

Impact of environmental regulations and environmental provisions on trade

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The purpose of this paper is to examine how stringent environmental regulations affect international trade flows. We show that national environmental legislation reinforces the impact on trade of environmental provisions in deep trade agreements.

Keywords: International trade, environmental regulations, environmental provisions in trade agreements.

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1. INTRODUCTION

There is a broad consensus (IPCC, 2021) that a huge decarbonization effort is required without delay to avert the detrimental repercussions of rising temperatures and the increasing frequency of climate disasters. While the increase in trade flows is contributing to climate breakdown, trade policy can be used to reduce carbon emissions by means of environmental provisions included in regional trade agreements (RTAs). This paper therefore examines how stringent environmental regulations affect export flows.

The link between trade and environmental quality and the possibility that lax regulations could give rise to environmentally-induced industrial relocation were first analyzed by Grossman and Krueger (1993). One strand of the literature argues that more stringent environmental provisions and environmental laws can lead developed countries to relocate dirty production to developing countries as predicted by the Pollution Haven Hypothesis (PHH). This hypothesis posits that companies may choose to relocate pollution-intensive industries to countries with less strict environmental regulations where low compliance costs give them a competitive advantage, hence creating pollution havens. Another strand of the literature examines the impact of environmental provisions in trade agreements on trade flows. For instance, Brandi *et al.* (2020) show that environmental provisions in RTAs can reduce the share of dirty exports and increase the share of green exports from developing countries, in particular from those with stringent environmental regulations. They argue that a developing country with stricter enforcement mechanisms might have more leeway to adapt its export composition to comply with environmental provisions in RTAs.

Within this frame, we contribute to the literature in two ways. First, we focus on both environmental provisions in RTAs and national environmental legislation to investigate whether more stringent environmental provisions and national environmental laws can be mutually reinforcing. Second, we examine the depth of environmental provisions in RTAs by classifying them according to their enforceability. Methodologically, we estimate a gravity model of trade for a global sample of countries over the period from 2001 to 2015, differentiating between clean, footloose and dirty products. The results of the estimation show

that national environmental legislation strengthens the effect of deep environmental provisions in trade agreements.

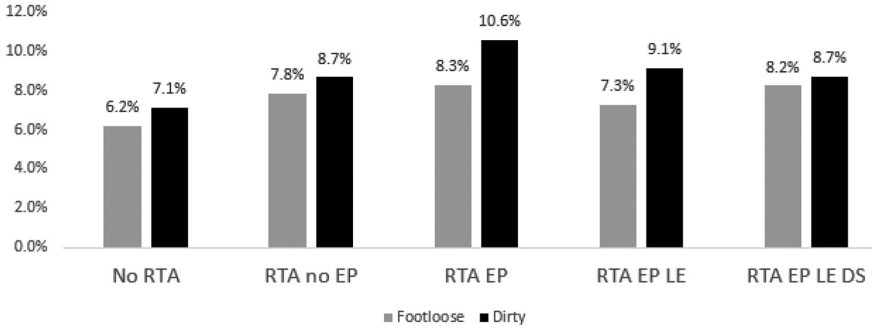
The rest of the paper is organized as follows. Section 2 presents some stylized facts, Section 3 outlines the empirical analysis and presents the results, and Section 4 concludes and discusses some policy implications.

2. TRADE AND ENVIRONMENTAL REGULATIONS

We draw on a number of data sources to examine the impact of environmental regulations on trade. The dependent variable, bilateral trade expressed in thousands of current USD, is obtained from the BACI dataset (CEPII). We differentiate between three groups of products: normal goods, footloose goods and dirty goods. This classification is taken from Martínez-Zarzoso *et al.* (2017) who define dirty goods as those produced by pollution-intensive industries for which incurred pollution abatement and control costs represent more than one percent of total costs (e. g. petroleum products). Footloose industries use very few raw materials and have low transportation costs since they do not need to locate near sources of raw materials (such as chemical materials). Normal goods are those not covered by the first two categories.

The explanatory variables associated with environmental regulations are taken from two sources. The first is the Deep Trade Agreement dataset (World Bank) showing whether a given trade agreement includes any environmental provisions. The database also includes information on the legal enforceability of provisions (Hofmann *et al.*, 2017). The resulting variable takes the value of zero in the case of no agreement, one in the case of an agreement without environmental provisions, two in the case of an agreement with non-enforceable environmental provisions, three if the agreement's environmental provisions are legally binding, and four in the case of legally binding environmental provisions subject to a dispute settlement mechanism. Figure 1 shows that more stringent environmental provisions reduce the share of trade in dirty goods from 10.6% to 9.1% in the case of legally enforceable environmental provisions and to 8.7% when these provisions are also subject to a dispute settlement mechanism. However, the inclusion of provisions that are not legally enforceable (*de jure* only) might not be effective at reducing trade in dirty goods.

Figure 1: *Share of footloose and dirty products in total trade – by agreement depth*



Source: Authors' own calculations. EP denotes Environmental Provisions; LE denotes Legally Enforceable and DS denotes Dispute Settlement.

Indeed, Figure 1 shows that trade in dirty goods represents 8.7% of total trade under RTAs without environmental provisions as opposed to 10.6% for agreements with environmental provisions.

The second source of environmental legislation is *Ecolex*, from which we build a variable for the number of national laws passed by countries over the period covered (in line with Núñez-Rocha and Martínez-Zarzoso, 2018). We focus on laws designed to protect the environment in general or to address energy issues or air and atmospheric concerns. These data show that although environmental treaty numbers rose at lower rates in both OECD and non-OECD countries after the 2000s, national legislation grew exponentially, pointing to the importance of considering national legislation when analyzing impacts on trade flows.

3. EMPIRICAL ANALYSIS AND RESULTS

To examine the effect of environmental regulations on trade, we estimate a gravity model of trade given by:

$$X_{ijkt} = \exp(\alpha_1 EP_{ijt} + \alpha_2 (EP * Type\ of\ product)_{ijkt} + \delta_{ij} + \theta_{ikt} + \theta_{jkt}) * \eta_{ijkt} \quad (1)$$

where X_{ijkt} denotes the level of bilateral exports of product k from exporter i to importer j in year t and EP_{ijt} is a dummy variable taking the value of 1 if the country-pair has an environmental provision for each depth category, and second a variable defining the type of product traded (dirty products, footloose products or default). θ_{ikt} measures exporter-product-time, θ_{jkt} the importer-product-time and δ_{ij} bilateral fixed effects. η_{ijkt} is the idiosyncratic error term. The specified model is estimated using the Poisson Pseudo-Maximum Likelihood estimator (PPML) to take into account zero trade flows and potential heteroscedasticity in the error term (Santos Silva and Tenreyro, 2006). This specification is estimated for different groups of countries and by direction of trade to see whether the enforcement of environmental regulations is affected by the trading countries' level of development.

The second specification includes national legislation as follows:

$$X_{ijkt} = \exp(\alpha_1 EP_{ijt} + \alpha_2 (EP * EL * type\ of\ product)_{ijkt} + \delta_{ij} + \theta_{ikt} + \theta_{jkt}) * \eta_{ijkt} \quad (2)$$

where EL denotes the number of environmental laws at national level. An interaction is introduced between EP and EL to show whether they are substitutes or complementary.

The main results indicate that it is important to consider the heterogeneity of the effects of RTAs on trade in different types of goods (dirty, footloose and normal goods). More specifically, RTAs with EPs increase trade in normal goods by around 5% on average, slightly less than RTAs without EPs. Moreover, in the case of dirty goods (resp. footloose goods), RTAs with EPs reduce trade by 18% (resp. 17%) compared with RTAs with EPs covering normal goods. Differentiating by country group and trade direction, the results show that dirty and footloose export flows from non-OECD to OECD countries decrease when an RTA has legally enforceable EPs subject to dispute settlement.

Results are less robust when interactions between RTA variables and the number of national environmental laws are included. Although not conclusive, the findings suggest that environmental legislation reinforces the effect of EPs in RTAs for exports of dirty and

footloose goods from non-OECD to OECD countries. This also holds for exports of footloose goods from OECD to non-OECD countries.

Finally, our results are robust to different levels of trade data aggregation, to the inclusion of lagged values for the target variables and to specifications with non-linear forms for the environmental regulation variables.

4. CONCLUSION

From a policy perspective, this paper points up a number of relevant considerations. First, the existence of environmental legislation does not necessarily have a concrete, tangible effect on trade flows. Consequently, although the *de jure* dimension is necessary, it is not sufficient. Thus, making laws legally enforceable internationally and subject to a dispute settlement mechanism—the *de facto* dimension—should make them more effective. Second, in the case of developing countries, there is still a long way to go before environmental provisions can be effectively enforced. While most trade agreements with such provisions have been proposed by advanced economies to protect against the PH Hypothesis, many developing countries do not have the capacities to enforce the international laws. Therefore, international efforts need to be rounded out by national laws. Indeed, our findings indicate that national environmental legislation could reinforce the impact of environmental provisions in trade agreements on the reduction in trade in dirty goods, especially for developing countries.

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