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Impact of Trade and Sustainable Development (TSD) chapters in the free trade agreements of the EU on its imports of environmental goods

A gravity model analysis

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Author: Vladislav Kaim

Supervisor: Karin Olofsdotter

Abstract

Sustainable development agenda in general and environmental considerations in particular have become deeply embedded into the ways the public and decision makers are thinking about trade policy. European Union, while not being the very first adopter of ambitious policies on this front as part of its free trade agreements (FTAs), has emerged throughout the 2010s as the most consistent one. From the signing of the EU – Korea FTA in 2011, Trade and Sustainable Development (TSD) chapter has been part of most FTAs coming after. It is argued that its effects on imports of environmental goods from the countries that entered into these agreements with the EU can vary. The Porter hypothesis, which emphasizes the role of environmental regulations in increasing innovation and productivity, leads to assuming that imports to the EU will increase. The pollution heaven hypothesis focuses on the issue of outsourcing of 'dirty' production in countries with weak regulations, in which case TSD chapters will serve more as a tool to reign in these imports rather than facilitate the green ones. A gravity model analysis is performed across all EU trade partners, 54 environmental goods and 10 years (2010-2019) to examine how TSD chapters and environmental regulations in FTAs with TSD impact imports of green goods by the EU member countries. The results demonstrate that largely it is positive but not consistently statistically significant, with increases in imports upward correlated with the income status of exporting countries. This essay also lays out potential explanations for this outcome and how it can influence future research on the topic.

Key words: *international trade, sustainability, trade and environment, European Union, environmental goods.*

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I dedicate this master essay to my grandmother, Raisa Kaim, who brought me up and shaped my personality in multiple ways but would not be able to see me graduate due to succumbing to COVID-19 last May. I would never be able to go so far without you.

Contents

I Introduction

International efforts to combat climate change and ensure sustainable global economic development have dramatically intensified over the last decade. 2015 has been an especially pivotal year in this regard, with the United Nations General Assembly (UNGA) adopting the Sustainable Development Goals (SDGs) until 2030 and parties to the UN Framework Convention on Climate Change (UNFCCC) adopting Paris Agreement on Climate at their 21st conference (COP21) in Paris. Nevertheless, the share of SDGs that are on track to be achieved by 2030 is by no means guaranteed to exceed that of their predecessors, Millennium Development Goals (MDGs), nor have the global emissions started abating, even taking the consequences of the COVID-19 pandemic into account.

A growing attention has been paid towards factors and sectors that have contributed towards current precarious climate situation, with aviation, shipping and international trade singled out. The latter has been a subject of an intense academic scrutiny over the years when it comes to 'carbon leakage' – a phenomenon characterized by richer countries offshoring carbon intensive production to the countries with more lax environmental regulations and importing said goods from there. Thus, under conventional carbon accounting methodology that emphasizes territoriality and no agreed global floor carbon price[1], one can come out formally 'clean'.

However, thanks to multiple efforts of various scientists, activists and diplomats, the contribution of the international trade to the climate crisis has become a topic of a wide discussion. Unfortunately, there are still few multilateral mechanisms that can institutionalize it and bring forward a binding global agreement on the matter. World Trade Organization (WTO) has been a universally mechanism for that, but negotiations on the Green Goods Agreement are stalling, like many other matters from the Doha Development Round, nor is the impasse at the Appellate Body solved. Newly appointed Director General of the WTO Ngozi Okonjo-Iweala vowed to make trade and

[1] This issue, together with the matter of global carbon markets and Kyoto credits, is part of the ongoing negotiations for finalizing the Rulebook for the Article 6 of Paris Agreement. Talks are expected to continue at least through COP26.

sustainability an important part of her agenda, but her ambition will need to be weighed against the interests of the member states (World Trade Organization, 2021).

In this situation, main onus is put on the most important global trading powers to act by example. European Union (EU) is the actor that demonstrates the greatest determination to become a global sustainability powerhouse. As an international trade actor with a massive presence, it recognized the trade and environment linkage in its recently adopted EU Climate Law, which contains an instruction to the European Commission (EC) to present a framework for a Carbon Border Adjustment Mechanism (CBAM) throughout this year to tackle carbon leakage in a way compatible with the WTO rulebook (European Parliament, 2021).

However, the upcoming CBAM is not the only instrument the EU has been able to leverage to steer its trade policy toward sustainability. For more than a decade already nearly every new preferential trade agreement (PTA) concluded by the EU contains a Trade and Sustainable Development chapter (TSD), the latest example being EU-Vietnam Free Trade Agreement, applied from 2020. It has signified an era of new, more stringent environmental and other (e.g., labor) standards in trade with developing and developed (Canada, Japan, Singapore) actors alike. Despite the growing importance of this instrument over the 2010s, the analysis of how the presence of TSD in a PTA 'greened' the EU imports has not so far been sufficient.

Thus, this work aims to research whether the imports of 'green' (or environmental) goods to the EU from countries that have a TSD in their PTAs with the bloc have grown by employing a gravity model-like framework using OLS, Poisson and fixed effects specifications. It covers the time period of 2010-2019, EU-27 countries as reporters and all non-EU-27 states as partners, and covers import flows of 54 environmental goods, and provides an additional breakdown of the results by income level of the partner countries.[2] As the use of TSD chapters will not recede in the upcoming PTAs that the EU is still

[2] Croatia, which became an EU member on 1 July 2013, is listed as a partner country in the model for the 2010-2012 period, and as a reporter country from 2013 onwards.

negotiating and with the CBAM entering the fray, it is important to take a look back and assess the effects of the previous period of application.

This thesis proceeds as follows. Chapter 2 is focused on reviewing the scholarship on the issues trade-environment and trade-sustainability nexuses. Chapter 3 analyzes the role, functioning and shortcomings of the TSD chapters in the PTAs of the EU. Chapter 4 summarizes theoretical and empirical knowledge accumulated in gravity models of international trade, with particular attention to the period following the publication of the seminal paper by Anderson and Van Wincoop (2003). Chapter 5 presents the regression model, sources of data and all its specifications. Chapter 6 is dedicated to the discussion of the results obtained. Chapter 7 concludes.

II Trade-sustainability nexus: a review

Conceptualization and empirical analysis of the underlying tensions between considerations driving sustainability and international trade are subjects that have enjoyed grown attention in the literature. Jimenez-Almazan et al. (2020) in their bibliometric and cluster analysis of the use of these terms in the Web of Science demonstrate their increased interrelatedness but their key characteristics are usually opposite. The trend has not changed with the significant increase in yearly numbers of publications on these topics, from 10 in 2007 to circa 160 in 2019 (Jimenez-Almazan et al., 2020, p. 6). Topics and keywords that seem to be enjoying the most frequent use in connection to the theme are footprint, land-use, environmental sustainability, industry, economy, greenhouse-gas emissions, corporate social-responsibility, challenges, and politics (Jimenez-Almazan et al., 2020, p. 16). This landscape is a demonstration of a still adversarial context in which terms like trade and sustainability can be used.

At the level of policy outcomes, trade and sustainability are, however, interacting very often and the analysis of both the role of former in fostering the latter and provisions related to enforcing sustainability standards influencing trade is growing. Sectoral research where the impact is analyzed in the industries with the biggest concern for sustainability in trade is a case in point. Houghton and Naughton (2017) dedicate their paper, for example, to the impact of the International Tropical Timber Agreements (ITTAs) as a set of novel international environmental agreements on the exports of tropical timber worldwide. Both ITTAs, signed in 1983 and 1994, have increased sustainability related safeguards on the tropical timber exports and ultimately decreased the trade in it for tropical and non-tropical countries alike, but the losses were offset by increased exports of plywood (from tropical countries) and sawn wood and veneer sheets (from the non-tropical ones). Thus, sustainability related clauses in the sectoral agreements do not ultimately lead to a reduction in trade but rather facilitate a shift in exports within the export categories to more sustainable items (Houghton & Naughton, 2017, p. 770).

Going from certain markets to all trade, research into trade-sustainability and trade-environment nexuses has extensively taken place both on firm and country levels. When it comes to analysis of the carbon intensity of exports at the firm level, their

incentives may not necessarily depend just on the policy environment, but how the output is measured to begin with and how the intermediate outputs are accounted for as well. Dardati and Saygili (2021), using microlevel data from the firms in Chile, show that just using total sales instead of value added as the main measure of output already allows to make exports look cleaner than they are in reality. The effect is compounded by not accounting for the role of intermediate inputs too. Thus, even though exporting firms, as it is known from the Melitz (2003) theory, are the most competitive ones, they are not necessarily as interested in investing in abatement technologies (Dardati & Saygili, 2021, p. 11). This in line with the findings from Cherniwchan (2017) that conclude that increase in resources to invest in abatement does not necessarily lead to lower emissions intensity.

These conclusions have led to an attempt of a broader revision of the concept embedded in the environmental Kuznets curve (EKC), that was stating that after passing a certain threshold in its income per capita, a country will have its emissions start going down. To re-check this hypothesis, Ansari and Khan (2021) conducted a decomposition analysis for 35 high-income, upper and lower middle income Asian countries in order to examine the impact of trade openness on the ecological footprint. Their findings established that the EKC hypothesis is still valid when subjected to the influence of trade policy determinants – trade liberalization leads to fewer emissions in high- and upper middle-income countries and increases them in the lower-income ones (Ansari & Khan, 2021, pp. 9 – 10).

Increasing role of the trade-environment nexus has found its way to be incorporated into general equilibrium models analysis as well. Erdogan (2014) develops such a model based on the new trade theory with random productivities and trade barriers for the OECD member countries. It considers impacts of the terms of trade and two types of environmental harmonization policies. In the case of the OECD countries complete liberalization of trade results in lower levels of environmental pollution, while among harmonization policies uniform pollution taxes provide bigger efficiency gains than quotas (Erdogan, 2014, p. 67).

Within the papers analyzing preferential trade agreements, there is an increasing focus on their design and how it influences not just trade flows, but the levels of environmental protection as well. This has been a logical consequence of the developments in PTAs themselves, as the average number of environmental provisions

there has risen worldwide from near zero in 1990 to 70 in 2018 (Brandi et al., 2020, p. 3). First, the depth of a PTA (i.e., how meaningful is the ensuing liberalization of trade) has impacts on both the trade flows by helping them grow (Dur et al., 2014; Mattoo et al., 2017), but also is associated with a negative impact from the standpoint of the role of environmental provisions (Brandi et al., 2020, pp. 7 – 9).

The growing number of provisions in PTAs since the start of 2010s was primarily driven by the EU with its TSD chapters and stand-alone provisions and annexes that became an integral part of their negotiating mandates, but also found its way into other agreements like Comprehensive and Progressive Trans-Pacific Partnership (CPTPP), United States – Mexico – Canada Agreement (USMCA) and others, with one notable exception – there are no environment or labor chapters in the recently concluded Regional Comprehensive Economic Partnership (RCEP) agreement. These trends have increased the academic scrutiny of their consequences over the evolution of the dynamics in green exports of the developing countries, particularly whether their shares increased as a result (Blumer et al., 2020; Morin et al., 2018; Morin et al., 2019).

The increase in the number of environmental and other sustainability-related provisions cannot be looked at without the growing public sentiment against free trade agreements, which in both developed and developing countries has been spearheaded to a substantial degree by environmental advocacy groups. Thus, Bernauer and Nguyen (2015) indicate, 'greening' PTAs had become an imperative if these agreements were to gather the necessary public and legislative support to enter into force. Moreover, with the signing of the Paris Agreement and Sustainable Development Goals in 2015 it became impossible to ignore the resulting obligations (even though both frameworks are non-binding from the point of view of international law). This led to countries, especially higher-income ones, becoming more forceful in using the issue of higher environmental and other sustainability-related standards as an integral part of diplomatic strategy and practice (Johnson, 2015). As an economic incentive, it at the same time served to increase their competitive advantages in the areas of green exports through striving to maximally reduce and, where possible, eliminate regulatory divergence in the field (George, 2014). Thus, it is not unreasonable to take protectionist impulse as the main hypothesis for rise in the role and number of environmental provisions in the PTAs – a point anchored in the

literature not only in the recent years, but before as well (Ederington & Minier, 2004; Lechner, 2016).

Quantitative estimations of the impacts of environmental provisions over overall trade flows have started becoming more prevalent, with the most recent and thorough being the analysis undertaken by Berger et al. (2020). Brandi et al. (2020) switched the focus to researching the role of the environmental provisions in the share of green and dirty exports of the developing countries including providing a breakdown by type of the environmental provisions (restrictive/liberal). They conclude that the increasing total number of environmental provisions in a PTA ultimately leads to an increasing share of green exports and a decrease in the share of the dirty ones. The authors thus consider that the Porter hypothesis, which emphasizes that environmental regulations are not undermining competitiveness but rather either cover the compliance costs through new benefits ("weak" hypothesis) or are outright increasing it ("strong" hypothesis; see Prakash and Potoski (2006) on the case for it through the diffusion of relevant technologies) through greater incentives to innovate (Porter and van der Linde, 1995), has more empirical weight that the pollution than the pollution haven hypothesis by Copeland and Taylor (1994). Brandi et al. (2019) have also found an empirical causal link between the number of environmental provisions in PTAs and more ambitious domestic environmental legislation. Thus, Brandi et al. (2019) and Brandi et al. (2020) have contributed to an ongoing shift in literature from emphasizing predominantly risks of concentration of conventionally dirty production in pollution havens to the benefits of 'greened' PTAs for those same developing countries that were otherwise considered basket case for the Copeland and Taylor's (1994) hypothesis.

However, one should exercise caution in completely withdrawing recognition from it as the carbon content of imports to the developed countries has been on the rise (Aichele and Felbermayr, 2015). Moreover, Kolcava et al. (2019) shows that developing countries entering PTAs with environmental provisions can anyway increase the carbon content of their exports. When it comes to a more critical look on the role and implications of the Porter hypothesis in this context, somewhat firm empirical evidence for the idea came only in the part of the impact on innovation (Johnstone et al., 2012), but not competitiveness (Dechezlepretre and Sato, 2017). It indicates that further research will be more focused on dissecting which environmental provisions are helping to green the

existing exports and facilitate green trade creation and which are just doing more harm than good. Thus, it is imperative for the relevant provisions in the PTAs to be both truly progressive in nature and have strong enforcement mechanisms. East Asian countries, many of which were considered primary protagonists of the pollution heaven hypothesis, have significantly increased the environmental content of their PTAs, with the greatest upgrades made by South Korea and the weakest by China (Koo & Kim, 2018, pp. 403 – 404). However, it has been the EU that has taken a consistent leadership in the greening process, and at the time the Deep and Comprehensive Free Trade Agreements (DCFTAs) it has signed with Georgia and Moldova were among the global leaders by the number of strong environmental provisions enshrined in them (Brandi et al., 2020, p. 4; TREND, introduced by Morin et al. (2018).

III TSD chapters in trade agreements of the EU

Since the very adoption of the SDGs, the EU law has required that sustainability be embedded in all its policies, including trade. Economic development of countries trade agreements with which are to be concluded is required to go hand in hand with social justice, respect for human rights, high labor and environmental standards. According to the European Commission (2021), modern rules on trade and sustainable development in the PTAs require the EU and its trade partners to:

a) "Follow international labor standards and agreements;
b) Effectively enforce their labor and environmental laws;
c) Not deviate from environmental and labor laws to encourage trade and investment, thereby preventing a 'race to the bottom';
d) Sustainably trade natural resources, such as timber and fish;
e) Combat illegal trade in endangered species of fauna and flora;
f) Encourage trade that supports tackling climate change;
g) Promote practices such as corporate social responsibility;
h) Promote sustainable public procurement;
i) Remove barriers to trade and investment in renewable energy".

Table 1 provides an overview of the countries and blocs whom the EU has an FTA with a TSD chapter with, both in cases where it is already in force (including provisional application) and where the agreement has been reached but is pending ratification. Geographically these trade partners are predominantly concentrated in Eastern Europe, Indo-Pacific region, and the Americas. It is also expected that other current negotiations that the EU is holding on prospective FTAs (e.g., with Australia, New Zealand, Gulf Cooperation Council) will reflect its growing tough stance on abiding by high standards in the trade-sustainability nexus.

Table 1. Countries and blocs with FTAs with the EU containing a TSD

Country/bloc	*Year of signing*	*Year of entering in application*
Canada	2015	2017
Central America	2012	2013
Colombia, Peru and Ecuador	2012*, 2016**	2013*, 2017**
Georgia	2014	2016
Japan	2018	2019
Mercosur	2019	-
Mexico	2018	-
Moldova	2014	2016
Singapore	2018	2019
South Korea	2011	2015
Ukraine	2014	2016
Vietnam	2019	2020

*for Colombia and Peru; **for Ecuador. Source: DG Trade, European Commission.

When it comes to the environmental protection facet in the TSDs, the EU is primarily focused on enshrining the key provisions of multilateral environmental agreements into them, as well as working with 16 partners in the WTO to conclude an encompassing an Environmental Goods Agreement. Apart from the Paris Agreement, UN Framework Convention on Climate Change (UNFCCC) and Kyoto Protocol, the following agreements and protocols are mandated for partners to follow in a TSD chapter (European Commission, 2021):

a) Convention on International Trade in Endangered Species of Wild Fauna and Flora;
b) Montreal Protocol on ozone layer protection;
c) The Convention on Biological Diversity;
d) Stockholm Convention on persistent organic pollutants;

e) Rotterdam Convention on international trade in hazardous chemicals and pesticides;
f) Basel Convention on hazardous waste movement and disposal.

Moreover, compliance with the agreements is required not only to conclude FTAs, but also for being eligible for GSP+ trade preferences scheme. For the FTAs, Sustainability Impact Assessments are conducted for each case prior to the commencement of the negotiations. As it was shown in the Chapter 2, it is not uncommon to enter into special agreements focused on regulating sustainable timber trade. The EU has concluded some of such accords, known in the bloc as Forest Law Enforcement Governance (FLEG) and Trade Voluntary Partnership Agreements.

In other aspects of sustainability, such as human and labor rights, the focus of TSD chapters in the FTAs of the EU is on ensuring freedom of association and collective bargaining, abolishing all forms of workplace discrimination, compulsory, and child labor, as well as high compliance with the standards set by the International Labor Organization in the fields of workers' rights, industrial security etc. While this facet of TSD is not a subject of a more intense scrutiny in this research, it is worth mentioning that labor standards have become a point that is growing fast in importance for the EU trade policy even when a country does not have an FTA with it. As an example of that, one can point at recent stripping of GSP+ preferences from Cambodia, or an earlier launch of the Bangladesh Sustainability Compact that followed the 2013 Rana Plaza tragedy where 1100 workers died when a garment factory building collapsed. Responsible business facet of the TSD is required largely to take the issues mentioned above into account and abide by the international rules on certain supply chain related aspects, e.g., conflict minerals.

Monitoring of the TSD compliance in the FTAs is multilayered in the EU processes. Member states have the right to be briefed on the developments in this field by the Trade and Sustainable Development expert group. In majority of FTAs with a TSD, there is a clause mandating the creation of the dedicated civil society advisory groups that represent environmental, labor and business interests, functioning under the auspices of the European Economic and Social Committee (EESC). As trade agreements are the competence of both the Union and the member states and the European Parliament must

vote for an FTA to enter into force, MEPs are often demonstrating an avid interest in the TSD related aspects and give them a special scrutiny.

European Commission has been focused on facilitating further improvements of the TSD chapter mechanism, and after its outreach to various stakeholders in the process, it published a non-paper (European Commission, 2018) with 15 proposals on improving the TSD implementation. Points focused on the need for substantial improvements particularly concerned climate change, space for meaningful engagement of civil society, and availability of resources for implementing the TSD chapters. Proposals are structured in four pillars: working together; enabling civil society; delivering; and transparency and communication. The first one emphasizes the need for the executive arm of the EU to increase their cooperation with the Parliament, member states, ILO, and secretariats of the respective multilateral environmental agreements. The second pillar is focused on increasing the role of civil society as a monitor of responsible business practices. Third indicates spheres in which enforcement of TSD and its specific aspects can be improved at national and international level, including through encouraging early adoption of core conventions. The transparency pillar recommendations provide more detail on how TSD submissions can be handled better and acted upon faster.

The body of academic literature and official expertise on the effectiveness and implementation of the TSD chapters in the FTAs of the EU has started forming in the last years but is still quite small due to the recency of TSD emerging as an important trade mechanism. However, the existing scholarship demonstrates a versatile field of interests emerging in the TSD analysis. Gammage (2018) pays special attention in her article to extraterritorial obligations resulting from TSD related human rights and social clauses. Recent precedents set by the EU Court of Justice produce obligation for the European Commission to make sure that the Union engages in 'development-friendly trade' (Gammage, 2018, pp. 15 – 16). However, the determination of whether this duty is 'weak' or 'strong' is lacking (Gammage, 2018, p. 19). Harrison et al. (2019) research whether TSD chapters are having a positive and tangible impact on labor rights using interviews in Canada, Moldova, and Caribbean countries. They determine that while on the surface TSD chapters improve the labor standards, the enforcement is continually weak and still deferential towards the partner countries (Harrison et al., 2019, pp. 273 – 274). Hradilova and Svoboda (2018) express the same concern about the enforceability of the measures

provided in the TSD chapters and show using a US – Guatemala case that a sanctions-based enforcement approach might not have high chances of achieving desired outcomes. Thus, the authors conclude, EU focus on supervision and capacity building is warranted but there is much more to be done to increase their effectiveness, as the experience of the EU – Korea FTA demonstrates (Hradilova & Svoboda, 2018, p. 1038). McNeill (2020) in his analysis emphasizes the role of environmental provisions under TSD in the FTAs of the EU in enhancing its economic advantage and how it will reflect on the ongoing negotiations with Australia, New Zealand, and the United Kingdom (at the time). Colli Vignarelli (2021) points out that TSD chapters, just as the FTAs they are part of, serve ultimately not just private interests but also values and principles that are crucial for a more sustainable fairer globalization.

However, this emerging field of analysis is so far rather focused on legal aspects and implications of the TSD chapters and attempts for their non-speculative but empirical analysis were not widely undertaken. Thus, as far as the best of author's knowledge goes, the research provided in this work, focusing on TSD (and to a lesser extent, environmental provisions) role in facilitating green imports into the EU, is among the first in this field. The analysis will be conducted via using the well-known gravity model specification.

IV Gravity model: theory and development

Gravity model represents one of the few unique cases in the economic research – its empirical validity and practical use have become evident even before the theoretical case for it was laid out. The model that is now the workhorse in the international trade related research was first intuitively derived by Tinbergen (1962), who thought of applying the logic of the Newton gravity to examine global trade flows. However, it has become truly popular in the wider trade research only after 1995. As it has already been mentioned, due to the analogy which the initial model is based upon coming from physics and lack of economic theoretical ground, it was massively questioned and even called "dubious" (Deardorff, 1984, p. 503). When Anderson (1979) tried in his paper to lay the foundations of what is now recognized as the conventional gravity model theory, his attempt was dismissed by others on the grounds of being too complex (Leamer & Levinsohn, 1995).

The analytical use of gravity research has been greatly boosted by Trefler's (1995) discovery of the "missing trade" paradox, generated by the framework of the Hecksher-Ohlin-Vanek (HOV) trade model. His explanation for it was the existence of the 'home bias'. Leamer and Levinsohn (1995) and Krugman (1995) were pointing to a high degree of empirical validity of the gravity model, at the same time looking for a theoretical explanation for the 'mystery of distance'. The experiment conceptualized by the latter where two countries would be moved from Earth to Mars has served as a trigger for incorporation of a key component into the gravity model, the multilateral resistance terms.

Eaton and Kortum (2002) and Anderson and Van Wincoop (2003) laid the microfoundations of the gravity model in their seminal papers. An even more important contribution of these works is in pointing towards estimation methods that were able to take the structure of the models into account (Head & Mayer, 2014, p. 8). In 2008, the gravity research moved forward to having firms as their main unit of observation, thanks to the publication of papers by Chaney (2008), Helpman et al. (2008) and Melitz & Ottaviano (2008). Focus on heterogenous firms in the context of analyzing the bilateral trade flows has considerably grown in importance. Moreover, the model itself, initially adapted just for the trade in goods, has been enriched to have offshoots applicable in the

trade in services (Head et al., 2009), portfolio investments (Portes & Rey, 2005) and international finance (Okawa & Van Wincoop, 2012).

One of the key challenges before and right after the mainstreaming of the Anderson and Van Wincoop (2003) model was to provide a consistent estimation of multilateral resistance terms. The most popular way of going around it is using fixed effects. Let us accept the definition of gravity in (1), as per Head and Mayer (2014), and then take logs of equation (1) in (2):

$$X_{ni} = GS_iM_n\varphi_{ni}, \quad (1)$$

$$\ln X_{ni} = \ln G + \ln S_i + \ln M_n + \ln\varphi_{ni}. \quad (2)$$

where S_i represents how capable country i is to export to all possible destinations, M_n contains all the characteristics of the destination market, G is the so-called "gravitational constant" (albeit it is not held constant anymore if the data is not cross-sectional), andφ_{ni} captures bilateral accessibility of n to exporter I on a spectrum of 0 to 1, accounting for the trade costs and their elasticity.

The practice of use of this naïve gravity model has initially emphasized the use of exporter and importer country GDPs as reliable proxies for S_i and M_n, as well as various measures of distance and cultural variables as core components ofφ_{ni}. However, since the publishing of the paper by Harrigan (1996) the use of fixed effects has gained more importance. Among others, Head and Mayer (2013) and Head and Mayer (2014) cite the advantages of the use of the fixed effects in terms of them being able to account for a wider range of unobservable factors at the country level. Moreover, the importance of having these controls in the model has grown once gravity models have started being routinely applied on the panel datasets, thus making certain important country-level characteristics time-variant too.

Another advantage of a systemic character when it comes to the use of fixed effects is their possibility to account for transshipment and re-exports of goods, so that they do not distort the resulting coefficients. As there is a sufficient number of countries whose trade-to-GDP ratio is 1 or more, it is clear that the country of production is not always the exporting one and the country of consumption is the importing one. Fixed effects allow to account for this reality in a way that other methods cannot. Moreover, they can absorb

the effects of easing/increasing of the non-tariff barriers the growing importance of which is hard to ignore in the modern world – for example, in the case of member countries of the Eurasian Economic Union (EEU), 75% of benefits of membership for them came exactly through the non-tariff channels (Kaim, 2020).

However, using a traditional log model with OLS specification or following the fixed effects path are not the only two options available – Santos Silva and Tenreyro (2006) concluded that under weak assumptions Poisson pseudo-maximum likelihood (PPML) estimator can be employed. That did not imply the necessity of data to be distributed as Poisson. Kaim (2020) cites three most commonly invoked advantages of usage of the PPML estimator that were previously summarized by Shepherd (2016): keeping consistence in the presence of fixed effects; possibility to include zeros in the observations of trade flows in the sample in this estimation and mitigate sample selection bias; PPML coefficients follow the same pattern as OLS and are easy to interpret. A new body of literature is emerging that had started to question the validity of use of the PPML estimator to solve heteroscedasticity problems, starting with Pfaffelmayr (2019).

As the main focus in this work is on the effects of TSD chapters in the EU FTAs over green goods imports, it is important to take stock of the body of literature on the impact of policy variables (which TSD absolutely is) over trade flows and how relevant coefficients are to be interpreted in a way that makes economic sense. One of the most fundamental papers that attempted to holistically determine what policy and cultural variables matter within both economic and econometric logic of the gravity model framework was produced by Head and Mayer (2014). Colonial links emerge as one of the most powerful variables, with contiguity and common language following thereafter. Naturally, having a free trade agreement and common currency were also considered strong, though the controversy around the effect of the latter was growing, with later papers continuously revising its role downward, particularly in the case of the euro. Depending on the paper, timespan and other factors, estimates range from a tripling effect to a negligible one (Head & Mayer, 2014, p. 30).

While most of the policy variables in gravity models are by their design dummy variables, that is not always the case when it comes to the literature focused on researching trade and sustainability. For example, a researcher may be interested not just in the mere presence of environmental, labor, or other provisions in a PTA, or whether

they are restrictive or liberal, but also in the impact of their overall number (Blumer et al., 2019; Brandi et al., 2019; Brandi et al., 2020).

Structural gravity research is facing a few problems that are yet to be fully overcome in the application of the gravity model. Firstly, the issue of errors in the gravity models remains an important topic. For example, Santos Silva and Tenreyro (2006) came to conclusion about usefulness of employing PPML estimators exactly while dissecting the problem of a potential correlation of the error term in an OLS regression with one or multiple independent variables. Head and Mayer (2014) argue, however, that while the problem can indeed persist, especially if the question is framed within the confines of whether the errors are heteroskedastic or not, by far not all pseudo-maximum likelihood estimators (PML) can be a good fit. Negative Binomial PML estimates, for example, depend on the units of measurement of the dependent variable, while the Gamma PML demonstrates small-sample bias; PPML estimator, on the other hand, exhibits an underestimation of the distance variable which goes away with the increasing size of the sample (Head & Mayer, 2014, p. 43 – 44). Later they conclude that OLS estimations can be considered unreliable and heteroskedasticity an issue if Gamma and Poisson PML estimators are similar to each other but different from the OLS, while if Gamma and OLS coefficients are similar and the Poisson ones are smaller, one either should employ the Poisson ones or check the model for misspecification (Head & Mayer, 2014, p. 44 – 45).

A second pending issue in the gravity model research that has been attracting a lot of attention is accounting for zeros in trade flows. Conventional theories and estimations always assumed that the trade flows are positive. However, many countries that are too distant from each other or due to other reasons are not trading with each other. Not accounting for many such flows inevitably induces sample selection bias in the estimations. Even the Melitz-Chaney model, especially in its version in Chaney (2008), was unable to tackle this because under the assumption of a continuum of firms there were no zeros generated. Eaton et al. (2012) dealt with the issue by abandoning this assumption and assuming instead that with a finite number of firms it is reasonable to expect a zero-trade flow when the firm with the maximum productivity drawn from the distribution still cannot profitably export to a certain destination. Santos Silva and Tenreyro's (2006) initial solution using PPML was questioned due to its use of statistical zeros, but the mixture model with high zero frequencies in Santos Silva and Tenreyro

(2011) still performed better with Poisson and Gamma PML estimators than log linearized OLS, log of one plus exports, or Tobit specification by Eaton and Tamura (1994).

Finally, there is a discussion on the margins of adjustment to trade shocks at the firm level that has become substantial after the Melitz (2003) paper. The definitions of 'intensive' and 'extensive' margins emerged, as well as methodologies for their calculation. The most popular of them is the CES-Iceberg (constant price elasticity) model, but it has been questioned in part for being unable to account for certain specific but still important cases, like, for example, when the exports of a specific good originate only from one country of origin (Head & Mayer, 2014, p. 55 – 56). The significance of this issue for determining the effects of policy variables in the gravity model research, especially when it comes to the PTAs concluded by the EU, is only going to grow because the bloc widely uses geographic indications (that a certain product because of its name and other properties can be only labelled as such when it is produced only in the location of its geographical origin) as a non-tariff barrier and is aggressively enforcing trade remedies when they are floundered. This was also one of the main roadblocks in the TTIP negotiations with the United States. Trade in goods that fall under the geographical indications provisions is significant, especially in the agricultural sector (cheeses, alcoholic beverages, etc.).

V Regression model design

Key hypothesis that is going to outline the current regression analysis needs to take diverging interpretations of the role of environmental provisions in trade agreements into account. There is a substantial case argued in the literature and politics, as well as by environmental activists, that an explicit reduction in volume and value of international trade is imperative to tackle its increasing role in global emissions. Moreover, sectoral NGOs, as well as trade unions in the EU, are vocally opposed to the creation and de-facto maintenance of 'pollution heavens' in the developing countries. This, coupled with growing European leadership in various sectors of green economy (e.g., clean energy), can plausibly lead to the conclusion that introduction of TSD chapters in the EU FTAs is underpinned by trade restrictive intentions.

On the other hand, one can note that these trade restrictive intentions might ultimately impact mostly trade in goods that are not considered environmental. Moreover, levelling the environmental regulatory playing field in an upward direction can induce the counterparts of the EU-27 countries to innovate and thus increase the value of their green exports. This assumption is in line with the Porter hypothesis that emphasizes increased gains in productivity as a result of this phenomenon (Porter & van der Linde, 1995). Also, as Brandi et al. (2019) conclude, 'greener' PTAs result in more and better domestic and environmental regulations, and it is reasonable to assume the same effect in case of consequences of having TSD in PTAs.

However, one obvious obstacle to a combination of Porter and growth from low base hypotheses is the lack of resources for leapfrogging towards scalable exporting green industries in the respective developing countries while the developed ones are on par with leading exporters in the EU. Many instruments of industrial strategy that were applicable and acceptable for developing countries before (subsidies, tariff protection, export credit etc.) are now either outright banned or highly scrutinized by both the WTO rules and the provisions of the PTAs with the EU (and here the effect is not limited to TSD, or environmental or labor provisions, but also manifests itself through provisions on state aid, for example). Thus, it might take more time than just a decade analyzed here for the Porter effect to have an actual effect on green exports.

Considering these theoretical standpoints and their potential empirical implications, it is the most reasonable to assume the following development. While the TSD chapters in the FTAs has progressive intentions in terms of levelling the regulatory playing field and 'greening' market access to the trade partners of the EU, due to their recency and upfront compliance costs required their benefits might not be clearly visible yet. Thus, the main hypothesis for this research will be that the impact of TSD chapters over the value of green imports is positive but not statistically significant – both on its own and in the interaction with the number of environmental provisions in an FTA.

The analysis of the role of TSD chapters in the FTAs of the EU on imports of environmental goods to its territory is based on a panel dataset of bilateral merchandise imports from 2010 to 2019. Data on those flows has been extracted from the UN Comtrade Database.

When it comes to determining which goods count as environmental and thus which flows will make into the dataset, there are multiple alternatives to choose from. First, there is an early extensive list of environmental goods compiled by the experts from the OECD (Steenblik, 2005), which contains 132 tariff lines and a very clear definition of a 'green good' – "a good that can be used to measure, prevent, limit, minimize or correct environmental damage". As Brandi et al. (2020) rightfully note, a big advantage of this list is its lack of political influence over the process of determination, even though it is relatively old. Next, during the Doha Round of negotiations in the WTO, the so-called 'Friends Group' presented a new list which contained 154 product items. Later, in 2012, APEC (2012) has adopted its Annex C, which contains 54 goods. The lists of goods that count as environmental under the auspices of the WTO Green Goods Agreement is still under negotiation.

From both theoretical and empirical standpoints, as Zugravu-Soilita (2018) concludes, a combination of the OECD and APEC lists is usually considered optimal. However, in this dataset only the Annex C from APEC is adopted for consideration due to limited computational and temporal resources available to the author. The goods listed in it are at the HS-6 level of aggregation.

The data collected under these selection conditions is then put together with the information on PTAs between the countries, presence of a TSD in them, number of environmental provisions, GDP, as well as other distance and cultural indicators. Data on

the number of environmental provisions in PTAs is available in the TREND database developed by Morin et al. (2018). As far as the author's knowledge and suggestions in the literature go, this is the most thoroughly developed database on the topic, containing information on about 600 PTAs and nearly 300 types of environmental provisions enshrined in them. The data on the PTAs concluded by the EU, including those containing a TSD, is available via DG Trade of the EC (European Commission, 2021). The presence of a TSD, as well as the interaction between it and the number of environmental provisions in a PTA that contains a TSD represent the main independent variables of interest as stated before.

Since the model is aiming to follow the logic of gravity, it is imperative to make sure that the independent variables that are its indispensable parts are present too. GDP data for both reporter and partner countries is extracted from the World Development Indicators (WDI) database of the World Bank. CEPII dataset is used to add data on specific variables for reporter-partner dyad, such as contiguity, common official language, common minority language, past colonial relationships, or the fact of being part of a country that does not exist anymore, as well as bilateral distance. The selected measure of distance here is the weighted distance between the biggest cities in each country adjusted by the share of the population in said cities in the overall population of the countries. This selection can be justified through the need of the distance variable to reflect not just geographical but economic and scale considerations as well.

The choice of the dependent variable is also worth an explanation. Usually, the literature on the topic is primarily interested in the effects over the *share* of green goods in the overall export/import figures, rather than the *absolute value* of green imports themselves. However, an increase in share of green imports that is not complemented by an increase in their absolute value would just mean that there is no green trade creation effect. Thus, the import value has been selected as the dependent variable.

As has already been determined, the main objective for this model is to find out how the presence of a TSD, both on its own and after accounting for the number of the environmental provisions in a PTA, affects the trade flows in selected environmental goods, namely their imports into the EU-27 countries from the non-member states. The panel structure of the data is exploited in three different specifications to ensure the robustness of the results obtained. First specification employs a 'full' (by the number of

variables used) gravity model with the ordinary least squares (OLS). The baseline regression equation for this specification is the following:

$$IMPORTVALUE_{ijt} = \lambda*PTA_{ij} + \gamma*ENVPROVS_{ij} + \beta*TSD_{ij} + \delta*(TSD*ENVPROVS)_{ij} + \tau*GDP_{it} + \rho*GDP_{jt} + \theta*CONTIG_{ij} + \varphi*DISTANCE_{ij} + X_{ij} + \varepsilon_{ijt} \quad (3)$$

where i is the index for the EU-27 importer (reporter), j for the non-EU-27 exporter (partner), and t for the respective year covered in the dataset, and ε_{ijt} is the error term.

$IMPORTVALUE_{ijt}$ is the value of green imports into the EU member countries from the partner countries. *ENVPROVS* here stands for the absolute number of environmental provisions in a PTA, regardless of whether it has a TSD or not. The dependent variable, as well as GDP and distance variables are log normalized. $CONTIG_{ij}$ is a dummy variable returning 1 if countries in a dyad share a border. X_{ij} represents a vector of the most commonly used cultural variables in structural gravity: $COMLANG\_OFF_{ij}$ (dummy variable showing whether two countries share a common official language); $COMLANG\_ETHNO_{ij}$ (dummy variable showing 1 if an ethnic minority language in a country is the majority language in another), $COLONY_{ij}$ (dummy for colonial links), $COMCOL_{ij}$ (dummy for a common colonizer), $COL45_{ij}$ (dummy for colonial status in 1945). Log of $DISTANCE_{ij}$ is the log of the population weighted distance between the two biggest cities of the countries in a dyad. The main coefficient of interest here is β, followed by δ. The results for the latter will also be juxtaposed with the coefficient for a *PTA*ENVPROVS* interaction, thus allowing us to see in which case additional environmental provisions strengthen positive effects on imports: when a country has just any PTA with the EU or specifically the PTA containing a TSD. Descriptive statistics for the main variables of interest, as well as independent non-dummy variables, are available in the Table 2.

The same model is then run using Poisson pseudo-maximum likelihood (PPML) estimator instead. The reason for employing PPML for checking the robustness of the obtained results in the model is that it allows us to include 'zeroed' trade flows that otherwise are thrown away, thus mitigating the sample selection bias (Santos Silva & Tenreyro, 2006). A more detailed reflection on PPML can be found in Chapter 4.

Table 2. Descriptive statistics of the key variables

Variable	Observations	Mean	Standard deviation
Log imports	249,061	9.811	3.244
PTA	249,113	0.415	0.493
ENVPROVS	249,095	16.951	29.644
TSD	249,113	0.068	0.251
Log GDP_i	249,113	26.735	1.464
Log GDP_j	248,183	26.858	1.935
Log distance	248,179	8.472	0.933

An alternative way to check the robustness of the model is to use fixed effects. Not only they are able to absorb the effects of most of the variables presented in the OLS regression but also contain other potential sources of endogeneity present. The baseline regression equation is the following:

$$IMPORTVALUE_{ijt} = \lambda*PTA + \gamma*ENVPROVS + \beta*TSD + \delta*(TSD*ENVPROVS) + \alpha_{ij} + \alpha_{it} + \alpha_{jt} + \alpha_{gi} + \alpha_{gj} + \varepsilon_{ijt} \quad (4)$$

This specification initially contains three sets of fixed effects: country-pair (α_{ij}), reporter-year (α_{it}) and partner-year (α_{jt}). The former, for example, eliminates the need for the cultural and distance variables incorporated in the OLS regression, while the other two take care of the variables that are time variant and can correlate with the *PTA, TSD* or/and *ENVPROVS*, like, for example, GDP. A few regressions in this specification will also contain sector-reporter (α_{gi}) and sector-partner (α_{gj}) fixed effects to account for heterogeneity of markets in various green goods. In this specification, standard errors are clustered at the country pair level to account for all possible idiosyncratic shocks that countries went through during the timespan covered by the dataset.

In the next specification, the sample is divided in four subsets, depending on position of the partner countries on the income status spectrum as determined by the World Bank. The regression models for the subsets are identical in their setup to those for the main dataset.

One source of endogeneity that still cannot be controlled in this specification, as Brandi et al. (2020) recognize, is related to the issue when the countries know about the changes in trade patterns with their partners in the future and can adjust the preferable number and content of environmental provisions in a PTA accordingly. However, there is a case to be made that in this framework that might not be a significant issue. Episodes in the EU trade policy of the recent years such as demise of the Trans-Atlantic Trade and Investment Partnership (TTIP) negotiations, as well as the stalling of the ratification of the EU-MERCOSUR FTA, demonstrate a reluctance of the EU to change the level playing field on a case-by-case basis.

VI Findings and the discussion of the results

In accordance with the hypotheses and model specification presented in the previous chapter, the results are aiming to inform us on whether having TSD in the PTAs with the EU allows for an increase in green imports into the EU. In the Table 3, Columns (1) – (4) are dedicated to the results in the OLS specification, while Columns (5) – (6) represent the findings from the PPML one. In the Table 4 the results of fixed effects regressions are presented, with the Columns (1) – (4) recording the results in the presence of the country-pair, reporter-year and partner-year fixed effects and Columns (5) – (8) demonstrating the coefficients in the presence of both the aforementioned and sector-reporter and sector-partner additional fixed effects. Same pattern applies for regressions in the subsets and the regression on the truncated version of the dataset. Such a setup allows to check the robustness of the results for the effect of having a TSD in a PTA, both as a standalone factor and in interaction with the number of environmental provisions in a PTA.

The Column (1) of the Table 3 provides a barebones version of the initial regression specification, with only *PTA* and *ENVPROVS* variables present. Its aim is to introduce a wider perspective over the impact of having any PTA with the EU over the imports of green goods in the EU. The results demonstrate a statistically significant increase in green goods imports when a PTA is concluded. In the Column (2) the interaction between *PTA* and *ENVPROVS* is introduced. In this case, all the variables keep the same sign and coefficients, except for *ENVPROVS*. However, the interaction term coefficient is slightly negative and statistically significant (every additional environmental provision in a PTA decreases the green imports by 0.3%). In the Column (3), the *TSD* variable is finally introduced, replacing the *PTA* variable in the specification. Here the presence of a TSD leads to a statistically significant decline in the green goods imports into the EU. Both results are again of a high statistical significance. In Column (4), the effect of TSD is positive but each additional environmental provision in a PTA with a TSD brings green imports down by 1.3%.

Table 3. OLS and PPML regression results on the whole sample

	(1)	(2)	(3)	(4)	(5)	(6)
LOG_IMPORTS	OLS	OLS	OLS	OLS	PPML	PPML
TSD			-0.572***	0.619***		-0.032***
			(0.039)	(0.096)		(0.004)
TSD*ENVPROVS				-0.013***		
				(0.001)		
ENVPROVS	-0.002***	0.001***	0.006***	0.007***	-0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
PTA	0.320***	0.320***			0.036***	
	(0.018)	(0.018)			(0.002)	
PTA*ENVPROVS		-0.003***				
		(0.000)				
Log GDP_i	0.739***	0.739***	0.738***	0.739***	0.075***	0.075***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.000)	(0.000)
Log GDP_j	0.970***	0.970***	0.978***	0.981***	0.101***	0.101***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.000)	(0.000)
CONTIG	0.865***	0.865***	0.782***	0.094***	0.077***	0.066***
	(0.032)	(0.032)	(0.032)	(0.032)	(0.003)	(0.003)
COMLANG_OFF	-0.020	-0.020	-0.061	-0.047	-0.004	-0.007
	(0.044)	(0.044)	(0.044)	(0.044)	(0.004)	(0.004)
COMLANG_ETHNO	0.349***	0.349***	0.405***	0.385***	0.028***	0.034***
	(0.044)	(0.044)	(0.044)	(0.044)	(0.004)	(0.004)
COLONY	-0.640***	-0.640***	-0.629***	-0.618***	-0.067***	-0.066***
	(0.037)	(0.037)	(0.037)	(0.037)	(0.003)	(0.003)
COMCOL	0.801***	0.801***	0.740***	0.770***	0.080***	0.080***
	(0.045)	(0.045)	(0.044)	(0.045)	(0.005)	(0.005)
COL45	0.350***	0.350***	0.321***	0.300***	0.046***	0.045***
	(0.052)	(0.052)	(0.052)	(0.052)	(0.005)	(0.005)
LOG_DIST	-0.502***	-0.502***	-0.555***	-0.552***	-0.054***	-0.061***
	(0.008)	(0.008)	(0.007)	(0.007)	(0.001)	(0.001)
Observations	247,206	247,206	247,206	247,206	247,206	247,206
R^2	0.312	0.312	0.312	0.312	0.329	0.327

Robust standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1

Columns (5) and (6) represent a good check for that by using the PPML specification. First, the PPML regression is run without the *TSD* variable in it, showing that having a PTA with the EU increases green imports into the bloc by circa 3.6%, while the overall number of environmental provisions affects them negatively, but by a negligible amount (however, the coefficient itself is highly statistically significant). In the Column (6), when the *TSD* variable is re-introduced, its presence in a PTA with the EU seems to have reduced green imports by 3.2%. The reason why interaction of PTA with

environmental provisions is present as a control in the tables is to be able to instantly compare the impact of the latter in any PTA and then specifically the TSD-containing one.

The specification that is expected to produce the most consistent results (by subsuming the effects of the "usual" gravity variables and other unobservables) is the one with the fixed effects, with the results presented in the Table 4. Columns (1) – (4) contain three sets of fixed effects (country-pair, reporter-year, and partner-year), while in Columns (5) – (8) two more are added (sector-reporter and sector-partner). One observation that can be made before delving deeper into the results is that coefficients for the main independent variables lose in their statistical significance. Neither having a PTA as such nor a PTA specifically with a TSD with the EU seems to matter much for imports of environmental goods into the bloc. However, one can notice that nevertheless that the TSD variable has a positive coefficient in almost all cases. It is also worth taking a special look at the Columns (4) and (8), where the effect of each additional environmental provision in a PTA with a TSD is statistically insignificant but positive too (0.8% and 0.3% increases in green imports per each additional provision respectively). This stands in contrast with the findings in the Columns (2) and (6), where each additional environmental provision in a PTA, regardless of whether it has a TSD or not, leads to a statistically significant decrease in green imports by 2.2%.

The results presented above provide a picture that includes all trade partners that are not in the EU-27. However, accounting for their difference in potentials of ramping up green exports to the EU is important to make the overall conclusions more meaningful. Thus, the procedure followed for producing the results has been repeated, but this time with the dataset cut in subsamples depending on the income status of each partner country in accordance with the World Bank classifications.[3] To increase the significance of this criterion, this status was counted as time-variant, so any potential change in income status by country during the 2010-2019 period was accounted for as it happened. The results are presented in the Tables 5, 6, and 7 for lower-middle income, upper-middle and high-income countries, respectively. Low-income countries were not included in the specification because there are no FTA signatories with a TSD among them.

[3] For convenience, the results for subsamples by income level and for the truncated sample are presented in the Appendix only for the fixed effects regression specification.

Table 4. Fixed effects regression results on the whole sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TSD			0.583	0.233			0.874**	0.746
			(0.433)	(0.682)			(0.356)	(0.488)
TSD* ENVPROVS				0.008				0.003
				(0.008)				(0.007)
ENVPROVS	0.002	0.023***	-0.003	-0.008*	-0.001	0.021***	-0.008**	-0.009**
	(0.004)	(0.002)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.005)
PTA	-0.048	0.029			0.023	0.105		
	(0.366)	(0.360)			(0.345)	(0.340)		
PTA* ENVPROVS		-0.022***				-0.022***		
		(0.004)				(0.004)		
Log distance	0.544	0.544	0.544	0.544	1.035	1.035	1.035	1.035
	(1.379)	(1.379)	(1.379)	(1.379)	(1.314)	(1.314)	(1.314)	(1.314)
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reporter-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Partner-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reporter-sector FE	No	No	No	No	Yes	Yes	Yes	Yes
Partner-sector FE	No	No	No	No	Yes	Yes	Yes	Yes
Observations	246,755	246,755	246,755	246,755	245,750	245,750	245,750	245,750
R^2	0.473	0.473	0.473	0.473	0.665	0.665	0.665	0.665

Robust standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1

This exercise allows to get a more nuanced perspective into who benefits more from having TSD in their PTAs with the EU in terms of green goods market access. In the presence of three fixed effects, the imports from lower-middle income countries with a TSD in their PTA to the EU increase by a whopping 433%, and this result is statistically significant at 10% level of confidence. Each additional environmental provision in their PTAs with the EU increases the green imports of the latter by 9.3% but the coefficient is

not statistically significant. In the presence of five fixed effects, the coefficients of interest lose significance and only the latter remains positive. Thus, one can conclude that for the lower-middle income countries there is a potential to benefit from a freer and more technologically developed markets such as the EU, especially since they start from a lower base. Pegels and Altenburg (2020) refer to it as an accumulation of network and bandwagon effects that create a green path dependency, disproving the concept that stipulates that countries need to grow first and 'clean' later. It would, however, not be easy as lower-middle income countries will require significant investments in upgrading the necessary industrial, regulatory and other capabilities.

The situation in the case of the upper-middle income countries is the following. In the presence of three fixed effects neither the coefficient for the TSD nor that for its interaction with the number of environmental provisions returns a statistically significant result, but with five fixed effects we observe an increase in imports by 174.8% significant at 1% confidence level, and an insignificant 0.8% increase from each additional environmental provision in a PTA with the TSD. The results for high income countries with three fixed effects are qualitatively the same as for the upper-middle income ones except one negative TSD coefficient in the Column (4) of the Table 7. In the presence of five fixed effects, however, TSD gives a boost to green exports to the tune of 344.6% in Column (7), statistically significant at 5% confidence level. However, in Column (8) each additional environmental provision in a PTA with TSD with high-income countries brings their green exports down by 8.3%, and this result is statistically significant at 1% confidence level.

As such, one can notice that the degree to which green imports to the EU are increasing (or not) is significantly correlated with the income level of the exporting countries – the richer they are, the more value in the green goods markets they are technologically prepared to capture. Countries having necessary technologies may thus look at the TSD chapters in FTAs as trade creation factors that help eliminate previously existing non-tariff barriers and quickly benefit from the renewed playing field. The danger, of course, is that for lower-middle income countries, as evidence shows, this potential cannibalization of green trade opportunities may result in lack of improvement in their market access status.

A few notes of caution are required further to conclude this section. First, as far as the environmental goods go, only 54 items are covered in this dataset, taking APEC methodology as a starting point, so all effects visible in the model are produced within these confines. The results might change both quantitatively and qualitatively in a larger sample that combines items present in OECD and APEC lists. However, attaining this goal is not possible in the framework of a master thesis due to the process being computationally heavy and much more time consuming, as it would necessitate an increase in the number of environmental goods under consideration by 2.5 times, which translates into a potential dataset with more than 600,000 observations instead of 250,000. Nevertheless, future research on this topic should absolutely consider expanding the model accordingly.

Since not all PTAs, regardless of whether they have TSD or not, are the same. Even though all PTAs must comply with the standard set in the Article XXIV of GATT ("covering essentially all trade"), there are marked differences when it comes to depth of addressing non-tariff issues, which TSD obviously is. One of possible measures that could be integrated into such an improved model is DESTA depth index used by Dur et al. (2014). Secondly, apart from a quantified depth indicator, PTAs of the EU are just qualitatively different, regardless of whether they have a TSD chapter or not – for example, Cotonou Agreement and a Deep and Comprehensive FTA with Moldova, Ukraine, or Georgia are vastly different in scope and purpose. A greater accent could be put on enhancing the low-income countries subsample in the research by incorporating the role of TSD commitments undertaken not in the framework of a PTA, but as part of participation in the generalized scheme of preferences of the EU (GSP+). Disaggregation of environmental provisions by type, not just across liberal/restrictive lines, is needed to have a better understanding of how various types of them are influencing the green imports themselves and when they enhance or hinder the effect of presence of TSDs in the PTAs.

Table 5. Fixed effects regression results on the lower-middle income countries sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TSD			1.674*	-9.666			0.958	-6.458
			(0.889)	(7.384)			(1.474)	(8.129)
TSD* ENVPROVS				0.093				0.061
				(0.063)				(0.070)
PTA	-0.818	-0.818			-0.826	-0.826		
	(0.567)	(0.567)			(0.894)	(0.894)		
ENVPROVS	0.008	0.008	-0.011*	-0.013*	0.009	0.009	-0.005	-0.007
	(0.009)	(0.009)	(0.006)	(0.007)	(0.011)	(0.011)	(0.011)	(0.011)
PTA* ENVPROVS		0.000				0.000		
		(0.000)				(0.000)		
Log distance	-0.628***	-0.628***	-0.629***	-0.628***	-1.250***	-1.250***	-1.249***	-1.250***
	(0.232)	(0.232)	(0.232)	(0.232)	(0.626)	(0.626)	(0.626)	(0.626)
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reporter-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Partner-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reporter-sector FE	No	No	No	No	Yes	Yes	Yes	Yes
Partner-sector FE	No	No	No	No	Yes	Yes	Yes	Yes
Observations	42,130	42,130	42,130	42,130	41,588	41,588	41,588	41,588
R^2	0.349	0.349	0.349	0.349	0.562	0.562	0.562	0.562

Robust standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1

Table 6. Fixed effects regression results on the upper-middle income countries sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TSD			0.390	0.290			1.011***	0.791*
			(0.534)	(0.673)			(0.367)	(0.446)
TSD* ENVPROVS				0.004				0.008
				(0.010)				(0.008)
PTA	0.082	0.191			0.086	0.176		
	(0.428)	(0.416)			(0.386)	(0.383)		
ENVPROVS	0.000	0.022***	-0.002	-0.004	0.002	0.019***	-0.005	-0.010*
	(0.005)	(0.003)	(0.005)	(0.007)	(0.005)	(0.004)	(0.004)	(0.006)
PTA* ENVPROVS		-0.022***				-0.018***		
		(0.005)				(0.005)		
Log distance	1.191	1.191	1.191	1.190	1.204	1.204	1.204	1.203
	(2.640)	(2.640)	(2.640)	(2.640)	(2.303)	(2.303)	(2.303)	(2.304)
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reporter-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Partner-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reporter-sector FE	No	No	No	No	Yes	Yes	Yes	Yes
Partner-sector FE	No	No	No	No	Yes	Yes	Yes	Yes
Observations	86,601	86,601	86,601	86,601	86,125	86,125	86,125	86,125
R^2	0.446	0.446	0.446	0.446	0.652	0.652	0.652	0.652

Robust standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1

Table 7. Fixed effects regression results on the high income countries sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TSD			0.770	-0.819			1.492**	10.750***
			(0.574)	(2.129)			(0.706)	(2.494)
TSD* ENVPROVS				0.014				-0.083***
				(0.021)				(0.023)
PTA	1.055	1.055			0.730	0.730		
	(0.888)	(0.888)			(0.852)	(0.852)		
ENVPROVS	-0.006	-0.006	-0.004	-0.004	-0.008	-0.008	-0.014**	-0.012**
	(0.008)	(0.008)	(0.005)	(0.005)	(0.008)	(0.008)	(0.006)	(0.006)
PTA* ENVPROVS		0.000				0.000		
		(0.000)				(0.000)		
Log distance	0.306	0.306	0.306	0.306	2.732***	2.732***	2.732***	2.733***
	(0.715)	(0.715)	(0.715)	(0.715)	(0.796)	(0.796)	(0.796)	(0.797)
Country-pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reporter-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Partner-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reporter-sector FE	No	No	No	No	Yes	Yes	Yes	Yes
Partner-sector FE	No	No	No	No	Yes	Yes	Yes	Yes
Observations	113,029	113,029	113,029	113,029	112,845	112,845	112,845	112,845
R^2	0.476	0.476	0.476	0.476	0.705	0.705	0.705	0.705

Robust standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1

VII Conclusion

The increasing intersection between international trade and climate policies, as well as wider context of sustainable development in the recent years has found its reflection in the growing number of the relevant provisions in PTAs. The EU has been one of the pioneers of a pivot towards recognizing these issues to be at the core of the negotiating mandates, initiating a push to include trade and sustainable development chapters in its PTAs since the negotiations with the Republic of Korea concluded in 2011. Since then, multiple agreements with such provisions have entered into force with developed and developing countries alike.

It can be interpreted as both of evidence of growing 'sustainability protectionism' and a sincere, indiscriminate approach to make sustainability a sufficient condition for free trade. The debate on what can be considered a prevalent reason would remain in the speculative realm without an empirical analysis of the impact TSD chapters have on the imports of environmental goods from the signatory countries into the EU. This research has aimed to provide a look into the evidence on the topic over a 10-year long timespan and a range of 54 environmental goods from the Annex C classification of APEC, using a gravity model design.

After running regressions in OLS, PPML and fixed effects specifications, the main hypotheses have been largely confirmed, as the influence of TSD chapters, as well as additional environmental provisions in the PTAs with these chapters, over the imports of environmental goods into the EU is positive but still largely statistically insignificant. This indicates that the TSD chapters have broader sustainability concerns in mind than just enhancing environmental protection considerations and for exporters adjustment to these realities might take more time than the current timespan of application of TSDs. This also has important implications on employing the Porter hypothesis as the main assumption about trade creation through innovation triggered by increase in sustainability standards. While it has empirical validity in the medium- and long-run cases (see Brandi et al. (2020) as one of many examples on that), the case might not be so clear-cut in a short- to medium-run periods. Adjustment that countries need to make to increase their green exports to the EU brings greater costs now both when it comes to regulatory compliance and technological innovation, and by far not all of them can make

the cut without significant aid and investments from the EU itself. Lower-middle income countries demonstrate great green export potential, as the results have shown, but the growth may flatten without the aforementioned tools.

This work has both scientific and policy relevance and would greatly benefit from being built upon through further improvement of the dataset and robustness strategies. The EU is positioning itself as an aspiring global leader in combining free trade and sustainability agenda, and for citizens and policymakers to see that those efforts are paying off, they need to have relevant research at hand. So far, a vast majority of the body of literature on the topic has been particularly focused on the role of the environmental provisions in the PTAs around the world. While this is necessary, it does not consider all the particularities of the EU trade policy, and namely its TSD instrument. With more research like the one undertaken in this essay, both officials and specialists will be able to understand if TSD chapters can already function as both a tool of 'leveling the playing field' and a catalyst of creation of new value in trade in environmental goods between the signatories. Moreover, as this specific research was carried on a non-OECD approved sample of green goods, taking the OECD compiled one as a baseline will provide even more granular results that a master thesis cannot produce.

As the gravity model theory itself also is not staying in place but moving forward from a country-centric to a firm-centric perspective since the mainstreaming of the Melitz model, future research will need to take these trends into account. As Brandi et al. (2020) mention in their own conclusions, the growing importance of global value chains (GVCs) in further trade creation in the environmental goods markets necessitates a closer look at how they are already influencing the latter. TSD chapters coupled with ever more progressive standalone environmental provisions in the PTAs that the EU is negotiating now can be a powerful tool in upgrading relevant sectoral GVCs with considerable spillover effects elsewhere.

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