Beyond the Green Facade: Anticipatory Trade Responses to the Carbon Border Adjustment Mechanism

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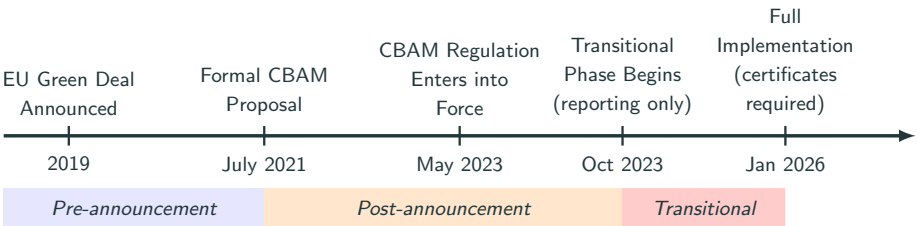
Global Economy

Outline

- Motivation
- Related Literature
- Data and Methodology
- Results
- Policy Implications and Discussion

What is CBAM?

- Global application of the EU's Emission Trading System → Cap and Trade measure to reduce carbon emissions.
- Importers must buy and submit CBAM certificates at the border. 1 certificate per 100 tonnes of emissions
- Also necessitates strict Monitoring Reporting and Verification (MRV) standards to verify whether the carbon price is paid in country of origin



Motivation

- The EU is a key export destination for EMs, especially in carbon-intensive sectors.
- The CBAM introduces a **future carbon-linked trade cost**, effectively acting as an anticipated non-tariff barrier.
- Trade policy with delayed enforcement creates incentives for intertemporal substitution $\rightarrow$ firms may shift exports forward (frontload) to avoid future carbon costs.
- To the best of our knowledge, current literature only simulates the effect of CBAM using theoretical models; empirical estimation is still widely unexplored.

Key Question

Does EU's CBAM announcement affect exports to the EU, and does this anticipatory response vary across AEs and EMs?

Related Literature

Trade and Regulatory Barriers:

Wei et al. (2023): Technical barriers increase compliance costs, leading firms to either upgrade quality or shift exports.

Nabeshima et al. (2021): Non-tariff measures reduce both export volumes (intensive margin) and product variety (extensive margin).

Carbon Border Policies & Trade:

Li et al. (2026): Carbon Border Adjustment Mechanism reduces the competitiveness of carbon-intensive exporters, especially in developing economies.

World Bank (2023), OECD (2025): Countries with carbon-intensive export structures face higher adjustment costs.

Data Sources

- **EU COMEXT** (Eurostat)
  - Monthly bilateral trade flows between the EU and partner countries, 2018–2023
  - 8-digit Combined Nomenclature (CN) product codes
  - Trade values in EUR
- **European Commission CBAM Guidelines (2021)**
  - Defines product scope and sectoral boundaries under CBAM
  - Used to map CN codes to CBAM-regulated product categories

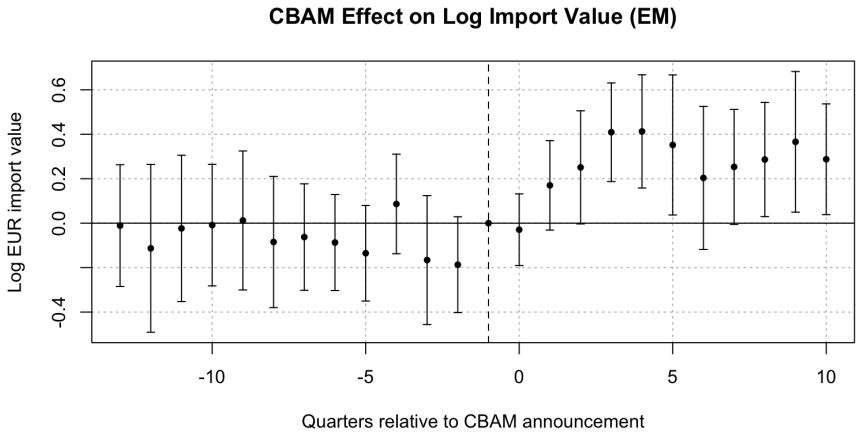
Identification Strategy

We estimate the following event study:

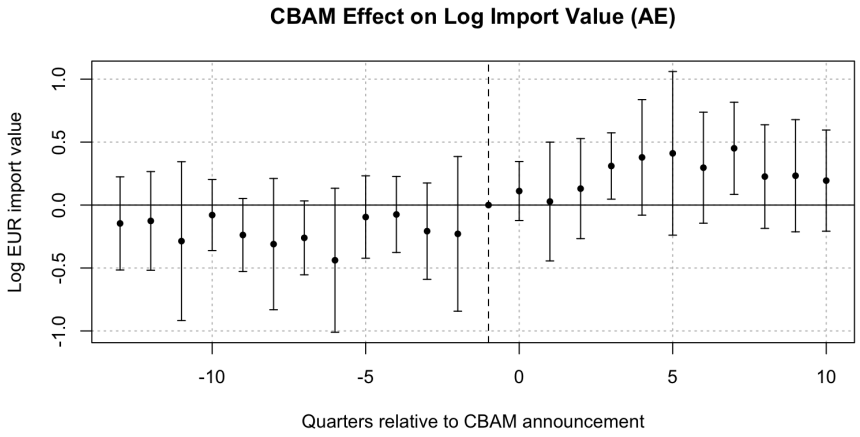
$$\log \mathit{Value}_{sct} = \alpha_{sc} + \delta_t + \sum_{\tau \neq -1} \beta_\tau \left(\mathbf{1}\{t = \tau\} \times \mathrm{CBAM}_s \right) + \varepsilon_{sct}$$

- s = sector, c = country, t = quarter
- $\log \mathit{Value}_{sct}$ = Log of Imports from Country c, sector s, time t to the EU
- α_{sc}: country $\times$ sector fixed effects
- δ_t: time fixed effects
- $\mathrm{CBAM}_s = 1$ if sector s is CBAM-covered; 0 otherwise
- τ: event time (quarters relative to CBAM announcement); reference period $\tau = -1$
- Standard errors clustered by country

Main Results: CBAM and Import Values (EM)



Main Results: CBAM and Import Values (AE)



Policy Implications

- **Strengthening monitoring, reporting, and verification (MRV) systems:** firms that can provide reliable emissions data may be more attractive suppliers than those that cannot.
- **Introduction of domestic carbon pricing mechanisms:** CBAM allows importers to deduct any carbon price already paid during production in the country of origin, policies such as carbon taxes or emissions trading systems could reduce the effective adjustment faced at the EU border.
- **Unlocking Green Finance:** Supporting MSMEs with ESG and climate compliance requirements to get funds from multilateral institutions focused on improving climate resillience.

Appendix

CBAM Adjustment Calculation

CBAM Adjustment Formula

$$\Delta_{\text{CBAM}} = \Big[\left(EF_{\text{direct}} + EF_{\text{indirect}}\right)_{\text{import}} - \left(EF_{\text{EU}} \times \phi_t\right) \Big] \times \left(P_{\text{EU-ETS}} - P_{\text{export-ETS}}\right)$$

where $t \in \{2026, \ldots, 2034\}$

Emissions Terms

- EF_{direct} Scope 1 emissions from production (tCO_2e/t)
- EF_{indirect} Scope 2 emissions from electricity use (tCO_2e/t)
- EF_{EU} EU benchmark emission factor (tCO_2e/t)
- ϕ_t Phase-in factor: share of EU free allocation withdrawn in year t; $\phi_t \in [0, 1]$

Carbon Price Terms

- $P_{\text{EU-ETS}}$ Prevailing EUA price ($/tCO_2$)
- $P_{\text{export-ETS}}$ Carbon price already paid at origin ($/tCO_2$); equals zero if no domestic carbon pricing exists
- Δ_{CBAM} CBAM certificate liability ($/tonne of product)