
Overall	n.s.	-	n.s.	-
Mining, communication	+	+	+	+
Agriculture	-	-	-	-
Manufacturing	n.s.	-	-	-
New partners				
Overall	n.s.	n.s.	n.s.	n.s.
Mining, communication	n.s.	n.s.	n.s.	n.s.
Agriculture	n.s.	n.s.	n.s.	n.s.
Manufacturing	n.s.	n.s.	n.s.	n.s.
Incumbent partners				
Overall	n.s.	n.s.	n.s.	n.s.
Mining, communication	+	+	+	+
Agriculture	-	-	-	-
Manufacturing	-	-	-	-

Effects on trading partners (RQ2)

- Similar effect on trade weighted for emission

  (less traded emissions from incumbent partners and for more regulated sectors)

  - A reduction in trade from “dirtier” countries would nullify the trade barrier effect
  - Potential leakage effect

Tab. Effects on trade embedded emissions

	Pres.	Numb.	Freq.	Preval.
All partners				
Overall	n.s.	n.s.	n.s.	n.s.
Mining, communication	n.s.	+	n.s.	+
Agriculture	n.s.	-	n.s.	-
Manufacturing	n.s.	-	n.s.	-
New partners				
Overall	n.s.	n.s.	n.s.	n.s.
Mining, communication	n.s.	n.s.	n.s.	n.s.
Agriculture	n.s.	n.s.	n.s.	n.s.
Manufacturing	n.s.	n.s.	n.s.	n.s.
Incumbent partners				
Overall	n.s.	n.s.	n.s.	n.s.
Mining, communication	n.s.	+	n.s.	+
Agriculture	n.s.	-	n.s.	-
Manufacturing	n.s.	-	n.s.	-

Take-home

Env-TBT:

- cut domestic emissions (as expected)
  - of cleaner sectors (environmentally biased, *Shapiro 2021*)
    - ⁉ Cleaner sectors more regulated because strategic? Hidden green protectionism?
- are trade distortive (against WTO TBT Agreement principles, *Santeramo et al. 2023*)
- are not tailored against more polluting countries (*Copeland et al. 2023*):
  - non-discriminatory (consistent with WTO TBT Agreement principles)
  - but ineffective in limiting trade of products obtained with dirtier technologies
    - ⁉ Flaws in conformity assessment procedures?
    - ⁉ Are env-TBT more industrial than environmental-related policies?

Thanks

Comments are welcome

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