Heterogeneous Effects of Environmental Outcomes Across Regional Trade Agreements

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- RTAs are where trade rules and environmental outcomes increasingly meet.
- Long-standing debate: do higher/better environmental outcomes kill exports or upgrade them?

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  - With increasing environmental performance of Country A, does it export more to Country B or Country C?

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  - Bilateral environmental alignment of RTAs Partners.
  - Directly test haven vs. halo across RTAs.

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- Clauses or Commitments $\neq$ Realized environmental quality on the ground.
- We use Yale Environmental Performance Index (EPI) as time-varying, outcome-based index (air, water, ecosystems, climate) (Block et al., 2024)

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  - HLT: Environmental Health
  - PCC: Climate Change

Key Findings of This Analysis

- **Pollution halo dominates:** A one-unit increase in the exporter's environmental outcomes is associated with a 2 to 5 percentage-point higher effect on exports to RTA-members, especially in USMCA and MERCOSUR.

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- **Pollution halo dominates:** A one-unit increase in the exporter's environmental outcomes is associated with a 2 to 5 percentage-point higher effect on exports to RTA-members, especially in USMCA and MERCOSUR.
- **Harmonization is second-order:** Similarity or Alignment are weak and inconsistent; exporter outcomes matters most.
- **Pollution havens are narrow:** A robust haven effect appears mainly for the ECO pillar within ASEAN; elsewhere, better outcomes are neutral or pro-trade.

Outline

- Introduction
- Data
- Model
- Main Results
- Component Analysis
- Conclusion

Data

Data

- **UN Comtrade:**
  - Aggregate export data
  - Annual: 1995–2024
- **WTO RTA Database:** RTA coverage for EU, USMCA, ASEAN, MERCOSUR, CPTPP.
- **Yale Environmental Performance Index (EPI) Database:**
  - Annual: 1995–2024
  - 58 Indicators
  - 11 Issue Categories
  - 3 Policy Objectives
  - The Main Environmental Performance Index (EPI)

Yale Environmental Performance Index

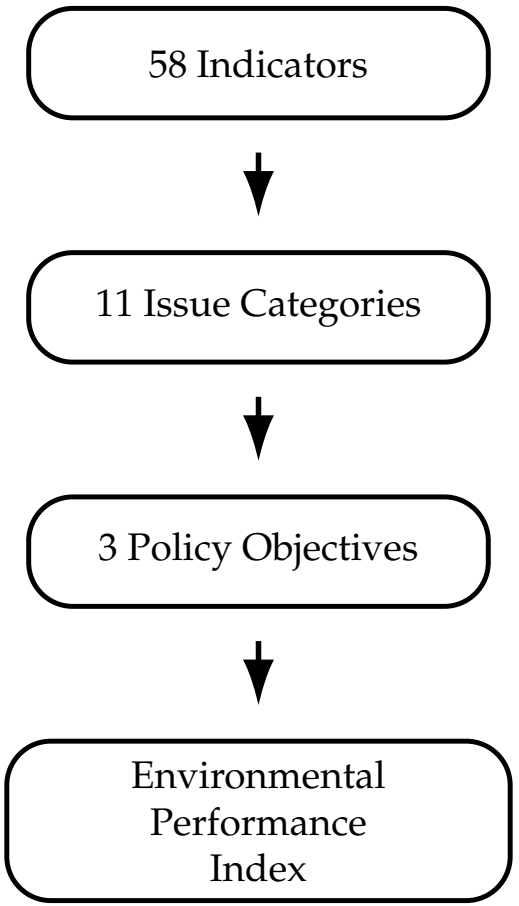

Figure 1: Flow from indicators to the Environmental Performance Index (EPI).

Yale Environmental Performance Index Database

Composition of Environmental Performance Index (100%):

Policy Objective		**Issue Categories**	
Title	**Weight**	**Title**	**Weight**
Environmental Health (HLT)	25%	Air Quality (AIR)	17%
		Sanitation & Drinking Water (H2O)	5%
		Heavy Metals (HMT)	2%
		Solid Waste (WMG)	1%
Climate Change (PCC)	30%	Climate Change Mitigation (CCH)	30%
Ecosystem Vitality (ECO)	45%	Biodiversity & Habitat (BDH)	25%
		Forests (ECS)	5%
		Fisheries (FSH)	2%
		Air Pollution (APO)	6%
		Agriculture (AGR)	3%
		Water Resources (WRS)	5%

Model

Main Model

We adapt a structural gravity model using Poisson Pseudo–Maximum Likelihood (PPML) following Larch, Shikher, and Yotov (2025) recommendations:

$$X_{ijt} = \exp\left\{\alpha_{i,t}^{X} + \alpha_{j,t}^{M} + \phi_{ij} + \sum_{r}\Big[\theta_{1r}RTA_{r,ijt} + \theta_{2r}\left(EOI_{it} \times RTA_{r,ijt}\right) + \theta_{3r}\left(H_{ij,t} \times RTA_{r,ijt}\right)\Big] + \theta_{4}H_{ij,t}\right\} + \varepsilon_{ijt}. \tag{1}$$

- $X_{ij,t}$ = exports from i to j in year t
- $EOI_{i,t}$ = exporter i's environmental outcomes in year t
- $RTA_{r,ij,t}$ = RTA specific dummy between countries i and j in year t
- $H_{ij,t}$ is harmonization ratio between exporter i and importer j.

Harmonization Ratio

For bilateral outcome alignment between exporter and importer, we use the harmonization ratio:

$$H_{ij,t} = 1 - \frac{|EOI_{i,t} - EOI_{j,t}|}{\max\{EOI_{i,t}\ ,\ EOI_{j,t}\}}$$

- $H_{ij,t}$ is harmonization ratio between exporter i and importer j.
- $EOI_{i,t}$ is environmental outcome index of exporter i for year t.
- $EOI_{j,t}$ is environmental outcome index of importer j for year t.

Specification

$$X_{ijt} = \exp\left\{\alpha^X_{i,t} + \alpha^M_{j,t} + \phi_{ij} + \sum_r \Big[\theta_{1r} RTA_{r,ijt} + \theta_{2r}\left(EOI_{it} \times RTA_{r,ijt}\right) + \theta_{3r}\left(H_{ij,t} \times RTA_{r,ijt}\right)\Big] + \theta_4 H_{ij,t}\right\} + \varepsilon_{ijt}.$$

Our Main Specification Includes:

- Exporter–year FE $\alpha^X_{i,t}$ absorb $EOI_{i,t}$ and outward MR.
- Importer–year FE $\alpha^M_{j,t}$ absorb inward MR.
- Pair FE ϕ_{ij} capture time-invariant bilateral frictions.

Results

Main Results

	(1)	(2)
RTAs	EOI × RTA	H × RTA
EU	0.0008	-0.2205
	(0.0031)	(0.1580)
USMCA	0.0266***	0.5738
	(0.0078)	(0.7558)
ASEAN	0.0004	-0.1256
	(0.0078)	(0.3051)
MERCOSUR	0.0567***	0.9528
	(0.0131)	(0.6906)
CPTPP	-0.0028	0.2237
	(0.0034)	(0.2163)
Observations	562,485	562,485
Pseudo R2	0.9913	0.9913

Component Analysis Based on Different Policy Objectives

Component Analysis: HLT, PCC, and ECO Indices

RTAs	(1)	(2)	(3)
	HLT	**PCC**	**ECO**
EU	0.0050	-0.0010	0.0021
	(0.0092)	(0.0058)	(0.0052)
USMCA	0.0843***	0.0331***	0.0259
	(0.0213)	(0.0128)	(0.0301)
ASEAN	0.1315***	-0.0051	-0.0658***
	(0.0353)	(0.0098)	(0.0238)
MERCOSUR	0.2191***	0.0506*	0.0792***
	(0.0480)	(0.0305)	(0.0249)
CPTPP	-0.0019	-0.0196**	-0.0091
	(0.0090)	(0.0095)	(0.0072)
Observations	562,485	562,485	562,485
Pseudo R2	0.9913	0.9913	0.9913

Notes: HLT represents Environmental Health Index, PCC represents Climate Change Index, and ECO represents Ecosystem Vitality Index.

Concluding Remarks

- Inside major RTAs, higher *exporter* environmental performance is on average trade-enhancing.
- A one-unit increase in the exporter's EPI is associated with a 2.6 to 5.7 percentage-point higher effect on exports when the exporter and importer are in the same RTA, especially in USMCA and MERCOSUR.
- Bilateral environmental outcome alignment has a negligible impact on trade flows.
- Overall, we show that this pro-trade channel is driven by the exporter's unilateral environmental outcomes.

Concluding Remarks

For Component Analysis:

- Environmental Health (HLT) consistently pro-trade.
- Climate Change (PCC) neutral globally but positive in the Americas and negative in CPTPP
- Ecosystem Vitality (ECO) shows haven dynamics in ASEAN while halo dynamics in MERCOSUR.

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- Suggestions and recommendations are appreciated.

Thank You!

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Robustness Check: Harmonization Match

We use an additional bilateral outcome alignment measure, the harmonization match:

$$M_{ij,t} = (EOI_{i,t} - \overline{EOI}_t)\,(EOI_{j,t} - \overline{EOI}_t)$$

where, $\overline{EOI}_t$ is the global mean in year t.

We find similar results for both $M_{ij,t}$ and $H_{ij,t}$.

Climate Change Mitigation (CCH)

Indicator	
Title	**Weight**
Adjusted emissions growth rate for carbon dioxide	7.50%
Adjusted emissions growth rate for carbon dioxide (country-specific targets)	0.50%
Adjusted emissions growth rate for methane	3.00%
Adjusted emissions growth rate for F-gases	2.00%
Adjusted emissions growth rate for nitrous oxide	1.00%
Adjusted emissions growth rate for black carbon	1.50%
Net carbon fluxes due to land cover change	1.00%
GHG growth rate adjusted by emissions intensity	6.00%
GHG growth rate adjusted by per capita emissions	6.00%
Projected emissions in 2050	1.00%
Projected cumulative emissions to 2050 relative to carbon budget	0.50%

Return