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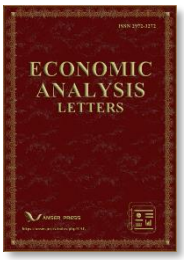

Are greener RTAs reducing "dirty" exports?

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ABSTRACT

We examine the impact of environmental provisions in regional trade agreements (RTAs) on the environmentally harmful exports. Results show that environmental clauses in RTAs help reduce "dirty" exports, whereas RTA depth promotes exports. The exporting country may divert its polluting exports to its trading partner if it faces more environmental provisions with other countries.

KEYWORDS

Regional trade agreements; environmental provisions; gravity model; trade diversion

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1. Introduction

Regional trade agreements (RTAs) have increased in number and depth over the last quarter-century. In contrast to traditional RTAs targeting at tariff reduction, deep trade agreements (DTAs) cover more behind-the-border policy areas, such as environmental regulations, competition policy, and intellectual property rights. The proliferation of RTAs has facilitated and promoted international trade in general (Mattoo et al., 2020; Dhingra et al., 2021). The provisions of RTAs, however, are becoming more diverse and extensive. The net impact of area-specific provisions on trade flows is still being studied, which has more implications for trade agreement design.

As RTAs are becoming greener, we revisit the trade effects of environmental provisions in RTAs. Environmental provisions address a wide range of environmental challenges, including restricting deforestation, safeguarding fish stocks, eliminating hazardous waste, and lowering CO2 emissions. According to recent studies, incorporating environmental clauses in RTAs can improve overall environmental performance (Baghdadi et al., 2013; Bastiaens and Postnikov, 2017). In contrast, little is known about the impact of DTA environmental provisions on trade flows. Two rare exceptions provide mixed results. According to Berger et al. (2020), environmental provisions in RTAs have a detrimental impact on trade flows, with developing countries being more strongly suppressed. Brandi et al. (2020) investigates the impact of environmental provisions on the composition of developing-country exports. They find that environmental provisions depress dirty exports while promoting green exports from developing countries.

Our study is closely related to these two papers but adds some new evidence. First, existing studies ignore the trade diversion effect of DTAs. One country's exports performance is not only subject to the environmental provisions in the RTAs signed with a trading partner but also affected by other countries. In such circumstances, we must consider both trade diversion and trade creation effects of the DTAs. Second, rather than the dirty exports share discussed by Brandi et al. (2020), we focus on the bilateral trade flows of polluting industries. Bilateral trade flows are more appropriate in the gravity model because environmental provisions affect both exports and imports. Third, we study the heterogeneous effect of the environmental provisions on trading partners with different development levels. Overall, we find that DTAs increase dirty exports while including environmental provisions help reduce polluting exports.

2. Data

We obtain bilateral trade data at the HS 6-digit level from CEPII's BACI database between 1995 and 2017. We use Low's and Yeats' (1992) approach to classify environmentally harmful industries, which has been used widely. Polluting industries are those that incur the highest level of pollution abatement and control costs, such as steel, cement, or chemicals. The DTAs database 2.0, compiled by Mattoo et al. (2020), contains detailed information on the content of a subset of eighteen policy areas including environmental provisions. It is a set of 283 agreements notified to the World Trade Organization (WTO) between 1958 and 2017. The WTO's RTA Database contains the majority of the data on regional trade agreements. Given the data availability, we finally have a panel dataset covering 176 countries from 1995 to 2017 for estimation.

3. Empirical specification

We conduct our investigation by embedding the variables of trade agreements between trading partners in an augmented gravity model of international trade. The following is our baseline regression equation:

$$DEX_{ij,t} = exp\left[\beta_0 + \beta_1 RTA_{ij,t} + \beta_2 DEPTH_{ij,t} + \beta_3 ENV_{ij,t} + \theta_{i,t} + \gamma_{j,t} + \mu_{ij}\right] + \epsilon_{ij,t} \quad (1)$$

The dependent variable $DEX_{ij,t}$ is dirty exports from country i to j at time t. $RTA_{ij,t}$ is a dummy variable

capturing the presence of an RTA between partners i and j at time t. $DEPTH_{ij,t}$ captures the effect of the overall depth of a trade agreement rather than the environmental provisions. The key variable of our interest, $ENV_{ij,t}$, is the maximum number of environmental provisions in DTAs between a pair of countries. The variables of DTA depth are normalized between 0 and 1. We assume that more environmental provisions would reduce dirty exports. To precisely estimate the gravity model, we run a fully saturated gravity model with bilateral fixed effects (μ_{ij}), time-varying exporter fixed effects ($\theta_{i,t}$), and importer fixed effects ($\gamma_{j,t}$). [1]

A limitation of previous work only estimating Equation (1) is that they did not consider trade diversion effects of DTAs. Hence, following Mattoo et al. (2017) and Dai et al. (2014), we augment Equation (1) to include the other two variables, $otherENVI_{i,-j,t}$ and $otherENVJ_{-i,j,t}$, which capture the overall impact of environmental provisions with other countries. Specifically, they are defined as follows:

$$otherENVI_{i,-j,t} = \frac{\sum_m X_{im(1995-1997)} ENV_{im,t}}{\sum_m X_{im(1995-1997)}}, m \neq i \tag{2}$$

$$otherENVJ_{-i,j,t} = \frac{\sum_n M_{nj(1995-1997)} ENV_{nj,t}}{\sum_n M_{nj(1995-1997)}}, n \neq i \tag{3}$$

where $otherENVI_{i,-j,t}$ is calculated for any country pair by taking the exports weighted average of $i's$ environmental depth vis-à-vis all countries except j. Similarly, $otherENVJ_{-i,j,t}$ is the imports weighted average of $j's$ environmental depth vis-à-vis all countries except i. Intuitively, if country i faces more restrictive environmental provisions with other trading partners, we would expect country i to increase dirty exports to country j. Similarly, if j signs agreements with more environmental clauses in the DTAs, it should have an impact on its imports from country i.

Then, Equation (1) becomes:

$$DEX_{ij,t} = exp\begin{bmatrix}\beta_0 + \beta_1 RTA_{ij,t} + \beta_2 DEPTH_{ij,t} + \beta_3 ENV_{ij,t} + \beta_4 \\ otherENVI_{i,-j,t} + \beta_5 otherENVJ_{-i,j,t} + \theta_{i,t} + \gamma_{j,t} + \mu_{ij}\end{bmatrix} + \epsilon_{ij,t} \tag{4}$$

We run all equations through Poisson Pseudo Maximum Likelihood (PPML) estimation, proposed by Santos Silva and Tenreyro (2006), to account for censoring and heteroskedasticity in trade data.

4. Empirical results

We begin by estimating Equation (1) for the entire panel. Table 1 displays the results. Column (1) contains only an RTA dummy variable, as in traditional regressions. The positive and significant RTA coefficient implies that country-pairs with "shallow" trade agreements trade more dirty goods than those without RTAs. We capture the trade effect of variations in overall depth of the DTAs in column (2) by excluding environmental provisions. The estimated coefficient of $DEPTH$ is positive and statistically distinct from zero at the 5% significance level, indicating that the depth of a DTA without environmental provisions encourages trade flows of environmentally harmful products. We include the ENV variable in column (3) to investigate how environmental provisions affects environmentally harmful trade flows. The estimated coefficient of ENV is significantly negative, indicating that including environmental provisions can help reduce dirty exports.

As criticized by Cheng and Wall (2005), fixed effects estimations may not appropriate for the data pooled over consecutive years since the dependent and independent variables cannot fully adjust in a single year's time. Therefore, we conduct a robustness check by using nonconsecutive data with 1-, 2-, 3- and 4-year intervals. The results reported in the Online Appendix are very similar with our baseline results.

[1] According to Baier and Bergstrand (2007), a set of country-pair fixed effects are helpful to address RTA endogeneity.

Table 1. The effect of environmental provisions on dirty exports.

Variables	(1)	(2)	(3)
RTA	0.093***	0.050**	0.047**
	(0.013)	(0.024)	(0.023)
$DEPTH$		0.111**	0.222***
		(0.048)	(0.064)
ENV			-0.119**
			(0.054)
Observations	478,954	478,954	478,954

*Notes: A full set of fixed effects ($i \times j$, $i \times t$, $j \times t$) is included in all regressions. Robust standard errors clustered by country pair are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.*

Next, we examine the effects of environmental provisions separately for whether the exporter and the importer are developed or developing economies. The estimated coefficients of ENV in Table 2 show that the negative effect of environmental provisions on dirty exports occurs across different groups of countries except for those exporting from developing to developed economies. One possible explanation is that developed countries initially have tighter environmental regulations and developing countries face little changes when they export to their developed RTA members.

Table 2. Effect of environmental provisions in DTAs in relation to the level of development of trading partners.

Variables	(1) North-North	(2) North-South	(3) South-North	(4) South-South
RTA	-0.469***	-0.088*	0.004	0.060*
	(0.090)	(0.046)	(0.043)	(0.033)
$DEPTH$	1.634***	0.600***	0.065	0.427***
	(0.258)	(0.141)	(0.129)	(0.097)
ENV	-1.255***	-0.321***	0.151	-0.357***
	(0.176)	(0.105)	(0.107)	(0.104)
Observations	27,876	99,000	94,492	257,428

*Notes: A full set of fixed effects ($i \times j$, $i \times t$, $j \times t$) is included in all regressions. Robust standard errors clustered by country pair are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.*

Furthermore, dirty trade flows between specific country-pairs are subject not just to environmental restrictions between these two countries, but also to additional environmental norms with other countries. Hence, we estimate Equation (4) and provide the results in Table 3. The estimated coefficients of the key regressor, ENV, remain significantly negative across regressions, demonstrating that environmental regulations help reduce dirty exports. Nevertheless, the estimated coefficient of $otherENVI$ is positive and statistically significant in column (1). This finding implies that, in the face of increasingly stringent environmental restrictions with other countries, country i may export more polluting items to country j. Meanwhile, we find such effect does not exist for importing countries since the estimated coefficient of $otherENVJ$ is insignificant in column (2). This finding is confirmed again when we combine $otherENVI$ and $otherENVJ$ in Column (3).

5. Conclusion

This article contributes to the trade effect of DTA environmental provisions. We find that traditional RTAs and the depth of DTAs promote bilateral trade between members in terms of dirty products, while including environmental provisions in the RTAs can help reduce environmentally harmful exports. However, one country would divert its dirty exports to the importing country if it were imposed more stringent environmental standards by other countries. A careful policy implication is that incorporating environmental provisions in the DTAs could be beneficial and feasible if the country's goal is to foster the green transition through regional trade liberalization. But

Table 3. The trade diversion effect of environmental provisions on dirty exports.

Variables	(1)	(2)	(3)
RTA	0.071***	0.070***	0.071***
	(0.026)	(0.026)	(0.026)
$DEPTH$	0.236***	0.243***	0.237***
	(0.067)	(0.067)	(0.067)
ENV	-0.135**	-0.178***	-0.145***
	(0.056)	(0.056)	(0.056)
$otherENVI$	0.008***		0.008***
	(0.002)		(0.002)
$otherENVJ$		-0.003	-0.002
		(0.002)	(0.002)
Observations	370,691	370,691	370,691

*Notes: A full set of fixed effects ($i \times j$, $i \times t$, $j \times t$) is included in all regressions. Robust standard errors clustered by country pair are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.*

the country should address the non-discriminatory nature of environmental provisions when developing the networks of RTAs based on the diversion effect of the deep trade agreement.

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Conflict of interest

The authors claim that the manuscript is completely original. The authors declare no conflict of interest.

Appendix

A 1. Baseline results using nonconsecutive years data.

Variables	(1) 1-year intervals	(2) 2-year intervals	(3) 3-year intervals	(4) 4-year intervals
RTA	0.062**	0.083**	0.046	0.062
	(0.030)	(0.036)	(0.041)	(0.041)
$DEPTH$	0.227***	0.275***	0.295**	0.302**
	(0.086)	(0.105)	(0.121)	(0.126)
ENV	-0.167**	-0.225***	-0.190*	-0.278***
	(0.072)	(0.086)	(0.097)	(0.098)
Observations	242,461	158,610	117,669	96,033

*Notes: A full set of fixed effects ($i \times j$, $i \times t$, $j \times t$) is included in all regressions. Robust standard errors clustered by country pair are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.*

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