THE EFFECTS OF CETA ON TRADE AND TRADE-RELATED CARBON EMISSIONS:

Evidence from the OECD countries

Group 1

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Abstract

This paper proposes an original empirical strategy to assess the possible effects of the Comprehensive Economic and Trade Agreement (CETA) between Canada and the European Union on trade and trade-related carbon emissions. On September 2017, CETA provisionally entered into force. Many authors have demonstrated that the impact on trade of Free Trade Agreements (FTAs) can vary depending on the level of development of the countries involved and the agreements' specificities. Using macroeconomic data, the aim of this analysis is twofold. First, it assesses whether and how tariff and non-tariff barrier removals embodied in CETA have affected bilateral trade. Second, it examines whether CETA induced a boost in trade of most (or least) polluting product categories, potentially leading to a "greener" EU-Canada trade. We find a large variety of export patterns amongst HS2 product categories. Overall, CETA seems to have induced a decrease in exports which contradicts the so-called "scale effect" usually put forward in economic theory. We did not find any significant effect of the impact of CETA on exports of more (or less) polluting products. Finally, the present findings must be nuanced, mainly due to the recent and provisional implementation of the agreement and the lack of data regarding CO2 intensity rates per product category. Future research could supplement this type of analysis if best-suited data are available in the coming years.

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I. Introduction

The relationship between trade and the environment is a controversial and complex topic in international economics that has attracted more attention due to environmental degradation. Whether Free Trade Agreements (FTA) can help to mitigate the polluting effects of trade on the environment has yet to receive a clear-cut answer. One underlying reason lies in the fact that their effects highly depend on the context of implementation and the characteristics of the countries involved.

The present research sheds light on the so-called Canada-European Union Comprehensive Economic and Trade Agreement (CETA), which covers virtually all sectors and aspects of Canada-EU trade. It entered into force provisionally on the 21st of September 2017. Although the agreement must be ratified in each EU country before it can take full effect, most of it currently applies (European Commission, 2023).

The 27 EU Member States and the United Kingdom (referred to together as the EU in this paper) represented Canada’s third largest merchandise trading partner, after the United States and China. The main goal of CETA was to further boost Canada-EU trade by reducing trade barriers between the two regions. Practically all tariff trade barriers for Canadian and EU businesses will be eliminated after complete ratification of the agreement. Already 98% were removed in 2017 when the agreement entered into force, and an additional percent will be eliminated over seven years. Non-tariff trade barriers will also be significantly reduced. The EU and Canada will work more closely on technical regulations for testing and certifying products to increase knowledge sharing and access to new technologies. The removal of tariff and non-tariff trade barriers could lead to an increase in absolute trade volumes overall. This will likely negatively impact greenhouse gas emissions, whether these originate from increased production or transport of goods.

However, CETA is said to have some of the most substantial commitments ever included in a trade deal to promote environmental protection and sustainable development. Indeed, a whole chapter of the agreement (Chapter 24) is dedicated to the environment. It requires each side to put into practice international environmental agreements and enforce their domestic environmental laws. Moreover, it prevents each side from relaxing their laws to increase trade or investment. Additionally, in the agreement's chapter dedicated to sustainable development (Chapter 22), the EU and Canada have agreed to promote and share initiatives related to eco-labeling, fair trade, energy efficiency, climate-friendly technologies, recycling, etc. Sharing these sustainable initiatives and technologies and effectively applying international environmental agreements could balance the impact of trade barrier removal and lead to a more limited impact on greenhouse gas emissions in the longer term.

Past research has primarily focused on the link between trade agreements and air pollution. We will consider a different approach by analyzing changes in trade volume by product category and investigating whether CETA has successfully limited bilateral trade of the most polluting product categories.

To explore the effects of the application of CETA on trade volumes of polluting products, we focus on a sample of 43 countries, including Canada, the 28 countries that belonged to the EU when CETA came into force, and 14 OECD member countries that were never part of CETA. By comparing the difference in trade growth between pairs of countries where the agreement entered into force and pairs of countries that are not part of the agreement, we find that overall, CETA has led to a significant decrease in nominal bilateral trade amongst CETA members. However, we find a large variety of results when looking at trade patterns within each HS2 product category. If some of the most traded products (either in the OECD or between the EU and Canada) show an increase in trade in the short run – which is in line with the scale effect that predicts an increase in trade volumes after the implementation of an FTA, as well as a related increase in resulting carbon emissions – others follow the opposite path. We did not find clear and significant results that could enable us to state whether CETA has or not positively impacted trade volumes of the most (least) polluting product categories. We can only observe a slightly positive correlation between CO2 intensity rates and growth in bilateral trade resulting from CETA.

Moreover, this correlation seems stronger among pairs of CETA members than among pairs of trading partners in which only one country has entered CETA. Finally, the product categories that saw the most considerable differences in trade growth are found into the most carbon-intensive ones. However, while fertilizers (category 31) experienced a significant decrease in bilateral trade, trade of iron and steel (category 72) has shown tremendous growth after implementing the FTA.

We acknowledge that CETA has entered into force only provisionally and relatively recently. Moreover, we have been confronted with a need for more data on the CO2 intensity of traded products. Our findings are therefore limited, and more research in the future would be needed to conclude the long-term effects of CETA on bilateral trade of polluting goods.

The remainder of the paper is divided as follows. Section II provides a brief review of the literature on the relationship between trade and the environment. Section III describes the data sources. Section IV presents the methodology and the main results of our research. Section V deals with the limitations we faced throughout the analysis. Finally, Section VI concludes.

II. Literature Review

II.1. Economic theories behind FTAs

It is common knowledge that Free Trade Agreements are theoretically meant to enhance a pair or group of countries' inclination to trade more and expand their market. This allows them to specialize, reduce their costs and increase economic welfare through various aspects of the economy (Krugman, 1979). The potential impact of these positive economic effects can be twofold. Proponents argue that the opportunity for two (or more) countries entering an FTA to exploit comparative advantages and implement greener technologies might be highly beneficial for the environment. By contrast, opponents argue that an increase in bilateral trade after implementing an FTA will likely raise countries' greenhouse gas (GHG) emissions (Porterfield et al., 2017). Their main argument relies on the so-called Pollution Haven hypothesis, i.e., the fact that an FTA fosters relocation of polluting industries in countries with lax environmental regulations. Additionally, they point out the role played by the scale effect, which is described below. (Nemati et al., 2019)

From a theoretical perspective, the literature identifies four main hypotheses describing the effects of FTA on pollution. The "Porter" hypothesis assumes that developed countries have less reason to pollute as they have access to cleaner industries and stricter environmental regulations. (Porter & Van der Linde, 1995). By contrast, the "Pollution Haven" hypothesis (Johnson & Beaulieu, 1996) states that FTAs involving countries with different degrees of economic development can induce developed countries with stricter environmental policies to relocate dirtier polluting industries to countries with less environmental regulations that are also usually less developed. This way, the developed country can still pollute while benefiting from trade liberalization. The "Factor Endowment" hypothesis (FEH) reaches the completely opposite conclusion. According to the FEH, the critical factor to consider is the endowment of resources of the countries ratifying the FTA. Because developing countries are usually labor-intensive compared to their capital-intensive developed counterparts, the latter are expected to emit more since labor-intensive products are thought to be cleaner (Copeland & Taylor, 2013; Temurshoev, 2006). Finally, the "race-to-the-bottom" hypothesis applies when countries compete through pollution havens and shift production towards dirtier products or reduce environmental policies. This phenomenon illustrates a "race to the bottom" regarding environmental regulations, putting forward economic benefits over long-term sustainable growth. (Frankel et al., 2005; Frankel & Jeffrey, 2009; Nemati et al., 2019).

Empirical research shows mixed results regarding the impact of FTA on environmental dimensions. On the one hand, some studies stand for trade liberalization for three main reasons. First, it reduces emissions through a better competition process. Second, it induces a shift towards cleaner methods of production and hence, cleaner products which in turn increase their competitiveness (Birdsall & Wheeler, 1993). Finally, liberalization introduces better technologies and regulations (Nemati et al., 2019).

On the other hand, other studies found that FTAs are associated with increased emissions through boosted growth of developing countries that are more intensive in polluting industries (Rock, 1996). They also found evidence supporting the "Pollution Haven" hypothesis; in some cases, FTAs cause developed countries to shift their production of dirty products to developing countries with lax environmental regulations (Reinert, & Roland-Holst, 2001; Yu, et al., 2011). However, authors always indicate that FTAs' effects on the environment heavily depend on the type of agreement and the countries involved (Nemati et al, 2019).

Beyond the four hypotheses mentioned above, the literature stresses three main effects relating to trade liberalization, trade volumes, and their joint impacts on the environment. First, the "Scale Effect" refers to pollution rising due to higher income, ceteris paribus. If an FTA creates new trade, the increased production and transport will imply more pollution. Following this intuition, FTAs seem to raise pollution levels by definition. However, it is crucial to remember that Trade Agreements are more than just a rise in bilateral trade. They also include sharing technologies and changing the production mix through specialization (Gozgor et al., 2020). This leads to the “Technique Effect” which refers to the situation where countries would reduce their emissions by opening to new technologies that are good for the environment. Higher-income countries have more tools to share clean technologies and implement them in an FTA, resulting in fewer emissions from the increased trade volume (Frankel & Jeffrey, 2009). Countries will also share their production techniques and eventually improve their market and industries (Birdsall & Wheeler, 1993). Finally, the “Composition Effect” refers to a change in pollution levels due to a shift towards more polluting industries and the production of “dirty products”. As an illustration, some studies found that developing countries were more intensive in “dirty industries” (Rock ,1996; Yao et al., 2019), meaning that an increase in bilateral trade could foster pollution if it induces a drastic trade shift toward more polluting countries and/or products. However, depending on the type of trade liberalization and its implementation area, the composition effect can be either beneficial or detrimental to the environment. The inverted U-shaped Kuznets Curve is commonly used to illustrate the sequence of effects over time. It represents the initial increase in pollution when income rises (scale effect) before decreasing after reaching a turning point (technique and composition effects) (Gozgor, 2017; Cole, M. A. (2003)).

Empirically, the “scale effect” is suggested to harm the environment, holding the other two effects constant. By contrast, the technique effect seems to reduce trade pollution, and the composition effect depends on the intensity of the country’s production of dirty products. In the literature, the technique and composition effects positively impacted the environment when FTAs were implemented between developing countries or developed countries only (Antweiler et al., 2001; Frankel & Jeffrey, 2009). The latter have easier access to clean energy and usually rely on more extensive national and international markets, meaning they can also be careful about their production mix. Once again, the total effect highly depends on the FTA and the countries' characteristics (Nemati et al., 2019).

II.2. Expected effects of CETA

Some cases of pollution havens were documented, for instance, when a developed country increased trade with a developing country to import a maximum amount of polluting goods without repercussions. Qirjo et al. (2019) analyzed the effect of CETA on GHG emissions. They concluded that Canada acts as a potential pollution haven for the rich and labor-intensive countries of the EU. Similarly, Yu. et al (2011) concluded that Mexico’s increase in emissions was due to the rise in trade with the US after the implementation of NAFTA. For this matter, it is crucial to understand the economic and environmental specificities of the Agreement implemented and to have a good knowledge of the characteristics of the involved countries. For example, a Free Trade Agreement between high-income countries with a chapter on pollution prevention like CETA is expected to have long-run positive effects if well implemented on the environment if we look at the findings from the literature (Managi et al., 2008). In the short run, the scale effect predicts a positive impact of CETA on pollution, although mitigated by the fact that Party members of CETA are mainly highly developed countries with a large share of cleaner industries. In the middle to long run, the technique effect is expected to reduce pollution and products’ carbon intensities by sharing newer and cleaner technologies. The role of the composition effect is less predictable as countries would have to adapt their trading product mix and relocate their capital-intensive production elsewhere, hence increasing pollution. However, these outcomes depend on the economic state of a country and its labor-to-capital ratio (Qirjo et al., 2019).

III. Data, Selected Sample, and Descriptive Statistics

III.1. Data Collection

Our empirical analysis uses a combination of 3 databases, provided notably by the *Centre d'Etudes Prospectives et d'Informations Internationales* (CEPII), the World Integrated Trade Solution (WITS) data center, and EXIOPOL.

We focused on a sample of 43 countries. Canada and the 28 countries that belonged to the EU when CETA came into force (23 of which are members of the OECD) constitute our treatment group. The impact of trade agreements on the environment being related to the type of countries involved (see section II), we selected the 14 remaining OECD member countries that were never part of CETA as our treatment group. Similarly to Canada and EU Member States, these countries are all high-income or upper-middle-income countries.

[Table 1]

The analyzed time period goes from 2013 to 2019. We used data from four years prior to the start of the provisional application of CETA to ensure a precise comparison between the different groups of countries. Additionally, to prevent our analysis from being influenced by the decrease in trade linked to the COVID pandemic, we preferred not to consider observations from the years 2020 and 2021.

a) CEPII Gravity Database

The Gravity dataset extracted from the *Centre d'Etudes Prospectives et d'Informations Internationales* (CEPII) contains 4,699,296 observations. It gathers a set of variables related to 252 countries from 1948 to 2019. Some of these variables depict trade flows (in thousands USD) between an exporting and an importing country at *time t*. The others provide a bunch of countries-specific information on macroeconomic indicators, geographic and cultural characteristics. Besides the aforementioned general restrictions applied to the dataset, we eliminated national trade inside each country. Finally, we dropped data related to countries no longer existing in 2013 and defined Germany as a unique entity. We ended up with a sample of 384,930 observations. A large set of *gravity variables* are introduced in the econometrical models (distance, GDP, common language, common borders). More details are given in the section dedicated to the methodology. On top of the existing data, we created an additional variable stating whether the country has or not direct access to the sea.[1] Finally, we generated two binary variables, indicating respectively whether CETA applied to a pair of countries – to both exporter i and importer j, and whether it applied to only one of the two at time t. By construction, those variables cannot be simultaneously equal to 1.

b) HS2 Exports (by product category)

We merged the previous database with data on trade flows by product categories. Product categories classification follows the Harmonized System Codes at the two-digits level (HS2). HS2 classification groups products under 100 distinct categories. Each dataset observation corresponds to the export value (in thousand USD) of a specific HS2 product category from an exporting to an importing country in a given year. This information was gathered by hand from the World Integrated Trade Solution (WITS) data center. The resulting merged dataset contains 873,045 observations.

c) CO2 intensity rates

Data on CO2 intensity rates were drawn from the replication data provided by Joseph S. Shapiro in his paper "The environmental bias of trade policy" (2020). In this analysis, Shapiro employs a measure of carbon intensity expressed in metric tons of CO2 per thousand dollars of output (CO2 Tons/$1000).

CO2 intensity data are derived from *Exiobase*, a comprehensive database carried out under the European research framework (Stadler et al, 2018). *Exiobase* is a global multi-regional input-output table combining trade data with direct CO2 emissions (from the International Energy Agency) for many product categories and several countries. To obtain the total (direct and indirect) CO2 emissions rates of product categories, Shapiro carried out a value chain analysis to account for emissions from intermediate goods. The CO2 rates, available at the country level, were averaged and weighted by the value of output, to create a single global measure of carbon intensity. While it could be argued that the carbon intensity of industries changes over time due to technological progress and more restrictive environmental laws, for the purpose of our analysis, we assume that these values do not change over the years we analyze.

Exiobase, and hence Shapiro, use their own product classification system, which was built to closely match the United Nations ISIC Rev. 3 standard. In order to make use of these data, we converted the ISIC product codes into HS codes, using a concordance table available on the World Bank website (WITS, 2012). The final dataset contained CO2 emission information for 33 HS2 product categories, reduced from the original 46 products available in the Shapiro dataset, due to the conversion from 4-digits to 2-digits of certain product codes[2]. They are listed in Table 8.

[1] Being country specific, this variable will end up in the fixed effects.
2 For example, values for bovine meat (HS4 0201) and poultry meat (HS4 0207) were averaged and merged into a unique, two digits HS product code (HS 02).

III.2. Descriptive statistics

Figure 1.a shows the trade trend between Canada and the 28 countries of the European Union between 2013 and 2019[3]. During this period, EU exports to Canada increased by 19 percent while imports grew by 6 percent. Between 2014 and 2015, trade volumes reduced, but the underlying reason is a steep strengthening of the dollar against the euro in that year.

Since the vast majority of imports and exports of European companies are settled in euros (Eurobarometer, 2015), it may be worth showing the same graph with trade values in euros. Figure 1.b in the Appendix was constructed by converting trade values with the average annual dollar-euro exchange rates (available on the European Central Bank website), and shows steady growth in all years under review, with EU trade to and from Canada growing by 42 and 26 percent, respectively.

Figure 1.a. – Bilateral trade between EU28 and Canada in billion USD (2013-2019)

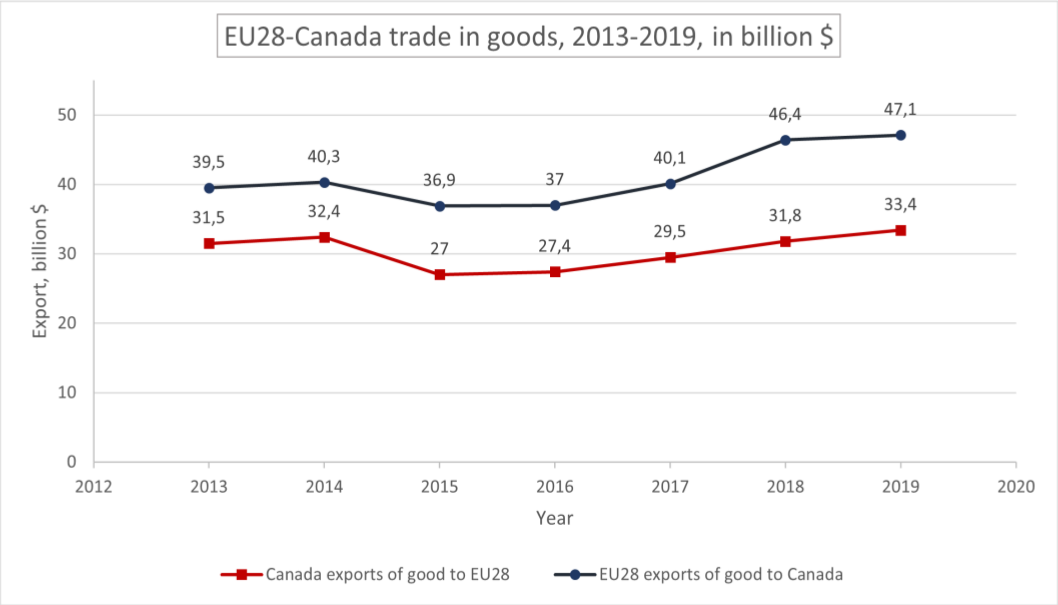


Table 2.a disaggregates these figures, showing the trends of the most traded product categories over time. In addition to trading volumes at two-year intervals and percentage growth in 2013-2019 and post-CETA approval, the table includes data on the CO2 intensity of products, measured in Metric Tons of Carbon Dioxide per $1,000 of output. Due to the unfortunate limitations of the source database, out of 96 Product categories, only 33 observations on CO_2 intensity are included.

Table 2.b in the appendix display the same statistics for the five most and least traded product categories between OECD countries + EU member states not part of the OECD.

Table 3 describes the growth in trade among the five most polluting product categories and the five cleanest - for categories on which we have CO2 intensity figures. An interesting – but not conclusive - statistic is the trade growth of these two groups after the provisional enactment of CETA.

3 The United Kingdom is included among EU members as it was still part of the EU and CETA in that time span.

Between 2017 and 2019products from the cleanest industries saw an 11.8 percent increase in trade, while the most polluting products were traded 25.6 percent more.

Table 2.a – Trade trend of the ten most exported product categories in 2013 between Canada and EU28

HS Code (2 digits)	Product Description	CO_2 rate (Tons/$) ×1000	Trade Volume, million USD				Trade Growth (%)	
			2013	*2015*	*2017*	*2019*	*2013-2019*	*2017-2019*
84	Machinery, Mechanical Appliances, Computers, Nuclear Reactors	0,56	10.700	9.394	9.255	11.121	3,9%	20,2%
71	Precious Metals, Stones, Pearls	–	10.416	9.114	11.262	12.185	17,0%	8,2%
87	Other Vehicles	0,45	5.490	5.315	6.314	7.001	27,5%	10,9%
27	Mineral Fuels, Mineral Oils	1,29	5.252	3.190	4.437	5.945	13,2%	34,0%
30	Pharmaceutical Products	–	5.128	4.835	5.527	6.593	28,6%	19,3%
85	Electrical Machinery	0,58	3.877	3.065	3.368	3.411	-12,0%	1,3%
90	Optical, Photographic Instruments	0,52	2.603	2.346	2.531	2.894	11,2%	14,3%
26	Ores, Slag And Ash	0,42	2.378	2.433	2.915	3.262	37,2%	11,9%
88	Aircraft, Spacecraft	–	2.280	4.014	3.529	4.358	91,1%	23,5%
22	Beverages	0.43	1.855	1.657	1.767	1.885	1,6%	6,7%
29	Organic Chemicals	–	1.761	1.126	1.275	2.270	28,9%	20,2%
Average growth of ten most traded products							*22,6%*	*15,5%*

Notes This table shows the 2013-2019 trade trends of the ten most traded products between Canada and European Union countries (EU27 + UK). The most traded products were chosen using 2013 data, and are ranked in a descending order. The *HS Code* and *Product Description* columns display product category information at the two digit level. The CO_2 rate is expressed in metric tons of CO_2 per thousand dollar of output, and is gathered from the Shapiro replication data, originally drawn from Exiobase Input Output database; a "--" value indicates that no CO_2 rate is not available for the selected product.

Table 3 – Trade Growth of the five cleanest and dirtiest product categories

HS Code	Product Description	CO2 rate (Tons/$)×1000	Trade Growth, %	
			2013-2019	*2017-2019*
Panel A - Five Dirtiest Industries				
31	Fertilizers	2,23	77,7%	78,4%
72	Iron And Steel	1,74	1,5%	13,1%
68	Articles Of Stone, Plaster, Cement	1,31	-15,4%	-3,1%
27	Mineral Fuels, Mineral Oils	1,29	13,2%	34,0%
69	Ceramic Products	1,23	1,7%	5,6%
Mean of five dirtiest industries		***1,56***	***15,7%***	***25,6%***
Panel B - Five Cleanest Industries				
17	Sugars And Sugar Products	0,37	27,7%	6,8%
26	Ores, Slag And Ash	0,42	37,2%	11,9%
22	Beverages	0,43	1,6%	6,7%
4	Dairy Produce; Birds' Eggs	0,43	28,7%	39,4%
24	Tobacco And Products	0,45	-37,0%	-5,7%
Mean of five cleanest industries		***0,42***	***11,7%***	***11,8%***

Empirical Strategy and Main Results

IV.1. Econometric specifications

The goal of our research is to evaluate the impact of the application of CETA on trade and trade-related carbon emissions. We used three different models to compare the evolution of trade between countries where CETA provisionally entered into force, the evolution of trade within pairs of countries where either the exporting or the importing country has entered CETA, and the evolution of trade between countries where CETA does not apply, for every product category. Subsequently, we examined the relationship between these trade growth differences, and the amount of CO2 emitted throughout the production of those products.

Our baseline specification to analyze the impact of CETA on the evolution of trade of a defined product category takes the following form:

$$ln\ X_{ijt} = \beta_0 + \beta_1 ceta\_both_{ijt} + \beta_2 ceta\_one_{ijt} + \beta_3 controls_{ijt} + \varepsilon_{ijt} \qquad (1)$$

Here, i indexes the exporting country, j indexes the importing country, and t indexes the year. ln X_{ijt} is the logarithm of the nominal bilateral trade from an exporting country i to an importing country j (in thousand USD) in year t. $ceta\_both_{ijt}$ is a dummy variable, equal to 1 if CETA applies in both countries i and j in year t. $ceta\_one_{ijt}$ is a dummy variable, equal to 1 if CETA applies either solely in country i, or solely in country j, in year t. $controls_{ijt}$ refers to our country and year-related control variables (GDP_i, GDP_j, direct access to the sea/ocean, common colonizer, common language, distance, and contiguity)[4]. They include namely the variable fta_wto_{ijt}, a dummy variable equal to 1 when both countries i and j are engaged in a regional or national trade agreement other than CETA in year t. ε_{ijt} represents the error terms.

We estimated (1) via an ordinary least square regression. We clustered standard errors over country pairs, to account for correlations at the country-pair level.

In accordance with theoretical recommendations, we included pair fixed effects and time-varying fixed effects for both the exporting country and the importing country in our model. Using pair-fixed effects enables one to account for any time-invariant observable and unobservable characteristics for a pair of countries. Time-varying fixed effects enable one to account for any observable and unobservable characteristics that vary over time for each exporter and importer (Yotov et al., 2016).

Our specification then takes the form:

$$ln\ X_{ijt} = \beta_0 + \beta_1 ceta\_both_{ijt} + \beta_2 ceta\_one_{ijt} + \beta_3 fta\_wto_{ijt} + \rho_{it} + \varphi_{jt} + \psi_{ij} + \varepsilon_{ijt} \qquad (2)$$

where ρ_{it}, φ_{jt} and ψ_{ij} capture respectively exporter-time fixed effects, importer-time fixed effects, and country-pair fixed effects. The only remaining control variable is fta_wto_{ijt}, all other control variables from (1) being absorbed in the fixed effects. We estimated (2) via a linear regression with multiple fixed

[4] GDP_i, GDP_j and distance are introduced in logarithms in all specifications.

effects. We clustered standard errors at exporter-time, importer-time, and country-pair levels, to account for autocorrelations over time for exporting and importing countries and correlations at the country-pair level.

As trade data is often responsible for heteroskedasticity, the estimates obtained with a linear regression model are likely to be biased and inconsistent. To prevent this issue, an alternative would be to apply the Poisson Pseudo Maximum Likelihood estimator (Yotov et al., 2016). Moreover, this estimator effectively deals with the presence of null values.

When using the PPML estimator, our specification becomes:

$$X_{ijt} = \; exp\left[\beta_0 + \beta_1 ceta\_both_{ijt} + \beta_2 ceta\_one_{ijt} + \beta_3 fta\_wto_{ijt} + \rho_{it} + \varphi_{jt} + \psi_{ij}\right] \times \varepsilon_{ijt} \quad (3)$$

Our dependent variable X_{ijt} is the absolute trade value in thousands of USD from country i to country j in year t. The other variables remain as in (2). We continued using exporter-time, imported-time, and country-pair fixed effects and clustering standard errors at the exporter-time, imported-time, and country-pair levels.

For each of our models, we are able to interpret the coefficients β_1 and β_2 separately, as $ceta\_both_{ijt}$, and $ceta\_one_{ijt}$ cannot be simultaneously equal to 1 by construction. These coefficients measure the causal impact of the application of CETA on changes in the trade of a defined product category over time. To ease the interpretation, we will transform these coefficients to obtain expressions of trade growth in percentages.

$$\Delta_1 = e^{\beta_1} - 1 \quad (5)$$

$$\Delta_2 = e^{\beta_2} - 1 \quad (6)$$

Based on $ceta\_both_{ijt}$ coefficient β_1, Δ_1 estimates the difference in exports growth of a specific product category, between a pair of countries where CETA entered into force, and a pair of countries not part of CETA. Based on $ceta\_one_{ijt}$ coefficient β_2, Δ_2 estimates the difference in exports growth of a specific product category, between a pair of countries not part of CETA, and a pair of countries where only one of the two enters CETA. By creating the variable $ceta\_one_{ijt}$ and examining the coefficient Δ_2, we would additionally be able to determine whether there was trade diversion. Indeed, while Δ_1 focuses on a pair of countries entering CETA, Δ_2 gives us information on the change in trade between two countries, when one of the two starts benefitting from the elimination of most trade tariffs with other countries.

To examine whether the difference in the evolution of exports is related to the level of pollution of product categories, we regressed the CO2 intensity of each product category on the coefficients previously obtained: Δ_1 and Δ_2. The specification takes the form of an ordinary least square regression:

$$\Delta_{1,k} = \alpha_0 + \alpha_1 CO2_k + \varepsilon_{1,k} \quad (7)$$

$$\Delta_{2,k} = \gamma_0 + \gamma_1 CO2_k + \varepsilon_{2,k} \quad (8)$$

In equation (7), $\Delta_{1,k}$ indicates the difference in trade growth of product category k due to the application of CETA, between a pair of countries where CETA entered into force and a pair of countries not part of CETA. It is the coefficient obtained from (5) for product category k. In equation (8), $\Delta_{2,k}$ indicates the difference in trade growth of product category k due to the application of CETA between a pair of countries not part of CETA and a pair of countries from which one of the two has entered CETA. It is the coefficient obtained from (6) for product category k. In both equations, $CO2_k$ is the CO2 intensity of product category k. $\varepsilon_{1,k}$ and $\varepsilon_{2,k}$ represent the error terms.

The parameters of interest are the coefficients α_1 and γ_1. α_1 indicates whether the difference in trade growth of a product category after implementing CETA in a pair of countries is correlated with its CO2 intensity. If α_1 is positive, it will indicate that the most polluting products have seen the largest increase in trade between countries where CETA entered into force, relatively to countries that are not part of the agreement. γ_1 indicates whether the difference in trade growth of a product category after implementing CETA in only one country of a pair of countries is correlated with its CO2 intensity. If γ_1 is positive, it indicates that the most polluting products have seen the largest increase in trade between countries where only one of the two benefits from CETA, relatively to countries that are not part of the agreement. Deriving from these 2 interpretations, if α_1 is negative and γ_1 is positive, it could hint at the presence of trade diversion. Indeed, when a country enters CETA, trade of the most polluting product categories with other CETA countries may decrease, while trade of the same product categories with non-CETA countries may increase. The reasoning is similar for positive values of α_1 positive and negative values of γ_1.

IV.2. Results

As a preliminary verification, we performed two tests to check for heteroskedasticity and potential sources of collinearity between the variables.

The VIF (Variance Inflation Factor) test was performed on the baseline model (including all the variables used in the analysis). The mean value was laying far below the critical threshold set at 10, reflecting the absence of collinearity. To detect the presence of heteroscedasticity in the error terms, we performed both Breusch-Pagan test (which looks for restricted homoscedasticity) and White test (which looks for unrestricted homoscedasticity) at each step of the regression. Robust standard errors were recommended to ensure more accurate estimates because they allowed to reject the null at the 5% level reflecting the presence of heteroscedasticity in the error terms.[5]

Results are organized in three parts. First, we will assess the impact of CETA on nominal bilateral trade flows from exporter *i* to importer *j* at time *t* of each HS2 product category, either when both the exporter and the importer have entered CETA or when only one of them did. Second, we will

[5] The Poisson Pseudo-Maximum Likelihood model is by construction robust to heteroskedasticity.

identify potential trends in terms of polluting patterns. Finally, we will discuss the results, their limitations, and some robustness checks.

a) Influence of CETA on bilateral trade flows

Table 4 describes the results obtained from the complete dataset, without any product distinction. The standard pooled OLS (Model (1)) shows highly significant coefficients - at the 1% level. The coefficients imply that exports from an exporting i to an importing country j both entering CETA grow by more than a half. By contrast, exports shrink by one fourth if only one of the two country is a CETA member. As soon as the gravity variables are concerned, the general results described in the literature (Bergstrand, 1985; Deardorff, 1995; Urata & Okabe, 2007) still hold. Distance plays a significantly negative influence on trade whereas an increase in GDP size boosts exports. Nevertheless, this model probably depicts biased results because of the absence of control for unobserved heterogeneity. Models (2) and (3) introduce multiple fixed effects. Except from the variable stating the existence of another regional free trade agreement between countries i and j, all the other variables are omitted. They are indeed absorbed by the exporter-time fixed effects, importer-time fixed effects, and country-pair fixed effects. If the linear regression model with multiple fixed effects predicts a slightly positive effect of CETA - though non-significant - on trade for the two variables of interest, Poisson regression predicts the exact opposite. On average, bilateral trade of a pair of CETA members fall by 11.2% ($e^{-0.119} - 1$) in the two years following the introduction of the agreement. This result goes against the short-term trade increase expected in the literature. It is worth noting that all models show a positive and significant – except for Model (2) - impact of the presence of another common free trade agreement on exports. In the Poisson framework, having a common regional free trade agreement between two countries increases nominal bilateral trade by 7.5% ($e^{0.073} - 1$).

[Table 4]

Given that trade volumes and specific characteristics vary from one product category to another, we decided to go further by looking for potential heterogeneities hidden in the previous results. It is likely that some product categories drive the global coefficients more than other. As a matter of fact, a similar analysis was performed in each of the 96 HS2 product categories.[6] According to the technical impossibility of discussing all coefficients, we decided to focus on the most relevant product categories with respect to the present research question and the available categories in terms of carbon intensities.[7]

A first global result from the pooled OLS is that all gravity variables show the same characteristics as theoretically predicted in general gravity models, no matter the product category. From now on, we will only focus on coefficients obtained in Model (2) and Model (3) rather than Model (1) because of the shortcomings associated to the standard OLS that were previously discussed. [8]

[6] HS2 lists 96 product categories from 1 to 97, excluding the category 77.
[7] The 33 categories are listed in Table 7. The outputs related to each of the 96 product categories are summarized in Table 8.
[8] The analysis of the coefficients often shows huge discrepancies between the pooled OLS and the other models, going to flips of signs.

1) Top 3[9] most exported products in the OECD [10] in 2013 [11]
    - Category **27** – Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes.
    - Category **84** – Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof.
    - Category **87** – Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof.

Models (2) and (3) in Table 5a predict a plunge in exports of product category 27 in the wake of CETA, both regarding pairs of member countries as pairs of countries with only one CETA member (in comparison with pairs of non-CETA countries). If the coefficient of *ceta_both* is significant in Model (2), significance shifts to *ceta_one* in the Poisson specification. The model forecasts a decrease in nominal bilateral trade by 39% following the implementation of CETA in one of the two countries involved in a trade relationship as compared to the situation where none of the two countries entered CETA. Having already an existing FTA between a pair of countries seems to play a positive but still insignificant influence on exports.

With regard to Category 84, Table 5b shows that the introduction of CETA only significantly affects trade values for pairs of countries in which one of the two countries is an effective CETA member. In this case, exports of category 84 from country *i* to country *j* soar by almost 20%. The increase in exports observed in the short run is in line with the scale effect usually identified in the literature (Gozgor et al. 2017; Nemati et al., 2019). Interestingly, the presence of another FTA affects exports of products listed in category 84 slightly negatively. One possible explanation could be the presence of strong regulations surrounding nuclear components. However, the effect remains totally insignificant.

Model (3) in Table 5c predicts a sharp and significant decrease – at the 5% level - in bilateral trade of Product 87 for pairs of CETA countries as well as for pairs of CETA/non-CETA members – although only significant at the 10% level – as compared to pairs of non-CETA members. Exports shrink to a larger extent in the former case; CETA induces a decrease in exports by 44% as soon as a pair of country belong to the agreement, against a 34% decline otherwise. This might evidence the influence of environmental regulations embodied in CETA.

[Tables 5a – 5b – 5c]

9 From Figure 2.b.
10 Including the 27 EU Members States
11 2013 is the initial year in our data; it will therefore be considered as the reference period. It is also worth noting that Product 27 is amongst the most carbon intensive products according to the ranking made available by J. Shapiro. Product 84 lays in the middle of the ranking whereas Product 87 can be found amongst the least carbon intensive product categories.

2) Top 3 most polluting product categories in terms of carbon intensity (Shapiro, 2020)
   - Category **31** – Fertilizers
   - Category **72** – Iron and steel
   - Category **68** – Articles of stone, plaster, cement, asbestos, mica or similar materials

Even though they share common patterns in terms of carbon intensity rates, the three products categories take very different paths. Category 31 in Table 6a shows one of the largest decreases in nominal bilateral trade (both for *ceta_both* and *ceta_one*). Model (2) predicts an insignificant 39% and 37% decrease, respectively. In Model (3), the decline is even sharper with a highly significant 73% and 62% decrease in trade after the implementation of CETA, as compared to trade patterns of pairs of non-CETA countries. One hypothesis explaining this decline is the anticipation of the new European Fertilizing Products Regulation that fully applies since 2022, allowing the commercialization of fertilizers only if they comply with these stricter environmental and safety requirements.[12] As soon as product categories 72 and 68 are concerned, the trade pattern is completely reversed. Models (2) and (3) in Table 6b detect one of the largest increases in exports values for category 72, significant at the 1% level. Bilateral trade between CETA members more than double whereas it inflates by 197% when it comes to a pair CETA-non-CETA members as compared to the control group. Table 6c illustrates that product category 68 follows approximately the same path, although none of the coefficients are significant. These two last categories are nevertheless amongst the most striking examples of the scale effect that boosts trade, and potentially pollution, in the first years following the introduction of an FTA, here CETA.

[Tables 6a – 6b – 6c]

3) Top 3 less polluting product categories in terms of carbon intensity (Shapiro, 2020)
   - Category **17** – Sugars and sugar confectionery
   - Category **26** – Ores, slag and ash
   - Category **22** – Beverages, spirits and vinegar

The less polluting category according to Shapiro's theory, i.e., category 17, sees a significant – at the 1% level – decrease in nominal bilateral trade which is slightly stronger if both countries *i* and *j* entered CETA (-35%) than if only of the two did so (-31%). Same signs applied to product categories 26 and 22 but results are not significant.

4) Amongst the relevant categories for which we lack carbon intensity rates, we can briefly mention the following[13]:

i. Top 3 less exported products in the OECD in 2013
   - Category **46** – Manufactures of straw, of esparto or of other plaiting materials; basketware and wickerwork.

[12] European Parliament. (s. d.). Review of the Fertilizing Products Regulation | Legislative Train Schedule. Retrieved from https://www.europarl.europa.eu/legislative-train/theme-environment-public-health-and-food-safety-envi/file-review-of-the-fertilising-products-regulation?sid=301&fbclid=IwAR1WXbBnPB8F5_nq-mWh5Ojk-mv3WoNw5exjgnls_HIcJUPfrpCKwyJDSQ8

[13] See Table 7 in the Appendices.

- Category **14** – Vegetable plaiting materials; vegetable products not elsewhere specified or included.
- Category **66** – Umbrellas, sun umbrellas, walking-sticks, seat-sticks, whips, riding-crops and parts thereof.

As soon as the less exported products in the OECD are concerned, few results are worth highlighting. Only the coefficients associated to *ceta_one* are significant at the 10% and 1% level for categories 14 and 66, respectively. If the former is strongly positive, the latter shows a decline in trade close to 32% after the implementation of CETA in one of the two countries.

ii. Top 5 most traded products between Canada and the EU28 [14] in 2013

On top of the product categories 27, 84, and 87, one can cite categories 71 and 30 amongst the most traded between the EU28 and Canada.

- Category **71** – Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal, and articles thereof; imitation jewelry; coins.
- Category **30** – Pharmaceutical products

Exports show a negative but insignificant trade pattern after CETA for category 71. Likewise, the coefficient of *ceta_both* is negative (-24%) and slightly significant when it comes to pharmaceuticals.

Several general conclusions can be drawn from the previous analysis. Overall, the Poisson specification predicts a decrease in trade between CETA members. This result goes against the scale effect that is expected to boost trade and transport in the years following the implementation of an FTA. However, the literature has shown that it is extremely difficult to identify trade creation and/or diversion related to the implementation of an FTA. Konstantinos et al. (2010) mention the discrepancies in the empirical results studying the impact of FTAs on trade; for instance, they highlight that some authors did not expect any change in trade patterns in the short run for NAFTA while very long-term positive effects were found (Egger, 2004). Others found a slight trade diversion (Fukao et al., 2003). Other trade agreements have led to neither trade creation nor trade diversion such as the Latin American Free Trade Agreement (Endoh, 1999). Moreover, it is at this stage impossible to identify any technique or composition effects that might boil down trade and/or pollution in the (very) long term.

Regarding trade by product categories, it is extremely difficult to identify the underlying reasons explaining either trade creation or diversion after the implementation of CETA. If some product categories fit the expected scale effect in the short run, many others see a significant decrease in trade following CETA, no matter their polluting power and whether the pair of countries entirely belong to CETA or not. Besides specific regulations that might have been introduced and the large hidden heterogeneity within each product category, CETA is very recent FTA that has yet to be ratified by all its members, which could make a difference as compared to the other FTAs analyzed in the literature.

[14] Note that products 71, 84, and 27 were the most exported from Canada to the EU in 2013. Similarly, products 84, 87, and 30 are the most exported from the EU to Canada.

One could only potentially hypothesize a trade diversion trend (from non-CETA to CETA partners) in product categories that show a positive and significant increase in exports when two CETA-members entered the agreement whereas a significant decrease when only one country in a pair of trading partners is a CETA member.

Finally, there are sometimes huge discrepancies between the three specifications. If the pooled OLS does not take into account any fixed effects, the differences between Models (2) and (3) might be somewhat explained by the fact that the Poisson regression takes zero values into account. The latter are numerous in our dataset since we deal with small trade values when it comes to trade by product categories (in 1000USD).

b) Relationship with carbon intensity rates

The last step of this analysis was meant to identify the potential impact of CETA on pollution, an indirect relationship that could occur through the change in trade patterns induced by the newly implemented FTA. We regressed successively the transformed CETA coefficients found in the three previous regressions on CO2 intensity rates of each product category. We especially focused on the specification using the coefficients obtained from the best-fitted model, i.e., the Poisson Pseudo-Maximum Likelihood Estimator. Unfortunately, regressing nominal trade elasticities for CETA implementation based on CO2 intensity rates per product category does not yield significant and robust results, especially because of the small sample size and potential omitted variable biases. Nevertheless, it is interesting to stress that at first glance, the results would suggest that the highest the CO2 intensity of a product category, the stronger the relationship CETA-exports, which could be further interpreted as an increase in the exports of the most polluting products following the implementation of CETA. In addition, this influence seems stronger among pairs of trading countries being part of CETA than among pairs in which only one of the countries is part of it. Such a result would go against the reduction of emissions predicted in Birdsall & Wheeler (1993) after the implementation of an FTA but would concord with Managi et al. (2008) and the scale effect predicting a positive impact of CETA on pollution in the short run (which is the case considered in this paper). Again, the impact of FTAs on the environment depends on the type of agreement and regulations (Nemati et al, 2019). Nevertheless, we again acknowledge the impossibility of reaching any clear-cut conclusions based on our results and hope to find better-suited data in the future to conduct a deeper analysis.

In order to assess, from a descriptive perspective, the relationship between the effect of CETA on trade and CO2 intensity rates, we decided to plot the CO2 intensity rates (tons for 1000USD) on expected average trade variation between a pair of countries entering CETA for each product category based on Pseudo Poisson Maximum Likelihood Model coefficients transformed into elasticities. Figures 2 and 3 suggest descriptively that there is no straightforward relationship between CO2 intensity rates and the expected impact of CETA on trade, for neither of the CETA dummies. Some outliers are nevertheless worth being briefly discussed.

- Category **72**: CETA is expected to have the highest percentage trade increase in both cases on “Iron & steel” which are part of the most carbon-intensive product categories. The change in CO_2 emissions for society would potentially be strong since this category is part of the top 10 most traded products from Canada to OECD countries.
- Category **4**: Part of the lesser carbon-intensive product category, one or both countries of a pair being part of the agreement is expected to have increased trade flow for the “Dairy products & others”. Nevertheless, the category is also part of the less-traded product categories overall. For instance, it nominally represented one-sixth of “Iron & Steel” exports in USD in 2019 for all countries.
- Category **31** & Category **10**: Fertilizers and cereals are, respectively, part of the more intensive carbon rates categories. While the first is part of the most polluting products to be traded, it is negatively impacted by the implementation of CETA in both cases. On the contrary trade of cereals, which are less carbon intensive than the latter but still part of the most polluting, is supposed to increase for *ceta_one* and *ceta_both.*

It is worth noting that the sign of trade variation due to CETA can vary depending on the dummy. Still, most of the time, the effect of the agreement on trade seems to follow similar patterns comparing elasticities of *ceta_one* compared to *ceta_both* for each product category.

Notwithstanding, heterogeneity lies amongst aggregated nominal value of each product category. We considered elasticities reflecting the impact of CETA on the trade growth of product categories. The market share of each product category should be taken into account when more variables about CO_2 intensity are made available to reflect the overall impact of different categories' production changes on carbon emissions. No pure inference can come from those descriptive results, still future research could further explore those patterns to corroborate them. Research on trade diversion and diversification could complement our analysis, in order to distinguish new trade growth from trade diversion.

Figure 3 - Relationship between CO2 intensity rates and *ceta_both* impact on trade

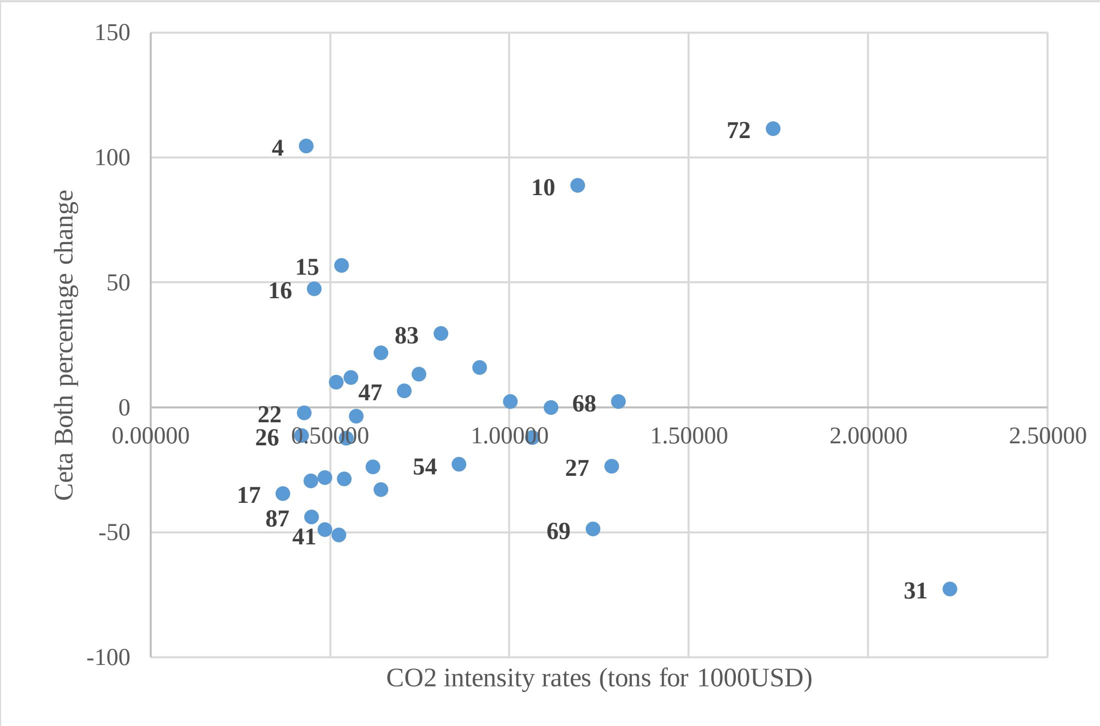
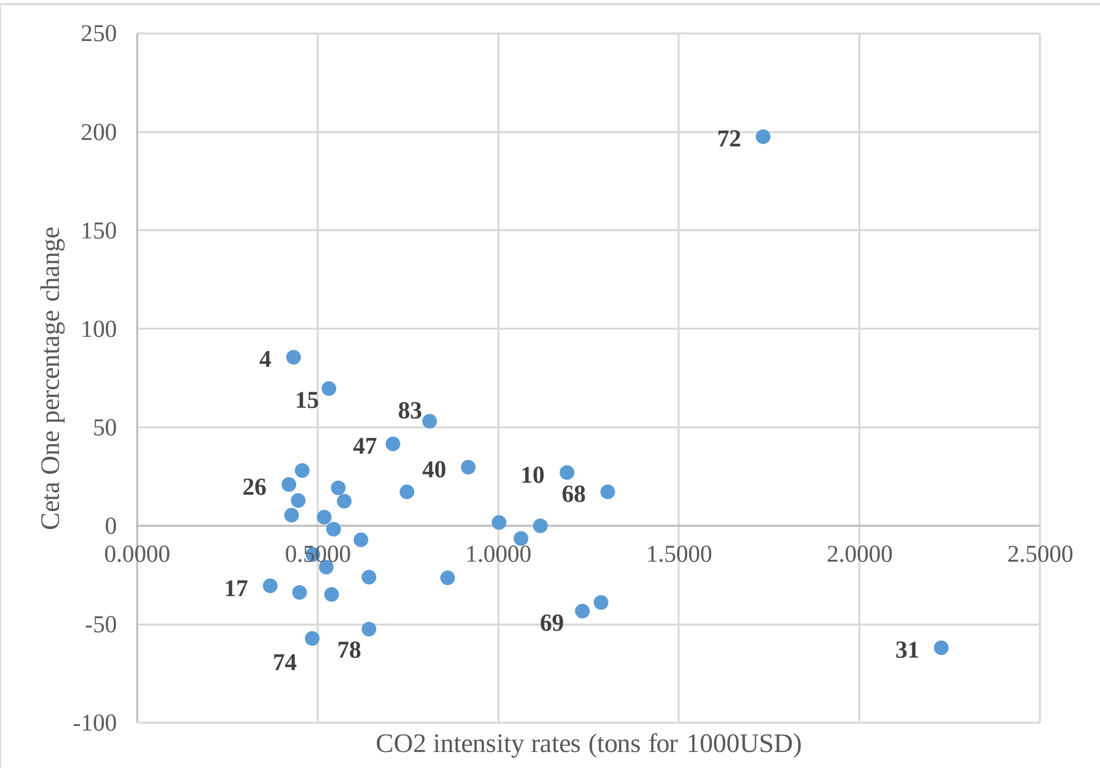


Figure 4 - Relationship between CO2 intensity rates and *ceta_one* impact on trade



Source: Constructed by the authors

c) *Robustness*

Preliminary robustness checks whose results were previously mentioned have been performed in this analysis. Besides this, we decided to test the robustness of our results by successively dropping the first two years of the period of interest; the reason being that the values of Canada-EU bilateral trade broadly differ depending on the currency used. Currency exchange rates indeed varied strongly between 2013 and 2019. While 1 USD was equivalent to 0.75 EUR in 2013 and 2014, its value rose to around 0.90 EUR for the years 2015 to 2019. Our trade data being expressed in USD, the observations for 2013 and 2014 are not depicting the rising trend for bilateral trade between Canada and the EU when expressed in Euro. Furthermore, the inflated values could drive the results obtained previously. A regression from 2015 to 2019 - i.e., dropping 2013 and 2014 - showed negligeable changes for the OLS coefficients (fixed effects included or not) but greater variations regarding pseudo-Poisson maximum likelihood coefficients, probably due to the underlying assumptions of the latter. Nevertheless, this should not jeopardize the validity of our results. Future research can consider directly translating data in EUR.

IV. Limitations

Several limitations to the present analysis are worth being highlighted. As soon as the empirical strategy is concerned, it is technically impossible to identify which of the exporting or importing countries is a CETA member in the case in which only one of a trading pair of countries entered CETA in 2017. Besides omitting the coefficients related to the standard gravity variables in the two last specifications, the fixed effects absorbing country-specific characteristics prevent us from differentiating or individualizing exporting from importing countries. In addition, this analysis relies on HS categories at the two-digits level, which aggregate sub-categories of products. The effects on trade are likely heterogenous within each product category.

Furthermore, regressing nominal trade elasticities for CETA implementation based on CO2 intensity rates per product category did not lead to significant and robust results. Lacking data on CO2 intensity rates by product, we decided to rely on J. Shapiro's data. The first issue was that the CO2 intensity rates have currently been computed for one year, for 33 categories. The few observations for CO2 rates per product category did not give a chance to broaden to analysis to all categories of the HS2 database. Considering intensity rates to be constant over time did not lead to significant results. Carbon intensity rates likely vary over time following the technique effect and the impact of innovation.

Another cause for concern is the relatively newness of the analysis performed in this paper. We previously underlined that trade patterns for some product categories did not follow the theoretical expectations regarding the implementation of Free Trade Agreements identified in the literature. We acknowledge the difficulty in properly identifying the reasons underlying a change in trade patterns when it comes to product categories. Besides a lack of theoretical references focusing on trade patterns by product categories, the large variety of results might be highly correlated to the implementation of specific regulations and obligations in CETA or in other trade agreements, impacting specific product trade at an unobserved level.

Finally, the present paper focuses on a very short-term time period (only two years after CETA's implementation). The literature often highlights the long-term effects of FTAs that cannot be identified in this analysis. One should also bear in mind that CETA has not yet been ratified by the entirety of its members, which is an important parameter to consider when interpreting the results.

V. Conclusion

In this paper, we have attempted at providing new insights on the relationship between trade agreements and the environment, by focusing on the Canada-European Union Comprehensive Economic and Trade Agreement (CETA) and its impact on bilateral trade of polluting categories of products.

Our findings indicate diverging impacts of CETA on trade, depending on the considered model. The ordinary least square regression and the linear regression with fixed effects both estimate that trade between a pair of CETA countries increases following the implementation of the agreement, while the Poisson regression estimates a decrease by 11.2% in their bilateral trade volumes. This last outcome contradicts the scale effect as described in the literature, which is expected to boost trade and transport in the first years following the implementation of an FTA.

Moreover, results vary depending on the product category taken into consideration. It is worth mentioning the evolution in trade values of the most exported product categories in the OECD. Mineral fuels and oils (category 27) and vehicles (category 87) saw a decrease in their trade volumes between countries where CETA entered into force. We found a significant positive impact of CETA on exports of nuclear reactors, machinery and appliances (category 84) only for pairs of countries where only one is part of the agreement. Considering the most polluting product categories in terms of CO2 intensity, we have observed very different trade patterns following the implementation of CETA. While fertilizers (category 31) showed sharp declines in trade values, varying between 39% and 73%, bilateral trade of stone and cement (category 68) and of iron and steel (category 72) was boosted, in accordance with the scale effect.

We did not find a clear and significant estimate of the impact of CETA and the trade volumes of the most (least) polluting product categories. Indeed, we needed more data on CO2 intensity for most of our product categories, and our sample had a very limited size. We could however observe a slightly positive correlation between CO2 intensity rates and growth in bilateral trade resulting from CETA. This correlation seemed stronger for pairs of countries both of CETA than among pairs in which only one of the countries is part of the agreement. The product categories that saw the largest differences in trade growth were the most carbon-intensive ones, with fertilizers (category 31) experiencing a significant decrease in bilateral trade, and iron and steel (category 72) showing tremendous growth in bilateral trade after the implementation of the agreement.

Our research counts several limitations. Notably, our analysis relied on HS product categories at the 2-digit level, which may mask heterogeneous effects within each category. Relying on HS product categories at the 4-digit or the 6-digit level could have provided more nuanced results. Additionally, our regression based on CO2 intensity rates per product category yielded insignificant results, due to a lack of data for most product categories and the likely variability of these CO2 intensity rates over time. Working with fixed CO2 intensity rates dismissed the possible technique effect following the implementation of a free trade agreement. Lastly, CETA has entered into force only provisionally and relatively recently. As highlighted in chapters 22 and 24 of the agreement, CETA aspires to be a progressive trade agreement, promoting sustainable development initiatives and technology sharing and enforcing international environmental commitments. Besides, the technique effect is likely to become visible only in the longer term. Therefore, more research in the future would be needed to draw exhaustive conclusions on the long-term effects of CETA on the bilateral trade of polluting goods.

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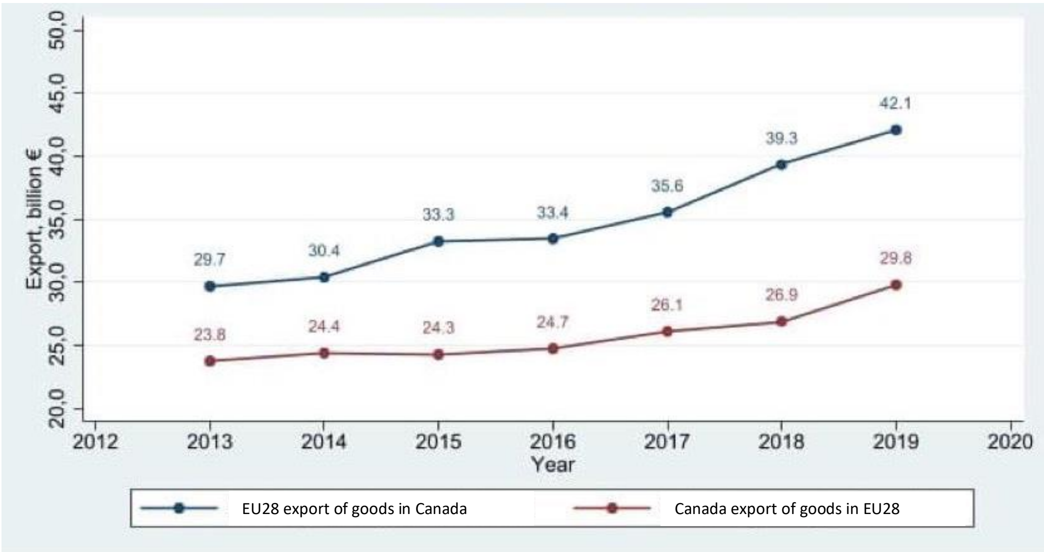
VII. Appendices

Figure 1.b – Bilateral trade between EU28 and Canada in billion USD (2013-2019)



Source: Constructed by the authors

Table 1 – OECD Members
Dates are indicated in the following format: DD/MM/YYYY.

COUNTRY	Code	OECD Member	OECD Entering Date	EU Member	CETA Provisional Application
Australia	AUS	Yes	(07/06/1971)	No	No
Austria	AUT	Yes	(29/11/1961)	Yes	Yes
Belgium	BEL	Yes	(13/11/1961)	Yes	Yes
Bulgaria	BGR	No	/	Yes	Yes
Canada	CAN	Yes	(10/04/1961)	No	Yes
Chile	CHL	Yes	(07/05/2010)	No	No
Colombia	COL	Yes	(28/04/2020)	No	No
Costa Rica	CRI	Yes	(25/05/2021)	No	No
Croatia	HRV	No	/	Yes	Yes
Cyprus	CYP	No	/	Yes	Yes
Czech Republic	CZE	Yes	(21/12/1995)	Yes	Yes
Denmark	DNK	Yes	(30/05/1961)	Yes	Yes
Estonia	EST	Yes	(09/12/2010)	Yes	Yes
Finland	FIN	Yes	(28/01/1969)	Yes	Yes
France	FRA	Yes	(07/08/1961)	Yes	Yes
Germany	DEU	Yes	(27/09/1961)	Yes	Yes
Greece	GRC	Yes	(27/09/1961)	Yes	Yes
Hungary	HUN	Yes	(07/05/1996)	Yes	Yes
Iceland	ISL	Yes	(05/06/1961)	No	No
Ireland	IRL	Yes	(17/08/1961)	Yes	Yes
Israel	ISR	Yes	(07/09/2010)	No	No
Italy	ITA	Yes	(29/03/1962)	Yes	Yes
Japan	JPN	Yes	(28/04/1964)	No	No
Korea (South)	KOR	Yes	(12/12/1996)	No	No
Latvia	LVA	Yes	(01/07/2016)	Yes	Yes
Lithuania	LTU	Yes	(05/07/2018)	Yes	Yes
Luxembourg	LUX	Yes	(07/12/1961)	Yes	Yes
Malta	MLT	No	/	Yes	Yes
Mexico	MEX	Yes	(18/05/1994)	No	No
Netherlands	NLD	Yes	(13/11/1961)	Yes	Yes
New Zealand	NZL	Yes	(29/05/1973)	No	No
Norway	NOR	Yes	(04/07/1961)	No	No
Poland	POL	Yes	(22/11/1996)	Yes	Yes
Portugal	PRT	Yes	(04/08/1961)	Yes	Yes
Romania	ROU	No	/	Yes	Yes
Slovak Republic	SVK	Yes	(14/12/2000)	Yes	Yes
Slovenia	SVN	Yes	(21/07/2010)	Yes	Yes
Spain	ESP	Yes	(03/08/1961)	Yes	Yes
Sweden	SWE	Yes	(28/09/1961)	Yes	Yes
Switzerland	CHE	Yes	(28/09/1961)	No	No
Türkiye	TUR	Yes	(02/08/1961)	No	No
United Kingdom	GBR	Yes	(02/05/1961)	Yes – exit EU on 31/01/2020	Yes – exit CETA on 31/01/2020
United States	USA	Yes	(12/04/1961)	No	No

Table 2.b – Trade trends of the five most and least exported product categories in 2013 between OECD countries + EU28 members

HS Code (2 digits)	Product Description	CO_2 rate (Tons/$) ×1000	Trade Volume, million USD				Trade Growth (%)	
			2013	*2015*	*2017*	*2019*	*2013-2019*	*2017-2019*
Panel A - Five most traded product classes								
27	Mineral Fuels, Mineral Oils	1,29	499.122	305.178	331.482	383.756	-23,1%	16%
87	Other Vehicles	0,45	479.775	501.326	541.030	557.566	16,2%	3%
84	Machinery, Mechanical Appliances, Computers, Nuclear Reactors	0,56	471.656	454.237	482.121	521.204	10,5%	8%
85	Electrical Machinery	0,57	320.937	302.939	306.277	312.981	-2,5%	2%
71	Precious Metals, Stones, Pearls	--	206.586	138.481	135.475	158.597	-23,2%	17%
Average growth of five most traded products							-4,4%	9,2%
Panel B -Five least traded product classes								
67	Prepared Feathers	--	181	167	185	185	2,2%	0%
50	Silk	--	154	118	93	86	-44,2%	-8%
66	Umbrellas And Others	--	112	109	115	119	6,3%	3%
14	Vegetable Plaiting Materials	--	96	93	106	103	7,3%	-3%
46	Manufacture Of Straw	--	85	61	67	77	-9,4%	15%
Average growth of five least traded products							-7,6%	1,6%

Notes This table shows the 2013-2019 trade trends of the five most traded and least traded products between OECD countries + the EU countries not in OECD. Intra-trade between EU countries is not considered in this table. The most traded products were chosen using 2013 data, and are ranked in a descending order. The *HS Code* and *Product Description* columns display product category information at the two digit level. The CO_2 rate is expressed in metric tons of CO_2 per thousand dollar of output, and is gathered from the Shapiro replication data, originally drawn from Exiobase Input Output database; a "--" value indicates that no CO_2 rate is not available for the selected product.

Table 4 – All HS2 product categories

VARIABLES	(1) OLS	(2) REGHDFE	(3) POISSON
ceta_both	0.438***	0.061	-0.119**
	(0.048)	(0.055)	(0.047)
ceta_one	-0.314***	0.022	-0.020
	(0.031)	(0.060)	(0.047)
Other FTA	0.184***	0.027	0.073**
	(0.059)	(0.028)	(0.030)
Distance (log)	-1.101***		
	(0.027)		
GDP_j (log)	0.733***		
	(0.014)		
GDP_i (log)	0.978***		
	(0.014)		
Access to the sea_j	0.559***		
	(0.073)		
Access to the sea_i	0.278***		
	(0.064)		
Common language	0.175		
	(0.107)		
Contiguity	1.216***		
	(0.116)		
Common colonizer	1.651***		
	(0.421)		
Constant	-19.905***	6.321***	12.495***
	(0.449)	(0.046)	(0.041)
Fixed effects	NO	YES	YES
Observations	851,205	868,381	873,004
R-squared	0.302	0.362	

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

Table 5a – Category 27

VARIABLES	(1) OLS	(2) REGHDFE	(3) POISSON
ceta_both	-0.200	-0.725***	-0.270
	(0.147)	(0.225)	(0.207)
ceta_one	-0.145	-0.377	-0.495**
	(0.108)	(0.240)	(0.248)
Other FTA	0.374*	0.004	0.113
	(0.213)	(0.267)	(0.207)
Distance (log)	-1.838***		
	(0.085)		
GDP_i (log)	0.863***		
	(0.045)		
GDP_j (log)	1.099***		
	(0.044)		
Access to the sea_j	1.994***		
	(0.201)		
Access to the sea_i	2.344***		
	(0.180)		
Common language	-0.100		
	(0.289)		
Contiguity	2.453***		
	(0.268)		
Common colonizer	2.636***		
	(0.571)		
Constant	-20.384***	8.332***	15.743***
	(1.405)	(0.320)	(0.261)
Fixed effects	NO	YES	YES
Observations	10,018	10,163	10,192
R-squared	0.453	0.902	

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

Table 5b - Category 84

VARIABLES	(1) OLS	(2) REGHDFE	(3) POISSON
ceta_both	0.318***	-0.104	0.111
	(0.069)	(0.132)	(0.069)
ceta_one	-0.140***	-0.037	0.175**
	(0.052)	(0.142)	(0.068)
Other FTA	0.028	-0.100	-0.004
	(0.103)	(0.068)	(0.031)
Distance (log)	-1.329***		
	(0.046)		
GDP_i (log)	0.942***		
	(0.020)		
GDP_j (log)	1.326***		
	(0.022)		
Access to the sea_j	0.539***		
	(0.105)		
Access to the sea_i	-1.060***		
	(0.079)		
Common language	-0.079		
	(0.150)		
Contiguity	0.219		
	(0.155)		
Common colonizer	0.937		
	(0.760)		
Constant	-23.342***	10.229***	15.116***
	(0.678)	(0.107)	(0.046)
Fixed effects	NO	YES	YES
Observations	12,013	12,245	12,256
R-squared	0.754	0.971	

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

Table 5c - Category 87

VARIABLES	(1) OLS	(2) REGHDFE	(3) POISSON
ceta_both	0.654***	-0.017	-0.580**
	(0.115)	(0.204)	(0.238)
ceta_one	-0.143*	0.144	-0.418*
	(0.081)	(0.196)	(0.232)
Other FTA	0.321**	0.210	0.039
	(0.153)	(0.132)	(0.043)
Distance (log)	-1.509***		
	(0.067)		
GDP_i (log)	0.890***		
	(0.033)		
GDP_j (log)	1.568***		
	(0.034)		
Access to the sea_j	0.446***		
	(0.150)		
Access to the sea_i	-1.430***		
	(0.170)		
Common language	-0.646***		
	(0.203)		
Contiguity	0.659***		
	(0.208)		
Common colonizer	1.717		
	(1.209)		
Constant	-26.558***	9.235***	15.921***
	(1.021)	(0.177)	(0.140)
Fixed effects	NO	YES	YES
Observations	11,147	11,353	11,398
R-squared	0.612	0.964	

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

Table 6a - Category 31

VARIABLES	(1) OLS	(2) REGHDFE	(3) POISSON
ceta_both	0.832***	-0.499	-1.300***
	(0.163)	(0.477)	(0.292)
ceta_one	-0.561***	-0.467	-0.973***
	(0.123)	(0.467)	(0.336)
Other FTA	0.232	-0.319	0.217
	(0.194)	(0.314)	(0.188)
Distance (log)	-0.789***		
	(0.086)		
GDP_j	0.504***		
	(0.046)		
GDP_i	0.542***		
	(0.048)		
Access to the sea_j	1.187***		
	(0.248)		
Access to the sea_i	1.799***		
	(0.219)		
Common language	0.802***		
	(0.246)		
Contiguity	2.611***		
	(0.274)		
Common colonizer	1.655***		
	(0.641)		
Constant	-11.512***	6.908***	12.437***
	(1.439)	(0.433)	(0.304)
Fixed effects	NO	YES	YES
Observations	7,546	7,553	7,564
R-squared	0.279	0.881	

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

Table 6b - Category 72

VARIABLES	(1) OLS	(2) REGHDFE	(3) POISSON
ceta_both	0.326**	1.105***	0.749***
	(0.130)	(0.326)	(0.129)
ceta_one	-0.236**	1.091***	1.089***
	(0.092)	(0.326)	(0.159)
Other FTA	0.357**	0.106	0.064
	(0.164)	(0.143)	(0.095)
Distance (log)	-1.616***		
	(0.068)		
GDP_j	1.008***		
	(0.036)		
GDP_i	1.189***		
	(0.039)		
Access to the sea_j	0.628***		
	(0.164)		
Access to the sea_i	-0.453***		
	(0.152)		
Common language	-0.246		
	(0.219)		
Contiguity	1.382***		
	(0.194)		
Common colonizer	2.062**		
	(1.009)		
Constant	-23.103***	7.563***	12.867***
	(1.125)	(0.238)	(0.139)
Fixed effects	NO	YES	YES
Observations	9,930	10,081	10,103
R-squared	0.517	0.930	

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

Table 6c - Category 68

VARIABLES	(1) OLS	(2) REGHDFE	(3) POISSON
ceta_both	0.121	-0.051	0.022
	(0.102)	(0.326)	(0.121)
ceta_one	-0.089	-0.104	0.157
	(0.072)	(0.329)	(0.125)
Other FTA	0.160	0.063	0.006
	(0.134)	(0.196)	(0.060)
Distance (log)	-1.355***		
	(0.059)		
GDP_j	0.868***		
	(0.029)		
GDP_i	1.167***		
	(0.032)		
Access to the sea_j	0.507***		
	(0.128)		
Access to the sea_i	-0.336***		
	(0.120)		
Common language	-0.047		
	(0.200)		
Contiguity	1.254***		
	(0.163)		
Common colonizer	2.337***		
	(0.702)		
Constant	-23.235***	6.739***	11.554***
	(0.968)	(0.298)	(0.103)
Fixed effects	NO	YES	YES
Observations	10,275	10,428	10,449
R-squared	0.567	0.936	

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

Table 7 – 33 HS2 product categories and CO2 intensity rates

HS2 code	Product Category Description	CO2 intensity rate (tons/1000 USD)
4	Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included	0.43
10	Cereals	1.19
15	Vegetable oils	0.53
16	Preparations of meat, of fish or of crustaceans, molluscs or other aquatic invertebrates	0.46
17	Sugars and sugar confectionery	0.37
21	Miscellaneous edible preparations	0.49
22	Beverages, spirits and vinegar	0.43
24	Tobacco and manufactured tobacco substitutes	0.45
26	Ores, slag and ash	0.42
27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes	1.29
31	Fertilisers	2.23
39	Plastics and articles thereof	0.55
40	Rubber and articles thereof	0.92
41	Raw hides and skins (other than furskins) and leather	0.53
44	Wood and articles of wood; wood charcoal	0.62
47	Pulp of wood or of other fibrous cellulosic material; waste and scrap of paper or paperboard	0.71
49	Printed books, newspapers, pictures and other products of the printing industry; manuscripts, typescripts and plans	0.64
54	Sewing thread of man-made filaments, whether or not put up for retail sale	0.86
61	Articles of apparel and clothing accessories, knitted or crocheted	0.54
68	Articles of stone, plaster, cement, asArticles of stone, plaster, cement, asbestos, mica or similar materials	1.31
69	Ceramic products	1.23
70	Glass and glassware	1.06
72	Iron and steel	1.74
74	Copper and articles thereof	0.49
76	Aluminium and articles thereof	1.12
78	Lead and articles thereof	0.64
81	Other base metals; cermets; articles thereof	0.75
83	Miscellaneous articles of base metal	0.81
84	Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof	0.56
85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles	0.57
87	Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof	0.45
90	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof	0.52
94	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; lamps and lighting fittings, not elsewhere specified or included; illuminated signs, illuminated name-plates and the like; prefabricated buildings	1.00

Table 8 – Coefficients and significance levels obtained from Poisson Pseudo-Maximum Likelihood Model

HS2 code	Product Description	ceta_one	ceta_both	Other FTA	Intercept	Observations
1	Live animals	-0.905 ***	-0.961 ***	-0.13	13.066 ***	6,624
2	Meat and edible meat offal	0.29	0.21	0.03	12.92 ***	7,396
3	Fish and crustaceans, molluscs and other aquatic invertebrates	-0.03	-0.14	-0.07	12.578 ***	8,541
4	Dairy produce; birds'Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included	0.618 *	0.715 **	0.105 *	12.003 ***	8,740
5	Products of animal origin, not elsewhere specified or included	0.10	-0.17	0.07	9.909 ***	7,347
6	Live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage	2.342 ***	2.38 ***	-0.05	10.933 ***	7,006
7	Edible vegetables and certain roots and tubers	0.08	-0.15	-0.02	13.086 ***	8,329
8	Edible fruit and nuts; peel of citrus fruit or melons	-0.10	-0.18	0.171 **	12.769 ***	8,637
9	Coffee, tea, mate and spices	-0.39	-0.01	0.207 **	11.478 ***	8,836
10	Cereals	0.24	0.635 *	0.00	12.605 ***	6,947
11	Products of the milling industry; malt; starches; inulin; wheat gluten	0.26	0.28	0.138 *	10.679 ***	7,811
12	Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medicinal plants ; straw and fodder	-0.05	-0.44	-0.06	12.428 ***	9,040
13	Lac; gums, resins and other vegetable saps and extracts	-0.24	-0.63	0.228 **	9.65 ***	7,172
14	Vegetable plaiting materials; vegetable products not elsewhere specified or included	1.619 *	1.00	0.27	7.125 ***	4,417
15	Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes	0.527 **	0.449 **	0.04	11.857 ***	9,304
16	Preparations of meat, of fish or of crustaceans, molluscs or other aquatic invertebrates	0.24	0.39	0.294 ***	11.218 ***	8,265
17	Sugars and sugar confectionery	-0.369 **	-0.425 ***	-0.01	11.721 ***	9,346
18	Cocoa and cocoa preparations	-0.47	-0.59	0.08	12.328 ***	8,880
19	Preparations of cereals, flour, starch or milk; pastrycooks' products	-0.13	-0.172 **	0.00	12.528 ***	9,830
20	Preparations of vegetables, fruit, nuts or other parts of plants	-0.394 ***	-0.313 **	0.06	12.354 ***	9,877
21	Miscellaneous edible preparations	-0.16	-0.331 ***	-0.06	12.153 ***	10,899
22	Beverages, spirits and vinegar	0.05	-0.02	0.05	12.829 ***	11,127
23	Residues and waste from the food industries; prepared animal fodder	-0.834 ***	-0.781 ***	0.11	12.604 ***	8,425
24	Tobacco and manufactured tobacco substitutes	0.12	-0.35	-0.19	11.873 ***	6,564
25	Salt; sulphur; earths and stone; plastering materials, lime and cement	0.19	0.26	0.08	11.143 ***	9,489
26	Ores, slag and ash	-0.32	-0.12	0.05	13.758 ***	5,256
27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes	-0.495 **	-0.27	0.11	15.743 ***	10,192
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	0.11	0.18	-0.15	12.367 ***	9,858
29	Organic chemicals	0.02	0.02	0.232 *	13.913 ***	10,348
30	Pharmaceutical products	-0.19	-0.273 *	0.03	14.537 ***	11,083
31	Fertilisers	-0.973 ***	-1.3 ***	0.22	12.437 ***	7,564
32	Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring matter; paints and varnishes; putty and other mastics; inks	-0.14	-0.11	0.01	12.302 ***	10,608
33	Essential oils and resinoids; perfumery, cosmetic or toilet preparations	-0.14	-0.223 *	-0.01	12.748 ***	11,054
34	Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles and similar articles, modelling pastes, "dental waxes" and dental preparations with a basis of plaster	0.02	0.00	0	11.969 ***	10,657
35	Albuminoidal substances; modified starches; glues; enzymes	0.21	0.28	0.02	11.011 ***	9,772
36	Explosives; pyrotechnic products; matches; pyrophoric alloys; certain combustible preparations	-0.18	-0.43	0.02	9.768 ***	5,953
37	Photographic or cinematographic goods	1.104 ***	1.057 ***	0.247 ***	10.804 ***	6,683
38	Miscellaneous chemical products	-0.378 ***	-0.451 ***	0.08	13.201 ***	11,051
39	Plastics and articles thereof	-0.02	-0.13	0.092 ***	14.021 ***	12,137
40	Rubber and articles thereof	0.258 **	0.15	0.02	12.658 ***	11,359
41	Raw hides and skins (other than furskins) and leather	-0.24	-0.718 ***	-0.191 *	11.63 ***	7,682
42	Articles of leather; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silk-worm gut)	-0.698 ***	-0.618 ***	-0.09	12.647 ***	11,011
43	Furskins and artificial fur; manufactures thereof	-0.833 **	-0.58	0.15	10.192 ***	6,799
44	Wood and articles of wood; wood charcoal	-0.08	-0.274 **	0.00	12.969 ***	10,886
45	Cork and articles of cork	-3.043 ***	-2.172 *	-0.17	13.118 ***	5,616
46	Manufactures of straw, of esparto or of other plaiting materials; basketware and wickerwork	1.33	1.26	0.899 ***	6.007 ***	5,809
47	Pulp of wood or of other fibrous cellulosic material; waste and scrap of paper or paperboard	0.35	0.06	0.275 **	11.61 ***	5,967
48	Paper and paperboard; articles of paper pulp, of paper or of paperboard	-0.18	-0.294 ***	0.06	13.287 ***	11,430
49	Printed books, newspapers, pictures and other products of the printing industry; manuscripts, typescripts and plans	-0.306 ***	-0.4 ***	0.01	12.203 ***	11,607
50	Silk	-0.77	-0.59	-0.09	10.002 ***	4,542

51	Wool, fine or coarse animal hair; horsehair yarn and woven fabric	-0.31	-0.54	0.07	10.637 ***	7,322
52	Cotton	-1.172 **	-1.051 *	-0.48	11.89 ***	8,243
53	Other vegetable textile fibres; paper yarn and woven fabrics of paper yarn	-0.14	0.15	0.19	8.646 ***	6,724
54	Sewing thread of man-made filaments, whether or not put up for retail sale	-0.31	-0.26	0.07	10.922 ***	9,196
55	Man-made staple fibres	-0.24	-0.29	-0.02	10.732 ***	8,310
56	Wadding, felt and nonwovens; special yarns; twine, cordage, ropes and cables and articles thereof	0.30	0.10	0.03	10.59 ***	10,114
57	Carpets and other textile floor coverings	-0.988 ***	-0.693 ***	0.16	11.361 ***	7,984
58	Special woven fabrics; tufted textile fabrics; lace; tapestries; trimmings; embroidery	0.29	0.27	-0.01	9.365 ***	9,051
59	Impregnated, coated, covered or laminated textile fabrics; textile articles of a kind suitable for industrial use	-0.30	-0.421 **	-0.07	11.121 ***	9,683
60	Knitted or crocheted fabrics	-0.573 *	-0.6 *	-0.04	10.657 ***	8,417
61	Articles of apparel and clothing accessories, knitted or crocheted	-0.432 **	-0.34 *	0.16	12.724 ***	11,390
62	Articles of apparel and clothing accessories, not knitted or crocheted	-0.20	-0.245 **	0.195 *	12.672 ***	11,301
63	Other made up textile articles; sets; worn clothing and worn textile articles; rags	0.10	0.14	0.09	11.068 ***	10,936
64	Footwear, gaiters and the like; parts of such articles	-1.146 ***	-1.215 ***	-0.22	13.5 ***	10,328
65	Headgear and parts thereof	0.597 ***	0.22	0.05	9.189 ***	10,134
66	Umbrellas, sun umbrellas, walking-sticks, seat-sticks, whips, riding-crops and parts thereof	-0.383 ***	-0.14	0.225 *	8.097 ***	7,388
67	Prepared feathers and down and articles made of feathers or of down; artificial flowers; articles of human hair	-0.25	-0.22	-0.04	8.57 ***	6,505
68	Articles of stone, plaster, cement, asbestos, mica or similar materials	0.16	0.02	0.01	11.554 ***	10,449
69	Ceramic products	-0.573 *	-0.671 **	0.11	11.853 ***	10,136
70	Glass and glassware	-0.07	-0.13	0.03	11.984 ***	10,980
71	Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal, and articles thereof; imitation jewellery; coin	0.02	-0.20	0.08	14.721 ***	10,087
72	Iron and steel	1.089 ***	0.749 ***	0.06	12.867 ***	10,103
73	Articles of iron or steel	-0.01	0.02	-0.09	13.372 ***	11,694
74	Copper and articles thereof	-0.854 ***	-0.676 **	0.22	12.999 ***	10,067
75	Nickel and articles thereof	0.445 *	0.07	-0.02	11.547 ***	6,252
76	Aluminium and articles thereof	0.00	0.00	0.22	12.784 ***	11,046
78	Lead and articles thereof	-0.747 **	0.20	-0.21	11.329 ***	5,166
79	Zinc and articles thereof	0.37	0.21	1.026 ***	10.292 ***	7,083
80	Tin and articles thereof	-0.50	-0.17	0.11	9.543 ***	4,880
81	Other base metals; cermets; articles thereof	0.16	0.12	0.01	11.066 ***	7,332
82	Tools, implements, cutlery, spoons and forks, of base metal; parts thereof of base metal	0.08	0.07	0.02	11.798 ***	11,225
83	Miscellaneous articles of base metal	0.425 **	0.258 *	0.00	11.756 ***	11,070
84	Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof	0.175 **	0.11	0.00	15.116 ***	12,256
85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles	0.115 *	-0.04	-0.02	14.894 ***	12,251
86	Railway or tramway locomotives, rolling-stock and parts thereof; railway or tramway track fixtures and fittings and parts thereof; mechanical (including electro-mechanical) traffic signalling equipment of all kinds	-0.08	-0.80	-0.02	12.448 ***	7,305
87	Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof	-0.418 *	-0.58 **	0.04	15.921 ***	11,398
88	Aircraft, spacecraft, and parts thereof	0.757 **	0.27	0.19	14.131 ***	9,075
89	Ships, boats and floating structures	2.733 ***	3.108 ***	1.167 **	10.515 ***	7,784
90	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof	0.04	0.10	0.105 ***	14.097 ***	12,073
91	Clocks and watches and parts thereof	0.37	0.438 *	-0.231 ***	12.726 ***	9,602
92	Musical instruments; parts and accessories of such articles	-0.359 ***	-0.267 **	0.03	10.062 ***	8,120
93	Arms and ammunition; parts and accessories thereof	-0.03	0.16	-0.08	10.927 ***	6,911
94	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; lamps and lighting fittings, not elsewhere specified or included; illuminated signs, illuminated name-plates and the like; prefabricated buildings	0.01	0.02	0.04	13.231 ***	11,504
95	Toys, games and sports requisites; parts and accessories thereof	-0.09	0.03	0.04	11.944 ***	11,303
96	Miscellaneous manufactured articles	0.343 **	0.281 *	-0.05	10.759 ***	10,598
97	Works of art, collectors' pieces, and antiques	-0.65	-0.82	-0.37	13.616 ***	7,887