Targeted Trade Policy Instruments and Climate Change Mitigation: The Case of Environmental Provisions in Trade Agreements

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Motivation: Trade and the Environment

- As trade grows so is the coupling of consumer choices in one part of the world to resource use elsewhere.
- This relationship is a key driver of climate change via deforestation, biodiversity loss, and GHG emissions.
- **Problem:** Given the challenges of reaching multilateral solutions, countries are incorporating environmental provisions (EPs) into bilateral trade agreements (PTAs) ▸ Graph of PTA growth
- But how effective are these bilateral approaches in achieving their climate goals?

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Research Questions

1. We examine the effect of including EPs in PTAs on climate change mitigation
2. Explore whether these effects vary based on the heterogeneity of the EPs.

Data: Preferential Trade Agreements and Environmental Provisions

- Source: TRade and ENvironment Database (TREND) ≈ 300 EPs in 775 PTAs
- Existing works classify EPs into climate-related EPs and others (Morin and Jinnah, 2018; Sorgho and Tharakan, 2022)
- This paper: We distinguish PTAs with direct climate change provisions
- **Direct provisions** tackle climate change explicitly (e.g., GHG reduction, harmonized climate regulations)
- **Indirect provisions** address env'tal issues more broadly (e.g., encouraging trade in env'tal goods, stakeholder engagement)
- Signals commitment to actively address CC

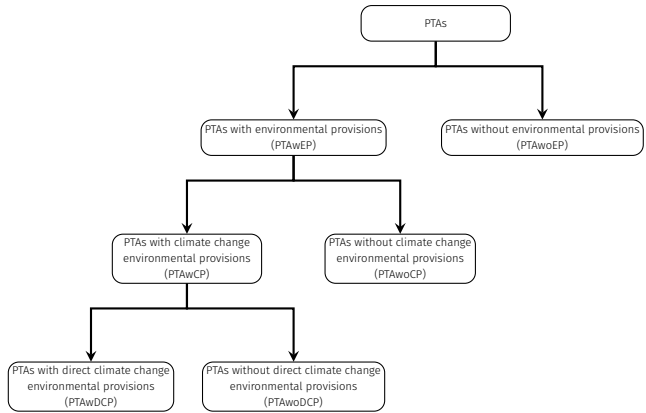

Figure 1: Classification of PTAs by EPs

Data: Measuring environmental performance

- Climate Protection Performance Index (CCPI) provided by Germanwatch e.V. (Burck et al., 2023)
- CCPI examines 14 indicators in four categories ▸ See figure:
  - 40% for GHGs emissions
  - 20% for renewable energy
  - 20% for energy efficiency
  - 20% for climate policy.
- **Coverage**: 57 countries, 2006 – 2019

▸ Changes in CCPI over time

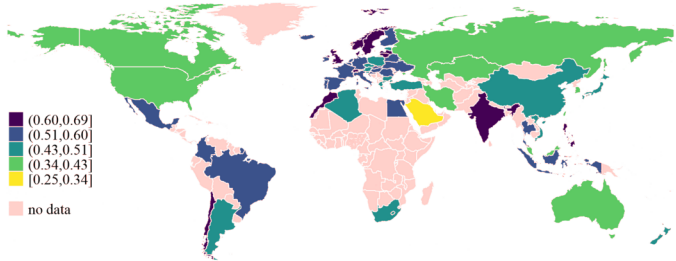

Figure 2: Variations in mean CCPI scores across countries

Method: Estimation equation

$$CPP^{\rho}_{it} = \alpha_1 PTAwoEP_{it} + \alpha_2 PTAwEP_{it} + \alpha_3 CPP^{\rho}_{it-1} + \alpha_4 \log Openness_{it} + \alpha_5 \log GDPcap_{it} + \alpha_6 \log Popdensity_{it} + \alpha_7 Demoindex_{it} + \tau_i + \delta_t + \mu_{it} \quad (1)$$

Variable Definitions:

- CPP^{ρ}_{it}: climate change mitigation performance of country i in year t.
- ρ: indicators of climate change mitigation performance and its sub-components
- $PTAwoEP_{it}$ is the cumulative count of PTAs that do not include EPs
- $PTAwEP_{it}$ is the cumulative number of PTAs that include EPs
- τ_i, δ_t: country and year fixed effects
- μ_{it}: error term

Estimator: Auto-regressive panel model estimated via exponential fractional regression to account for CPP^{ρ}_{it} being bounded between 0 and 1 (Ramalho et al., 2018). ▸ Summary statistics

Identification

- **Omitted variables** $\longrightarrow$ controlled with country & time fixed effects
- **Reverse causality** $\longrightarrow$ dynamic panel (Arellano–Bond), lagged PTA variables
- **Measurement bias** (CCPI) $\longrightarrow$ standardized criteria; alternative measures
- **Endogeneity of Income (GDP) & Trade** $\longrightarrow$ Instrumental Variables (IV)
  - **Trade:** Predicted flows from structural gravity (PPML)
  - **Income:** Predicted GDPpc from growth regression
  - **Instrument for openness:** $\widehat{Openness}_{it} = \sum_{j \neq i} \widehat{X}_{ijt} / \widehat{GDPpc}_{it}$

Benchmark results: PTA with EPs support climate change mitigation efforts

Dependent variable	CCPI	Emissions reduction	Increased renewable energy	Improved energy efficiency	Climate policy
	(1)	(2)	(3)	(4)	(5)
$PTAwoEP_{it}$	−0.010	0.080	−0.077	−0.323	−0.182***
	(0.037)	(0.169)	(0.132)	(0.268)	(0.050)
$PTAwEP_{it}$	0.017***	0.004***	−0.001	0.031***	0.036***
	(0.005)	(0.001)	(0.009)	(0.011)	(0.009)
Controls	Yes	Yes	Yes	Yes	Yes
Country fixed effect	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes
Observations	727	727	727	727	727
Countries	57	57	57	57	57
Hansen test (Prob)	0.117	0.123	0.128	0.166	0.137

Notes: CCPI means climate change performance index. $PTAwoEP_{it}$ is the number of preferential trade agreements without environmental provisions in force for country *i* in year *t*. $PTAwEP_{it}$ is the number of PTAs with environmental provisions. Standard errors, clustered at the country level, are in parentheses. ***, **, and * denote significance at 1%, 5%, and 10% respectively.

Results: more pronounced effects for PTAs with direct climate change provisions

	CCPI		Emissions reduction		Renewable energy use		Energy efficiency		Climate policy	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$PTAwoCP_{it}$	−0.002		−0.040**		0.014		0.021		0.004**	
	(0.025)		(0.020)		(0.015)		(0.016)		(0.002)	
$PTAwCP_{it}$	0.017***		0.024***		−0.006		0.019**		0.002**	
	(0.006)		(0.001)		(0.010)		(0.008)		(0.001)	
$PTAwoDCP_{it}$		−0.015		0.050***		0.028		0.049***		0.061
		(0.043)		(0.017)		(0.029)		(0.016)		(0.057)
$PTAwDCP_{it}$		0.045**		0.008**		−0.008		−0.004		0.010
		(0.023)		(0.003)		(0.010)		(0.009)		(0.014)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	727	727	727	727	727	727	727	727	727	727

Notes: Standard errors, clustered at the country level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

The results are robust to alternative measure of climate performance

- Environmental Protection Index ▸ Graph ▸ Results
  - Covers 132 countries
  - Subindices $\longrightarrow$ environmental health, and climate and energy
- CO_2 equivalents ▸ Results

Conclusions

- PTAs with EPs improve climate change mitigation performance at the country level
- Results are robust across different measures of environmental performance: CCPI, EPI, and CO_2 emissions data
- Effectiveness, however, depends on diversity of EPs $\longrightarrow$ PTAs with direct climate provisions are more effective than those addressing environmental issues more broadly
- Key takeaway: If PTAs are to achieve climate change mitigation efforts, they must directly address climate change issues

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- Key takeaway: If PTAs are to achieve climate change mitigation efforts, they must directly address climate change issues

THANK YOU!!

References

Burck, J., Marten, F., Bals, C. and Höhne, N. (2023). Climate Change Performance Index. Tech. rep., Germanwatch, NewClimate Institute, and Climate Action Network, Bonn, accessed: 2025-08-20.

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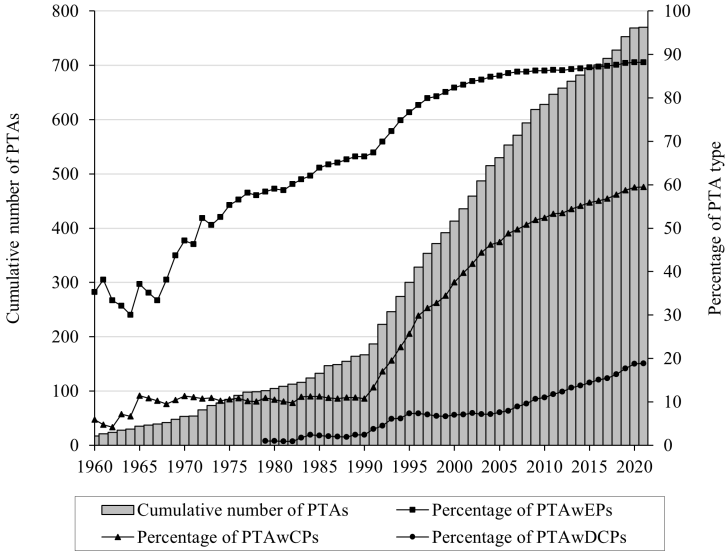
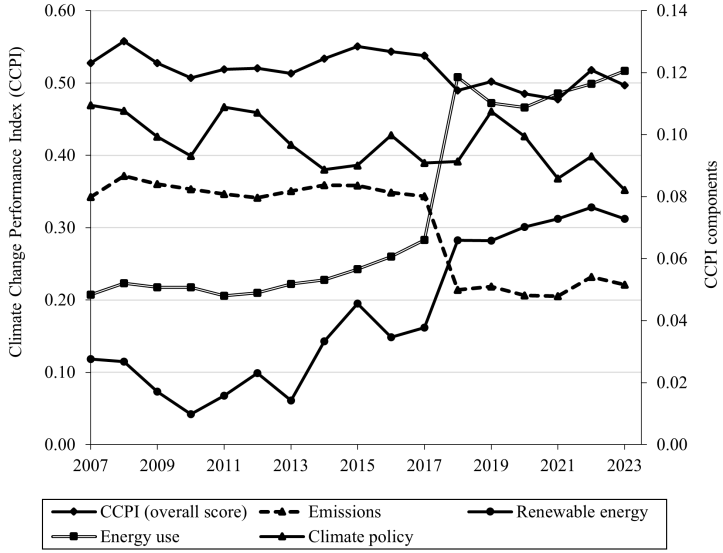
Sorgho, Z. and Tharakan, J. (2022). Do PTAs with Environmental Provisions Reduce GHG Emissions? Distinguishing the Role of Climate-Related Provisions. *Environmental and Resource Economics* 83: 709–732, doi:10.1007/s10640-022-00707-9.

Global evolution of PTAs by type



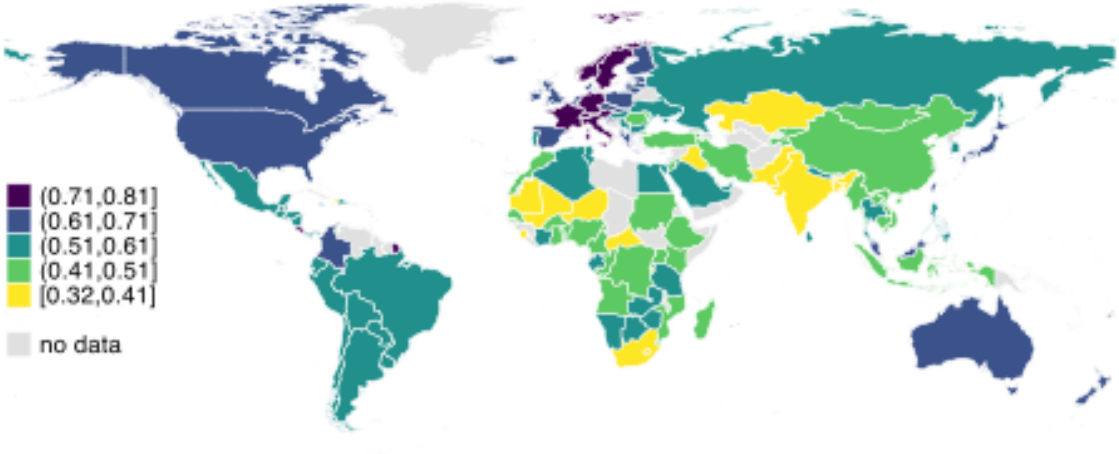
Global trends in CCPI and its components from 2007 to 2023



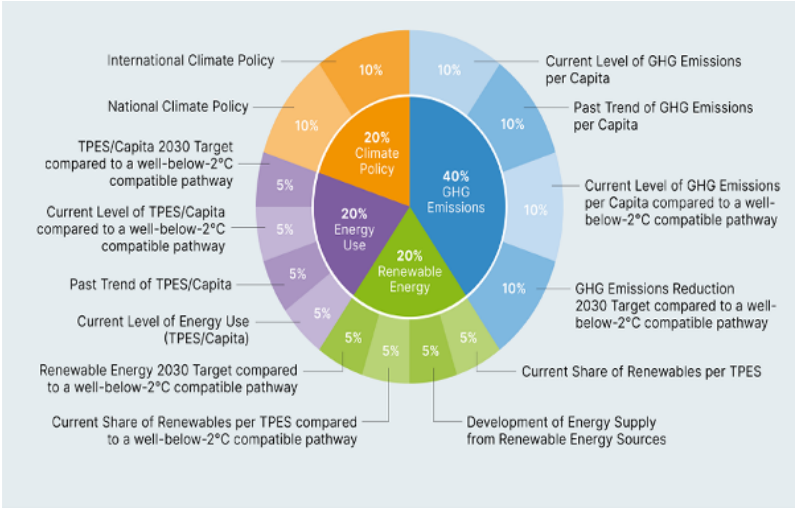
Summary statistics

	N	Mean	SD	Min	Max
Climate related variables					
CCPI (overall score)	983	0.518	0.105	0.088	0.796
Emissions	983	0.304	0.090	0.093	0.466
Renewable energy	983	0.042	0.034	0	0.194
Energy efficiency	983	0.075	0.037	0.006	0.187
Climate policy	983	0.097	0.042	0	0.200
EPI (overall score, [0 1])	1,779	0.560	0.127	0.184	0.935
Environmental health	1,959	0.625	0.276	0.001	0.999
Climate and energy	1,737	0.498	0.226	0.002	0.998
PTA variables					
All PTAs	1,840	27.118	24.164	1	113
PTAwEPs	1,840	24.942	23.406	1	110
PTAwoEPs	1,840	2.177	2.459	0	16
PTAwCPs	1,840	17.299	16.121	0	77
PTAwoCPs	1,840	9.819	10.262	0	41
PTAwDCPs	1,840	8.980	11.401	0	57
PTAwoDCPs	1,840	18.138	14.705	1	60

Variations in mean environmental performance index (EPI) across countries



Components of the Climate Change Performance Index (CCPI)



Alternative measures: Environmental Protection Index

Graph

	Environmental Protection Index			Environmental health			Climate and energy		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$PTAwoEP_{it}$	0.009			−0.423***			−0.005		
	(0.064)			(0.061)			(0.057)		
$PTAwEP_{it}$	0.007**			0.026**			0.015**		
	(0.003)			(0.012)			(0.006)		
$PTAwoCP_{it}$		−0.020			−0.074***			−0.002	
		(0.025)			(0.028)			(0.016)	
$PTAwCP_{it}$		0.002**			0.057***			0.025***	
		(0.001)			(0.018)			(0.009)	
$PTAwoDCP_{it}$			−0.025*			−0.059*			0.013
			(0.015)			(0.031)			(0.012)
$PTAwDCP_{it}$			0.003**			0.147***			0.012**
			(0.001)			(0.051)			(0.004)
Country & Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	787	787	787	905	905	905	794	794	794
Countries	114	114	114	132	132	132	115	115	115

Alternative measures: CO_2 equivalents

	(1)	(2)	(3)
$PTAwoEP_{it}$	0.033 (0.035)		
$PTAwEP_{it}$	−0.004*** (0.001)		
$PTAwoCP_{it}$		0.008 (0.021)	
$PTAwCP_{it}$		−0.004*** (0.002)	
$PTAwoDCP_{it}$			−0.008 (0.020)
$PTAwDCP_{it}$			−0.002*** (0.001)
Country fixed effect	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes
Observations	1,826	1,826	1,826
Countries	132	132	132
Hansen test (Prob)	0.119	0.125	0.115

Notes: Standard errors, clustered at the country level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.