Trade
4 SUSTAINABLE DEVELOPMENT

HORIZON 2020

The Effect of SDG-related Provisions in PTAs on SDGs

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Outline

- **Background of Study**
- **Data**
  - Environmental Provisions in PTAs
  - SDG Indicators
- **Estimation Methods**
  - Panel Fixed Effects
  - Synthetic Difference-in-Difference
- **Estimation Results**
- **Conclusion**

Background: Deep Trade Agreements

Select a year range
1960 to 2019

■ Less than 10 policy areas
■ Between 10 and 20 policy areas
■ More than 20 policy areas
— Cumulative number of agreements

Number of policy areas covered in Preferential Trade Agreements (PTAs), 1950-2018

Source: Deep Trade Agreements Database 1.0..
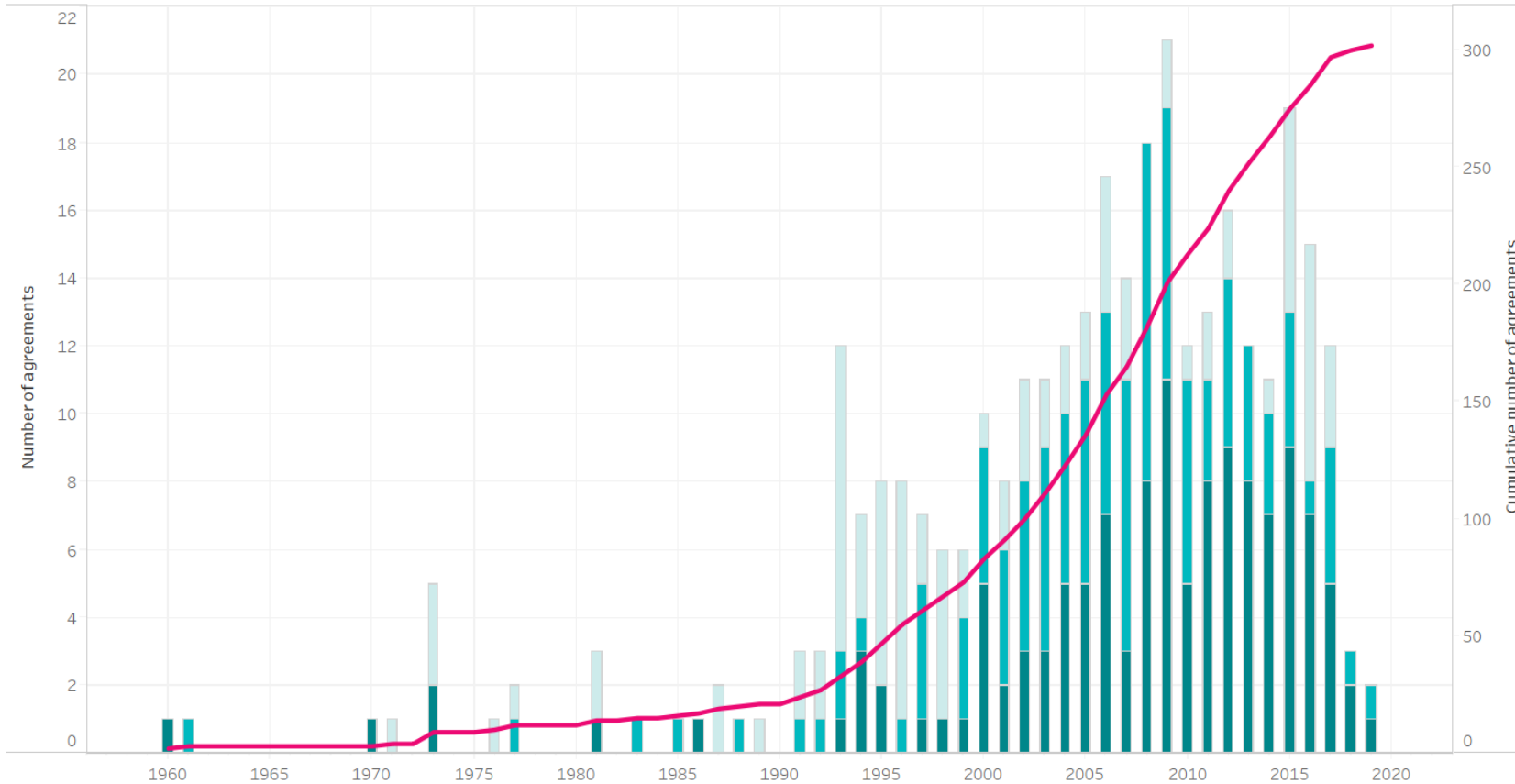
PTAs have become deeper, both at the extensive (number of policy areas covered) and intensive margins (specific commitments within a policy area).

Mattoo et.al (2020) .

Background: SDG-contents of Trade Agreements

Some of these non-economic provisions have the potential to influence the SDGs:

- ***Provisions on labour standards***
    1. SDG 8 (Decent Work and Economic Growth)

- ***Provisions on environmental protection and climate change***
    1. SDG 6 (Clean Water and Sanitation)
    2. SDG 7 (Affordable and Clean Energy)
    3. SDG 13 (Climate Action)
    4. SDG 14 (Life Below Water)
    5. SDG 15 (Life on Land).

- ***Provisions on democracy, human rights, gender equality***
    1. SDG 16 (Peace, Justice and Strong Institutions)
    2. SDG 5 (Gender Equality)

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Background: Deep Trade Agreements

- Concerns about usefulness of these non-economic provisions due to the general lack of enforceability (exception: human rights) or enforcement.

- Fast growing literature on both their economic and non-economic effects. [Francois et al. (2022), Di Ubaldo and Gasiorek (2022), Brandi et al (2020), Abman et. al (2021)]

- **Question and Approach**
  - Assess the impact of SDG-related PTA provisions, by linking specific provisions to SDG indicators.
  - Focus of presentation is on *environmental* SDG indicators
  - Two approaches for now
    a. Panel Fixed Effects estimator with 'continuous' trade policy variables
    b. Synthetic Diff-in-Diff with binary treatment variable

Data on Environmental Provisions in PTAs

Trade and Environment Database (TREND) by Morin et al. (2018)

- Based on 630 PTAs signed between 1948 and 2018.

- PTA list from Design of Trade Agreements Database (Dur et al., 2014).

- Manual coding of environmental norms in PTAs (0/1 coding).

- Final data - 14 broad areas, 308 environmental norms

- More detailed about specific environmental norms than other data sets such as World bank Deep Trade Agreements.

- Example;   Specific norm on water efficiency

  1. *CARIFORUM EC EPA, art. 138(2)(a): "The Parties agree to cooperate […] in the following areas: (a) projects related to environmentally-friendly products […], including those related to appropriate water-saving."*

  2. *China-Peru, art. 164: "to promote sustainable rural development through […] projects in areas of mutual interest such as: […] the conservation and management of the water resource for agricultural use."*

Environmental Provisions in PTAs

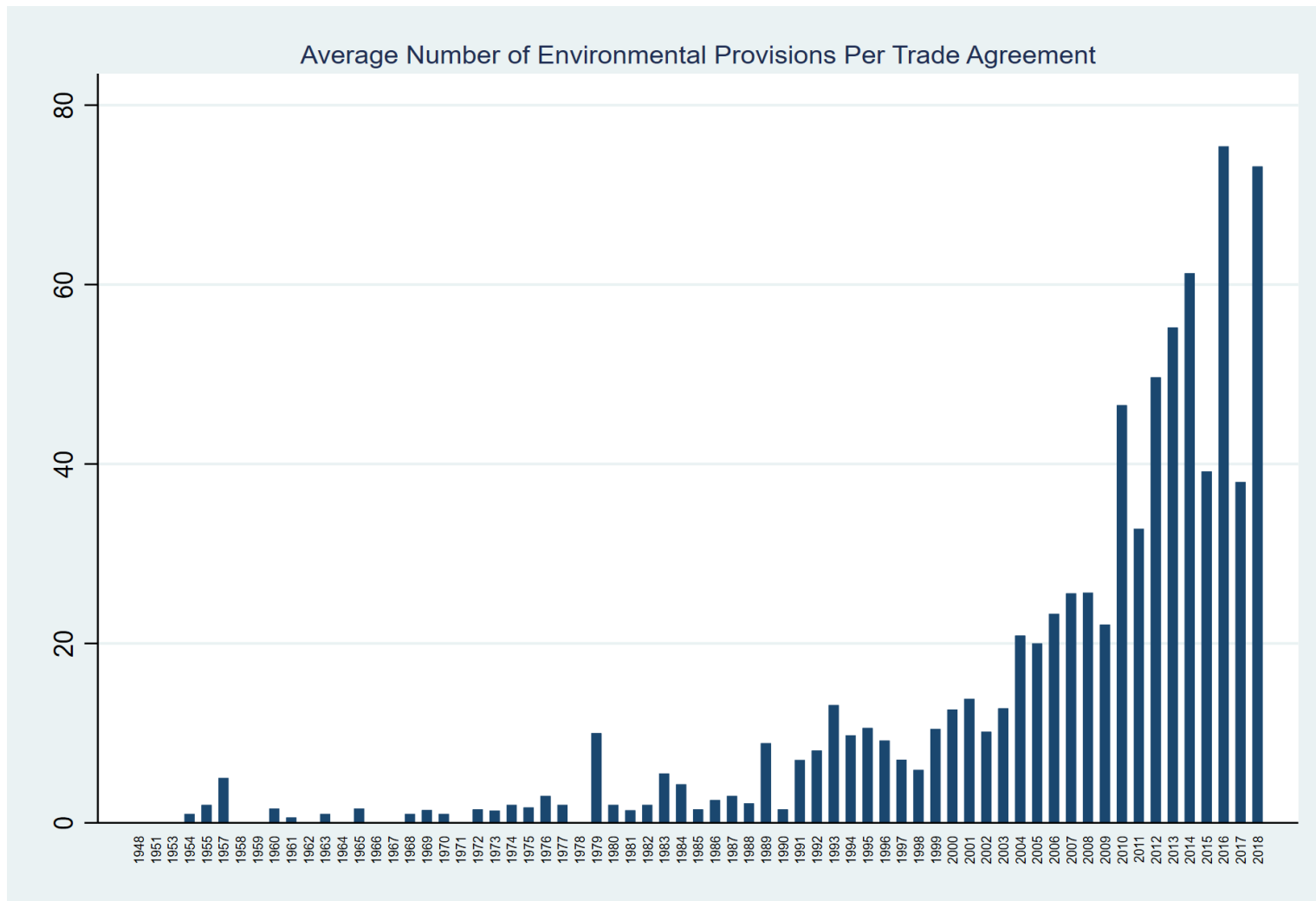Number of Trade Agreements: With and Without Environmental Provisions (EP)
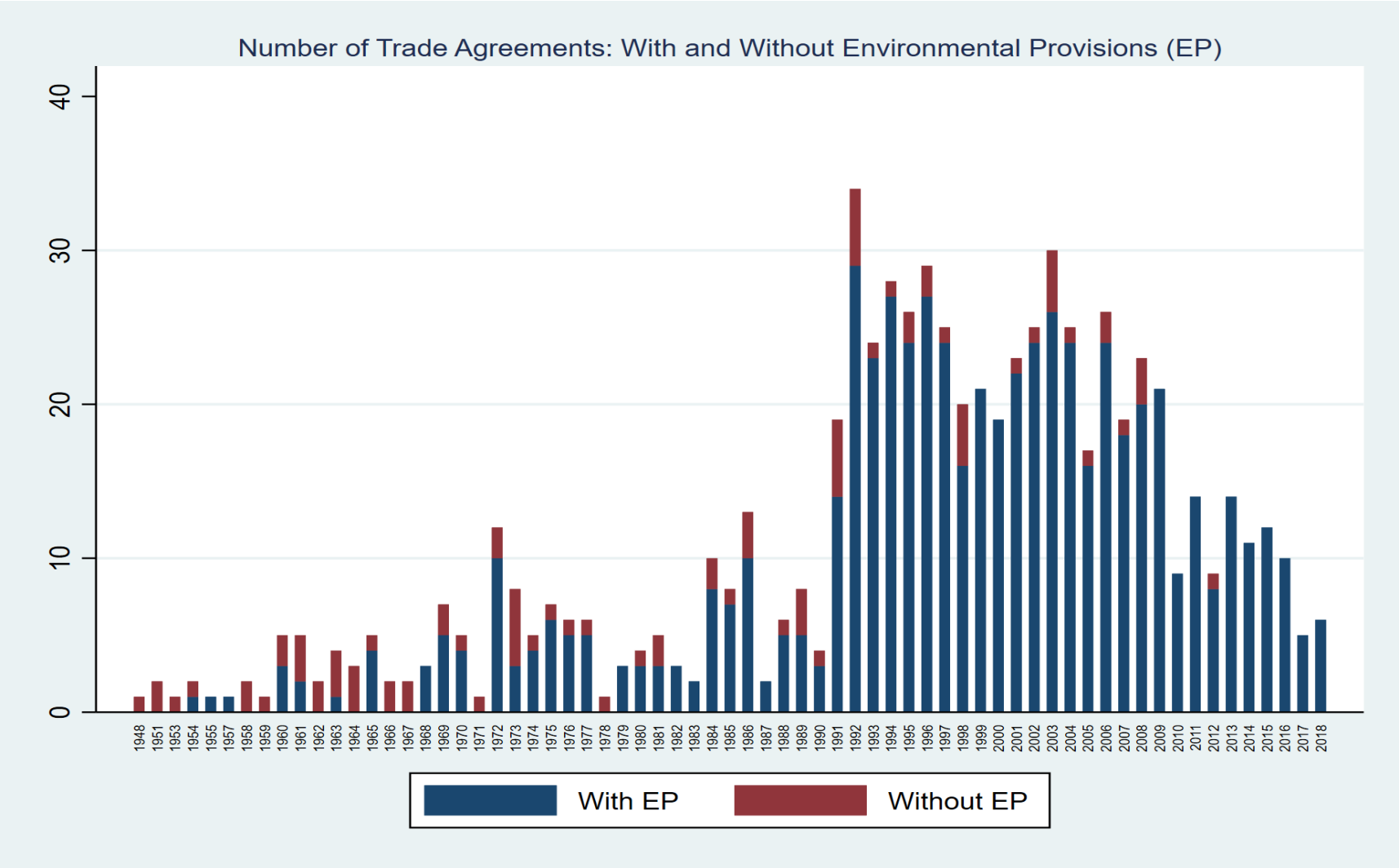
Data Source : TREND

- *Inclusion of EP's in PTA's is not a new thing.*

Environmental Provisions in PTAs

Average Number of Environmental Provisions Per Trade Agreement

Data Source : TREND

- *Rapid increase in the average number of norms per PTA after 1990.*

Data on SDG Indicators

- Sourced from FAO, World Bank (WDI), 2018 Environmental Protection Index.

- Consider SDG indicators that can be affected directly by specific environmental provisions in PTA. Example:
    1. For **SDG 7 (Affordable and clean energy)** we consider 7.2.1 (Renewable energy share of total final energy consumption) but not 7.1.1 (Proportion of population with access to electricity).

- SDG indicators data have lots of missing data:
    1. We restrict our initial analysis to 2000-2018 for fixed effects estimations, to be able to consider more indicators.
    2. For Synthetic-diff-in-diff, focus for now is on indicators with continuous data over feasible time periods.

List of SDG Indicators Used In Analysis

SDG	Description	Indicators
6	**Clean Water and Sanitation**	6.4.1 Total Water Efficiency 6.4.2 Water Stress
7	**Affordable and Clean Energy**	7.2.1 Renewable Energy Share of Total Final Energy Consumption 7.3.1 Energy Efficiency
11	**Sustainable Cities and Communities**	11.6.2 PM2.5 Air pollution
13	**Climate Action**	13.2.2 Total Greenhouse Gas Emissions
14	**Life Below Water**	14.4.1 Fish Stock Status 14.5.1 Marine Protected Areas
15	**Life on Land**	15.1.1 Forest area as % of total land area 15.2.1 Above-ground biomass stock in forest 15.2.1 Proportion of forest area within legally established protected areas 15.5.1 Species Protection Index

- **Red**: Will show results for this presentation

Approach 1: Panel Fixed Effects with 'continuous policy variables'

- For country i at time t, we estimate;

$$SDG_{i,t} = \alpha_i + \alpha_t + \beta \textbf{\textcolor{red}{Pol}}_{i,t-5} + EP_{i,t-5} + X_{it-5} + \varepsilon_{i,t}$$

Where:

- **Pol** : No. of specific SDG-related provisions in PTAs
- EP : No. of environmental provisions in PTAs (overall environmental depth)
- X: Trade as a percentage of GDP

- Policy variables and control variables lagged to allow for adjustment period.

Approach 2: Synthetic Difference-in-Difference (SDID)

- Environmental provisions in PTAs are endogenous due to reverse causality. Countries that have EP in PTA might be more environmentally conscious that those that do not, or vice-versa.

- We employ the synthetic diff-in-diff proposed by Arkhangelsky et. al (2021) which combines features of the synthetic control methods and difference in difference.

- SDID estimator assigns 'appropriate' counterfactual to treated groups by computing units- and time-specific weights:
  1. weights emphasize more similar control units, and balance pre- and post-treatment periods for control units
  2. aim is to satisfy parallel trends assumption, by aligning pre-treatment trends

- Method allows staggered treatment approach which is ideal for this situation.

Synthetic Difference-in-Difference

- The estimator necessitates a balanced panel featuring both pre- and post-treatment periods. Guided by data availability, we use:
- ***Period and Sample***
  - Observation period depends on data availability of outcomes.
  - We allocate 5 years pre-treatment and 5-years post treatment period.
    - Example : An outcome variable with data from 1990-2018 will have as a sample, all countries signing PTAs between 1995-2013.
  - Countries with missing SDG data are dropped.
- ***Treatment:*** Countries signing PTAs featuring a specific SDG-related provision during the treatment period.
- **Additional matching Variables**
  - GDP, Population, GDP per Capita, Trade Openness
- **Caveat: PTAs signed outside the treatment period are not used.**

SDG 6.4.2: Water Stress- Fixed Effects

Table 1: Impact of Specific Provision on Water Stress

	(1)
Management. of Transboundary Water Ways(t-5)	-2.188**
	(1.10)
No.of EP (t-5)	-0.035
	(0.03)
Trade (% of GDP) (t-5)	0.232*
	(0.14)
Constant	50.068***
	(8.44)
Obs.	2112
Groups	165
Adjust. R2	0.008
Time FE	Yes
Country FE	Yes

- .10 ** .05 *** .01. Clustered standard errors in parenthesis.
- **Provisions are continuous**.

SDG 6.4.2: Water Stress- SDID

Table 2: Impact of Specific Provision on Water Stress

Panel A: FE with Indicator Provision	(1)	(2)
Transboundary Waterways	-4.585**	-4.178*
	(2.08)	(2.29)
Constant	40.445***	39.080***
	(1.69)	(4.96)
Obs.	1843	1843
Groups	97	97
Adjust. R2	0.018	0.020
Time FE	Yes	Yes
Country FE	Yes	Yes

Panel B: SDID	(1)	(2)
Transboundary Waterways	-1.910**	-1.714
	(0.92)	(1.44)
Obs.	1843	1843
Groups	97	97
Treated	29	29
Control	68	68

* .10 ** .05 *** .01. Column (1) in both panels excludes controls/matching variables. Controls include GDP, Population, GDP per Capita and Trade(% of GDP).

SDG 7.2.1- Renewable Energy in Energy Mix (%)- FE

Table 3 : Impact of Specific Provisions on Renewable Energy

	(1)
Renewable Energy Production(t-5)	0.978***
	(0.14)
No. of EP (t-5)	0.001
	(0.00)
Trade (% of GDP) (t-5)	-0.001
	(0.01)
Constant	29.786***
	(1.04)
Obs.	2381
Groups	179
Adjust. R2	0.215
Time FE	Yes
Country FE	Yes

* .10 ** .05 *** .01. Clustered standard errors in parenthesis

SDG 7.2.1- Renewable Energy in Energy Mix (%)-SDID

Table 4: Impact of Specific Provisions on Renewable Energy

Panel A: FE with Indicator Provision	(1)	(2)
Renewable Energy Production	0.551	0.560
	(1.10)	(1.06)
Constant	36.678***	35.792***
	(0.79)	(1.49)
Obs.	3625	3625
Groups	125	125
Adjust. R2	0.050	0.127
Time FE	Yes	Yes
Country FE	Yes	Yes

Panel B: SDID	(1)	(2)
Renewable Energy Production	2.637	2.959*
	(1.71)	(1.77)
Obs.	3625	3625
Groups	125	125
Treated	95	95
Control	30	30

* .10 ** .05 *** .01. Column (1) in both panels excludes controls/matching variables.
Controls include GDP, Population, GDP per Capita and Trade(% of GDP).

SDG 13.2.2: Total Greenhouse Gas Emissions -FE

Table 5: Impact of Specific Provisions on Total GHG Emissions

	(1)
Reduction Of GHG Emissions(t-5)	-0.047***
	(0.01)
No. of EP (t-5)	-0.000*
	(0.00)
Trade (% of GDP) (t-5)	0.000
	(0.00)
Constant	10.419***
	(0.05)
Obs.	2325
Groups	175
Adjust. R2	0.320
Time FE	Yes
Country FE	Yes

* .10 ** .05 *** .01. Clustered standard errors in parenthesis.

SDG 13.2.2: Total Greenhouse Gas Emissions -SDID

Table 6: Impact of Specific Provisions on GHG Emissions

Panel A: FE with Indicator Provision	(1)	(2)
GHG Reduction	-0.127***	-0.089**
	(0.04)	(0.04)
Constant	10.267***	10.296***
	(0.04)	(0.07)
Obs.	3596	3596
Groups	124	124
Adjust. R2	0.307	0.344
Time FE	Yes	Yes
Country FE	Yes	Yes
Panel B: SDID	(1)	(2)
GHG Reduction	-0.193***	-0.208***
	(0.03)	(0.04)
Obs.	3596	3596
Groups	124	124
Treated	48	48
Control	76	76

* .10 ** .05 *** .01. Column (1) in both panels excludes controls/matching variables.
Controls include GDP, Population, GDP per Capita and Trade(% of GDP).

SDG 14.4.1: Fish Stock Status-FE

Table 7 : Impact of Specific Provisions on Fish Stock Status

	(1)	(2)
Conservation of fisheries(t-5)	0.458	
	(0.99)	
Prevent Pollution(t-5)		-11.723***
		(3.01)
No. of EP (t-5)	-0.023*	-0.018*
	(0.01)	(0.01)
Trade (% of GDP) (t-5)	0.065	0.067
	(0.06)	(0.06)
Constant	23.774***	36.729***
	(5.14)	(5.69)
Obs.	1029	1029
Groups	106	106
Adjust. R2	0.079	0.086
Time FE	Yes	Yes
Country FE	Yes	Yes

* .10 ** .05 *** .01. Clustered standard errors in parenthesis

Measures the percentage of a country's total catch that come from taxa that are classified as either over-exploited or collapsed.

SDG 14.4.1: Fish Stock Status-SDID

Table 8: Impact of Specific Provisions on Fish Stock Status

Panel A: FE with Indicator Provision	(1)	(2)
Conservation of fisheries	-2.011	-2.257
	(2.24)	(2.32)
Constant	17.366***	13.703***
	(1.60)	(4.73)
Obs.	2050	2050
Groups	82	82
Adjust. R2	0.230	0.236
Time FE	Yes	Yes
Country FE	Yes	Yes

Panel B: SDID	(1)	(2)
	b/se	b/se
Conservation of fisheries	-0.762	0.520
	(3.29)	(2.97)
Obs.	2050	2050
Groups	82	82
Treated		
Control		

* .10 ** .05 *** .01. Column (1) in both panels excludes controls/matching variables. Controls include GDP, Population, GDP per Capita and Trade(% of GDP).

Table 9: Impact of Specific Provisions on Fish Stock Status

Panel A: FE with Indicator Provision	(1)	(2)
Prevent Pollution	3.423	0.747
	(3.71)	(4.55)
Constant	17.366***	13.647**
	(1.58)	(5.17)
Obs.	2050	2050
Groups	82	82
Adjust. R2	0.230	0.234
Time FE	Yes	Yes
Country FE	Yes	Yes

Panel B: SDID	(1)	(2)
Prevent Pollution	7.047**	5.462
	(3.34)	(3.83)
Obs.	2050	2050
Groups	82	82
Treated	14	14
Control	68	68

* .10 ** .05 *** .01. Column (1) in both panels excludes controls/matching variables. Controls include GDP, Population, GDP per Capita and Trade(% of GDP).

Conclusion

- This study estimates the impact of environmental provisions in PTAs on environmental SDG indicators.

- We present results based on two approaches: Fixed effects with continuous policy variable and synthetic difference-in-difference (with indicator policy variable).

- We find heterogenous effects across SDG indicators with provisions on reducing Greenhouse gas emissions showing the most consistent negative effects across estimation methods.

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Appendix