CETA, an ex post analysis

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Abstract

We perform an ex-post analysis of the effects of the CETA trade agreement in the agricultural, farming and food transformation sectors. We find strong evidence in support of a positive trade effect of the treaty.

We also perform a series of analyses aimed at ascertaining the effects of the treaty on various subsectors. We find overall net-positive trade effects although we can clearly identify "winners" and "losers" of the treaty.

Our analyses seem to indicate a positive trade creation effect not limited to the parties. We find evidence that the increase in trade flow between the members had a net positive effect in the form of an increase in overall international trade.

We draw some preliminary policy conclusions on the effects of the treaty.

Keywords

CETA – Gravity Equation – Trade – Poisson Regression – Cluster analysis

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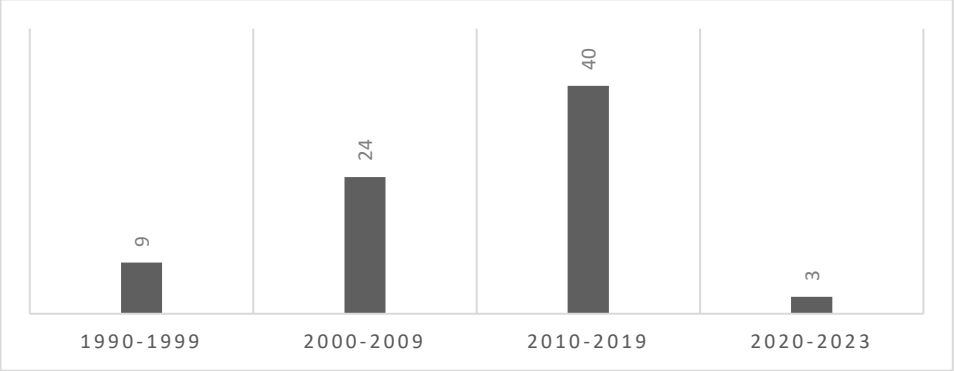
1. Introduction

The European Union (EU) is a regulatory and commercial powerhouse, but in the age of what Bhagwati (1995) calls "the spaghetti bowl phenomenon" the block has started to implement more and more bilateral and regional trade agreements to circumvent a constantly more gridlocked World Trade Organization (WTO).

Figure 1. *New EU trade agreements by decade*



From left to right we can appreciate the number of new trade agreements entered into force each decade from 1990 to 2023.

As both Mattoo et al (2022) and El Dahrawy Sánchez-Albornoz & Timini (2021) point out this spaghettization phenomenon has been constantly growing after the stall of the WTO's Doha Negotiation Round. Indeed, most of the EU's free trade agreements (FTAs) entered into force after 2005 and this is no isolated trend. At the international level the cumulative number of FTAs into force went from 50 in the early '90s to 100 in 2000, 200 in 2010 and 305 in 2020. El Dahrawy Sánchez-Albornoz & Timini (2021) makes a compelling analysis of the growth of FTAs in Latin America both within the region and between regional players and other partners. Moreover, the EU has taken a distinct approach to these new trade agreements. After 2006 as D'Erman (2020) underlines the EU adopted a new direction for its trade policy and, while reducing tariffs and quotas, it also pursued a new kind of so called "second generation trade agreements". South Korea, Colombia, Peru, and Ecuador are clear examples of FTAs that not only reduce tariffs but also non-

tariff barriers (NTBs). These agreements reduce constraints on investments, public procurement and financial services while also strengthening intellectual property rights.

The Comprehensive Economic and Trade Agreement (CETA) between Canada and the EU is one of these FTAs. CETA entered provisionally into force as of the 21 September 2017, this means that most of the treaty provisions are applicable although the ratification process of the EU Member States (EUMS) is still ongoing. To this day 2/3 of EUMS have ratified CETA while the others are at various stages of the ratification process. This partial application hasn't hindered the major components of the treaty. As such only limited dispositions on investments, financial services and audiovisuals are not in place.

In looking at CETA our aim is twofold.

On the one hand, traditional economic theory studies the effects of FTAs for consumers and export-oriented firm Ghosh & Yamarik (2004) and Baier & Bergstrand (2007). Yet, literature on the effects of the CETA is sparse at best. Most relevant papers are superficial or deal on very limited sectors and or regions (i.e., the effects of the treaty on Czech automotive or on fishing industry in the Canadian eastern seaboard in Sabau & Boksh (2017)). Furthermore, the effects of FTAs vary widely Baier et al (2019) and therefore our aim is to understand the effects of the CETA with a grounded theorical and empirical methodology.

On the other hand, most of the opposition to the treaty has come from the agricultural sectors of the EUMS. Agricultural products account for a relatively small portion of EU and Canadian trade and Gross Domestic Product (GDP), in 2020 agricultural exports amount to 205 bn USD and 18 bn USD respectively, they account to 1.34% and 3.46% of the GDPs of the EU and Canada. Yet European farmers are a vocal interest group and in countries like Italy, France and Poland, they are fearful of the effects of the agreement on local productions, rural areas, food safety, the potential impact of genetically modified organisms (GMOs) on human health, and the protection of geographic indications. These issues have caused the ratification process to

stall in a number of countries. Our aim is to assess, after the implementation of the treaty, how it affected agricultural trade at the industry level.

We analyse the effects of the CETA trade agreement on bilateral trade to draw lessons on how this agreement impacted the agricultural sector in general and the main commodity groups within it, not only with reference to the EU and Canada but also for the rest of the world. Our findings, obtained with the PPML methodology, show that the treaty positively impacted trade between the EU and Canada in the agricultural field, not only in the aggregated but also at the cluster and sub-sectoral level with very few exceptions.

After a brief literature review, we present a short analysis of the political background of the treaty, the source and structure of our dataset and our model. We analyse data on a 9 years period for 225 entities with an HS2 level detail. Subsequently, we provide a comparison of our results between the OLS and PPML estimation methodology at the aggregated level before presenting the results at the sectoral level and performing a temporal analysis to ascertain the evolution of the effects over time.

Our work confirms the existing literature on the positive effect of CETA and adds to the debate on the effect of trade agreements at deeper, dis-aggregated levels.

2. Literature review

The CETA trade agreement, having provisionally entered into force in 2017[3] is a relatively young trade agreement. In its short life most of the literature on the topic has focussed on the negotiations surrounding the treaty, its implementation, the ratification procedure in the EU Member States, and the legal mechanisms it created to manage transatlantic trade.

[3]Notice concerning the provisional application of the Comprehensive Economic and Trade Agreement (CETA) between Canada, of the one part, and the European Union and its Member States, of the other part.

Little to no attention has been paid to the actual economic returns of the treaty and its impact on the creation of welfare (Table 1). Sabau & Boksh (2017) have briefly tried to address similar topics, but in a very limited way. They focussed only on the impact of CETA on fish (HS code 03) in a detailed although extremely narrow analysis. They restricted their study both geographically, looking at the Newfoundland and Labrador provinces and economically only on the effects on the fishing industry.

Kutlina-Dimitrova (2023) has produced a broader analysis, focussed on evaluating some selected key indicators of the treaty before and after its provisional application. This work, although detailed, is a simple observation and comparison of indicators and thus does not evaluate with econometric tools the broader impact of the treaty. What Kutlina-Dimitrova (2023) found, is a general positive effect of the treaty on bilateral trade with a growth in exports for both parties, nonetheless we would like to better understand the impact of the treaty on welfare creation worldwide and not limitedly to its parties considering the agricultural sector as a whole and by sub-sectors. Our aim, thus, is to go beyond a bilateral comparison and consider the effects of the treaty worldwide both on its parties (intra-treaty effects) and on non-parties (extra-treaty trade).

Harada & Nishitateno (2021) and Timisina and Culas (2022) try to assess the effects of FTAs in the trade of agricultural commodities, and both make use of Poisson Pseudo Maximum Likelihood (PPML) estimations to ascertain the effects of said FTAs while similarly Sun & Reed (2010) analyse the trade creation and diversion effects in the agricultural market. These studies are limited by a contained geographical dataset. Timisina and Culas (2022) with 23 countries from the Asia-pacific region, Harada & Nishitateno (2021) with 27 (mostly Asian) exporters and Sun & Reed (2010) with 81 countries. Harada & Nishitateno (2021) finds strong trade creation effects in the field of wine trade while Timisina and Culas (2022) find not only strong trade creation effects but also that trade creation offsets trade diversion in the wheat trade for the countries that they take in consideration.

The traditional workhorse of ex-post analysis of trade data is the gravity model. The gravity model is usually estimated using Ordinary Least Squares (OLS) estimator. However, this estimator appears to be extremely biased, as widely debated by authors like Santos Silva & Tenreyro (2006). The OLS estimation of the gravity model appears to have (among others) one main limitations: heteroskedasticity. Issues that have also been confronted by Harada & Nishitateno (2021) and Timisina and Culas (2022).

A first attempt at resolving these issues has been presented by Anderson & van Wincoop (2003) with the introduction of the concept of Multilateral Trade Resistance (MTR). Yet MTR accounts for the traditional issues related with distance in the gravity model but does not address the root of the heteroskedasticity issue. Others have tried to achieve a better understanding of the varying role of distance like Baniya et al (2020) but without overcoming the limitations of OLS regression.

Santos Silva & Tenreyro (2006) have shown that when heteroscedasticity is accounted for the OLS estimates generate biased results. Thus, they have revolutionized the estimation of the gravity model by utilizing a PPML estimator. The coefficients of the gravity model, estimated with PPML, are much more efficient and they also account for another traditional issue of OLS gravity estimation, the presence of zeroes in the data.

In the case of zeroes, PPML allows for their inclusion without damaging the robustness of the estimations. Finally, PPML can be adapted to work with endogenous regressors (Windmeijer & Santos Silva, 1997) and panel data (Wooldridge, 1999).

In our model, building on the seminal work of Santos Silva & Tenreyro (2006) we decided to use a PPML model, further developed by the work of Correia et al (2020) on Poisson pseudo-likelihood regression with multiple levels of fixed effects. The use of Correia et al (2020) allows us to reconciliate not only the improvements brought by Santos Silva with the introduction of PPML but also the work of Anderson & van Wincoop (2003) by including MTR in the form of time-origin and time-destination fixed effects.

Table 1. *Literature review*

Anderson & van Wincoop	(2003)	Gravity with Gravitas: A Solution to the Border Puzzle
Baier & Bergstrand	(2007)	Do free trade agreements actually increase members' international trade?
Baier et al	(2019)	On the widely differing effects of free trade agreements: Lessons from twenty years of trade integration
Baniya et al	(2020)	Trade effects of the New Silk Road: A gravity analysis
Correia et al	(2020)	PPMLHDFE: Fast Poisson Estimation with High-Dimensional Fixed Effects
Ghosh & Yamarik	(2004)	Are regional trading arrangements trade creating? An application of extreme bounds analysis
Harada & Nishitateno	(2021)	Measuring trade creation effects of free trade agreements: Evidence from wine trade in East Asia
Kutlina-Dimitrova	(2023)	CETA: Evolution of Key Economic Indicators
Sabau & Boksh	(2017)	Fish Trade Liberalization Under 21St Century Trade Agreements: The Ceta And Newfoundland And Labrador Fish And Seafood Industry
Santos Silva & Tenreyro	(2006)	The Log of Gravity
Santos Silva & Tenreyro	(2022)	The Log of Gravity at 15
Sun & Reed	(2010)	Impacts of Free Trade Agreements on Agricultural Trade Creation and Trade Diversion
Timsina & Culas	(2022)	Australia's Free Trade Agreements (FTAs) and Potentiality of Wheat Exports: A Panel Gravity Model Approach
Windmeijer & Santos Silva	(1997)	Endogeneity in Count Data Models: An Application to Demand for Health Care

Most relevant literature

3. Political background of the treaty

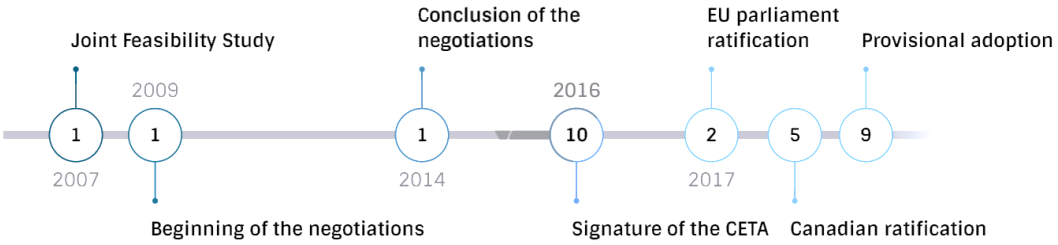
Timeline of the negotiations

In 2007, the EU and Canada agreed on the production of a joint study to assess the feasibility of a trade agreement between the parties.

After the adoption of a joint document in 2009 an intense round of negotiations started. The negotiations culminated in 2014 with the conclusion of negotiations and the beginning of a legal review, and translation, period.

The treaty was formally signed in Brussels on the 30th of October 2016. With the approval of the EU Parliament in February 2017 and of the Canadian Authorities in May 2017, the treaty entered provisionally into force for all is member parties as of September 2017.

Figure 2. *Timeline of the CETA agreement*



Legal framework

In principle the procedure of adoption of a new treaty is as follows:

The Treaty on the Functioning of the European Union establishes (article 3) that "The Union shall have exclusive competence in the following areas: […] (e) common commercial policy".

In the traditional framework of trade policy after identifying a suitable partner(s) the Council authorises the European Commission to negotiate with a "negotiating mandate" which contains the objectives and limits of the negotiation pursued by the Commission. Council and Parliament oversight the negotiations together with the active involvement of all relevant stakeholders by the Commission. The process can last several years and be subject to

delays, suspensions, and all manners of modifications. After a text is agreed, finalised, and translated in all the languages of the EU plus those of the partner country(ies) it is submitted for adoption to the Council.

In the last stage the council can discuss the treaty. The Council can only adopt or reject the treaty, it is not possible to amend it. If the discussion is positive the Council adopts the decision for the signature of the treaty on behalf of the Union and the treaty is then transmitted to the Parliament for consent.

After the Parliament's consent the Council adopts the decision to conclude the agreement. Voting in the Council on trade matters is usually by majority vote, although a few areas require unanimity. In general, intellectual property, FDIs, related fields require unanimity.

The peculiarity of the CETA regarding investments, financial services and the creation of the dispute resolution mechanism means that the agreement goes far beyond the scope of "traditional" trade agreements.

Specifically, the scope of the treaty is such as to require that not only the Union but also the individual Member States be party to it. This as created somewhat of a contentious issue given the fact that EU national Parliaments have been tasked with ratifying the treaty together with the European Parliament.

Provisional implementation

To avoid the potential issues deriving from the lengthy adoption processes by the national Parliaments the Council of the EU, together with the Canadian Government has decided to implement provisionally the treaty pending the final ratifications of the EUMS. As outlined in a Notice released by the Commission in September 2017 the treaty entered into force as of the 21st of September 2017. Nonetheless some provisions have been suspended while the national Parliaments ratify the text.

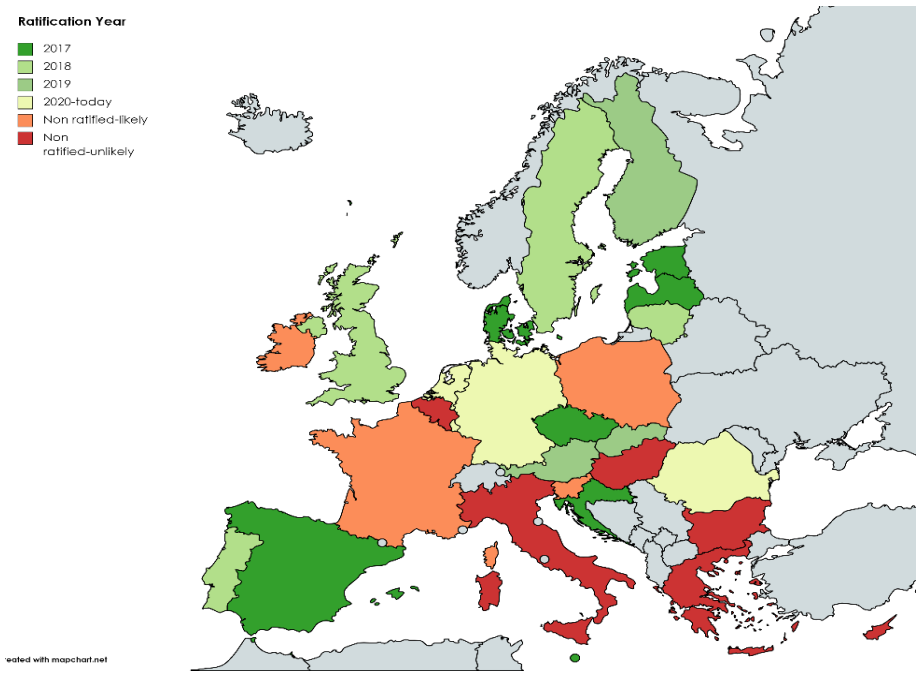
The provisions concern mainly investments, the financial sector and lastly some aspects in the field of telecommunications.

Thus, for the time being, the treaty is fully operational, with the above-mentioned limitations. All member parties are implementing it even without having ratified it and we expect a limited impact of its full adoption on agricultural trade.

Status of the ratification process

As of October 2023, two thirds of the EU Member States have ratified the agreement.

Figure 3. *Status of the ratification process in the EU by country and year*



In dark green the EUMS that have ratified the agreement in 2017, lighter green indicates 2018 and 2019. From 2020 only 3 EUMS have ratified. In red the EUMS that are still in the ratification process subdivided by likely and unlikely.

The Member States that have not ratified the agreement are Italy, France, Belgium, Ireland, Poland, Slovenia, Hungary, Bulgaria, Greece, and Cyprus. The agreement applies to them with the same extent as it applies to the other parties. In all these countries there is a cross-cutting opposition based on themes advanced by green parties. The topic of GMOs is also used widely. Apart from this kind of issues most of the opposition is of a political nature.

Ireland, France, Slovenia, and Poland are the most likely to ratify in the coming years. Ireland has internal opposition, but the issues are mostly related with the internal constitutional structure of the country. Poland and Slovenia, with the recent elections that brought the countries closer to the centre of the political spectrum are also likely to ratify. Lastly, France, despite the adoption of the agreement by the lower chamber has not tabled it at the Senate. The reasons are indicated in the limited agency of the Government over the fractured Parliament.

Of the remaining countries most of them base their obstruction to the ratification process in internal politics and are extremely unlikely to ratify the treaty. Nonetheless, Belgium is a notable exception. In the country coexist 4 elective bodies whose consent is required for ratification. Flanders, Wallonia, Brussels, and the Federal Legislative. The Federal level and Flanders have long since ratified the treaty while Brussels and Wallonia, a clear example of the country's internal divisions, have not.

4. The dataset

The dataset takes data from 225 entities over a period of 9 years, from 2012 to 2020. We have three distinct levels:

a) The aggregated one where we have a single entry for all the bilateral trade in agricultural products for a given unidirectional couple in a certain year,
b) The cluster level where we have three entries per year,
c) The industry level where we have 24 entries per year.

To build the dataset we had available data at the Harmonized System-HS6 level. The HS is the international standard for classification of exported commodities, and we aggregated the HS6 level at the HS2 level by aggregating trade data. Thus, we selected only the first 24 HS2 codes, the ones referring to agricultural trade and this forms our biggest dataset. By further aggregating the HS2 codes as per Table 2, we obtained the three

clusters and, lastly, by aggregating the three clusters we obtain the total value of agricultural exports of a given country to another in a given year.

Table 2. *Synthetic structure of the clusters*

Cluster	HS2 codes	Description
1	**From 1 to 5**	**Animals & animal products**
2	**From 6 to 15**	**Vegetable products**
3	**From 16 to 24**	**Foodstuffs**

Description of the first three cluster and allocation of the pertinent HS2 codes.

We focussed on the 2012 -2020 period since, given the provisional entry into force of the treaty in 2017, we wanted to have a good number of years, prior to the treaty, to establish the baseline for our analysis.

The source of our data is the *Centre d'études prospectives et d'informations internationals* (CEPII). The centre, a French research institution has produced the BACI dataset, an international trade database providing data on bilateral trade flows for over 200 entities at the product level (5000 products). Products correspond to the "Harmonized System" nomenclature (6-digit code). We also have data on GDP for these countries, in the form of GDP, GDP per Capita and GDP in PPP, population, distance, membership to the WTO and several other variables.

To summarize we have roughly 453 thousand observations in the first level, 1.3 million in the second and 19.5 million in the third. As is expected in the literature, the majority of observations is comprised of zeros and in the following table (Table 3) we underline the number of zeros per dataset and their ratio when compared with the observations.

Table 3. *Zeros and observations by dataset.*

Datasets	Group	HS Codes	Zeros	Observations	Ratio
Totals	Totals		268.197	453.600	**59,1%**
Clusters	All		809.543	1.360.800	**59,5%**
	Cluster 1	01 to 05	270.742	453.600	**59,7%**
	Cluster 2	06 to 15	269.419	453.600	**59,4%**
	Cluster 3	16 to 24	269.382	453.600	**59,4%**
HS Codes	HS	ALL	16.664.405	19.504.800	**85,4%**

For each of our three datasets, Totals, Clusters and HS Codes we look at the number of zeros in the trade value data and the total number of observations. We provide a ratio of the two for easier comparison.

Regarding the number of zeroes in the dataset, it is quite high, in the "Totals" dataset and in the "Clusters" one we have around 60% of the dataset composed by zeros, this escalates further when dealing with the industry (HS) level. Thus, the issue of zeros seems to play a relevant role.

5. The model

The traditional gravity model moves its steps from the gravity equation of Sir Isaac Newton. The idea behind it is that the exports of a country are positively dependent on the size of its economy and that of the partner country, and negatively dependent on the distance between the two.

$$X_{h,f} = G\frac{Y_h Y_f}{D} \quad (1)$$

Given the fact that the gravity equation is multiplicative in nature we can easily transform it into a linear form.

$$ln(X_{h,f}) = G + b_1 ln(Y_h) + b_2 ln(Y_f) + b_3 ln(D_{h,f}) \quad (2)$$

This equation is simply a logarithmic transformation but, as rightly pointed out by Santos Silva and Tenreyro (2006), it holds striking similarities to Newton's Law as it holds similarly striking differences. The mathematic relations within Newton's law are set in universal constants, the same cannot be said for the gravity equation. There is no set of variables that, if applied to a random sample can produce a perfect relation.

Thus, to account for deviations from theory, we need to use a stochastic version of the equation. We thus include an error term.

$$ln(X_{h,f}) = G + b_1 ln(Y_h) + b_2 ln(Y_f) + b_3 ln(D_{h,f}) + e_{h,f} \quad (3)$$

The main determinants of the exports $X_{h,f}$ are the GDP of the two countries Y_h and Y_f and the geographical distance between them, *D.* When it comes to the sign of the coefficients, we expect b_1 and b_2 to be positive and b_3 to be negative, the reasoning is that the bigger the countries the bigger the exchange of goods and that the longer the distance between them, the smaller the exchange of goods.

This equation has furthermore two relevant issues, the error term is traditionally assumed to be independent of the regressor and, contrary to universal gravitation, there is a strong possibility that trade be zero between distant and small countries.

Santos Silva and Tenreyro have shown that the issues briefly indicated above are inherent to the OLS testing of the gravity equation, even when including the multilateral trade resistance limitations introduced by Anderson and Van Wincoop (2003). They have therefore advanced an alternative transformation of the gravity equation. They argue that although, contrary to Newton's law, economic relations do not hold with the certainty of physical laws, we can expect them to hold *on average*. From this intuition they propose that economic models like the gravity equation produces the expected value of the dependent variable, for a given value of the independent variables. They argue that if y and x are linked by a constant-elasticity model of exponential form we can interpret the gravity equation as the conditional expectation of the trade flow given the independent variables.

We can therefore express the model in the following form:

$$X_{h,f} = \exp[\, G + b_1 ln(Y_h) + b_2 ln(Y_f) + b_3 ln(D_{h,f})] \quad (4)$$

We also have to take in consideration that even if the model holds on average this is not true for every *i,* thus we need to take in consideration a certain error term that guaranties us that on average y will be greater or equal to zero and that the expected value of the error term will be zero. The equation becomes as follows.

$$X_{h,f} = \exp[\, G + b_1 ln(Y_h) + b_2 ln(Y_f) + b_3 ln(D_{h,f})] + e_{h,f} \quad (5)$$

Lastly, we can account for fixed effects. Literature traditionally accounts for country-year fixed effects, $\gamma_{h,t}$ and $\delta_{f,t}$ (origin-year and destination-year), but in our model we went one step forward. Since we are dealing with several economic sectors, we wanted to account for the possible effects of market fluctuations on the result. For this reason, we included also HS2Code fixed effects,θ, when evaluating the dataset at the HS Code level. The final form of the equation considering the fixed effects is as follows:

$$X_{h,f} = \exp[\, G + b_1 ln(Y_h) + b_2 ln(Y_f) + b_3 ln(D_{h,f}) + \gamma_{h,t} + \delta_{f,t} + \theta] + e_{h,f} \quad (6)$$

Lastly, we perform our analysis with the PPML methodology as advocated by Santos Silva and Tenreyro thus allowing us the presence of zero observations and confirming that heteroskedasticity will not result in biased observations.

Apart from the typical variables of the gravity model, the two variables of main interest for this empirical analysis are trade creation and trade diversion. They are dummy variables built as follows. Trade creation is equal to 1 when both members are member of the treaty and 0 otherwise. Trade diversion will capture the trade diversion effect of the treaty, it will be 1 when only the destination is a member of the treaty and zero otherwise. Furthermore, we developed two dummies that aim at analysing other aspects of the trade diversion effect; specifically, we created Inverted Trade Diversion that assumes the value of one when only the country of origin is part to the treaty and Joint Trade Diversion that is the sum of Trade Diversion and

Inverted Trade Diversion. All these dummies assume a value of zero in the period preceding the provisional application of the agreement.

Multidimensional Distance is measured as geographical distance between capitals, and it is used as a proxy for trade costs. Other dummy variables are meant to account for other dimensions of distance. Specifically, we focus on the presence of a common border, the sharing of a common continent, the sharing of a common first language and, lastly, the sharing of an eventual second language. These variables aim at accounting for two different kinds of distance, physical and cultural. Common continent and shared border all account for shared geography and enhance possible economic ties that distance alone cannot fully grasp. Common first and second language account for cultural distance. A shared history, a shared colonial past and strong linguistic ties are often accounted for stronger trade. Well-known examples of this are the ICT sectors of India and Nigeria that benefit from a largely English-speaking population.

Building on the work of Santos Silva & Tenreyro (2006, 2022) and Anderson and van Wincoop (2003) we estimate this model by the PPML accounting for multiple fixed effects (FE). Specifically, as briefly mentioned above, we consider country-specific fixed effects and their interaction with time, and when appropriate we include HS code level sub-sector fixed effects. This model helps us solve the inherent issues of OLS estimation in several ways. First, these FE allow us to control for the presence of eventual non-absorbed heterogeneity. Second, time-origin and time-destination fixed effects allows to account for any potential country-specific time effects contained in the data, including multilateral resistance. Third, HS2 fixed effects are to control for potential heterogeneity at sub-sectoral level.

The estimation of the model would thus be:

$$X_{h,f,t} = \exp[\, G + b_1 ln(Y_{h,t}) + b_2 ln(Y_{f,t}) + b_3 ln(D_{h,f}) + b_4 TradeCreate_{h,f,t} + b_5 TradeDivert_{h,f,t} + b_6 ComLang_{h,f} + b_7 Com2Lang_{h,f} + b_8 Contig_{h,f} + b_9 ComCont_{h,f} + \gamma_{h,t} + \delta_{f,t} + \theta\,] + e_{h,f} \quad (7)$$

Table 4 provides a summary of the expected signs of the coefficients resulting from the estimation of equation (7).

Table 4. *Expected sign of the coefficients*

b_1	Negative, we expect closer countries to trade more than distant ones
b_2	Positive, we expect bigger countries to export more
b_3	Positive, we expect bigger countries to import more
b_4	Positive, we expect the treaty to have a positive effect on its parties
b_5	Ambiguous, leaning negative, the treaty might lead to trade diversion, nonetheless the expected effect is ambiguous since such diversion effects might be balanced by the creation of new trade
b_6	Positive, the sharing of a common language is a trade facilitator, and we expect countries that share one to trade more with each other
b_7	Positive, the sharing of a second common language is a trade facilitator as well, and we expect countries that share one to trade more with each other
b_8	Positive, we expect contiguous countries to trade more than non-contiguous ones
b_9	Positive, we expect countries that share the same continent to trade more than countries that are much further away from each other

Expected sign of the coefficients and explanation

Furthermore, to test the robustness of our analysis, we will perform OLS estimations with and without FE and evaluate it together with the PPML[4] analysis.

Lastly, in our analysis we identified a problem well known in the literature, that of multicollinearity for variables such as GDP and trade diversion. Cheong

[4] We will use the PPMLHDFE command of Stata as developed by Correia et al (2020). This type of command allows for a series of improvements on the traditional PPML testing. The most relevant for us is a substantial reduction of calculus required to perform the regression and the vast capacity to accommodate a high number of FE.

et al (2015) address it in their work and correctly identify that the contemporary estimation of trade creation and trade diversion together with time-origin and time-destination fixed effects causes multy collinearity.

6. Results

Table 5. *PPMLHDFE and OLS estimates*

Dependent Variable:	*Exports*		*Ln Exports*		*Ln Exports*	
	PPMLHDFE		OLS		OLS	
	Baseline estimates		Baseline		Time FE	
Ln Distance	-0,828	***	-1,453	***	-1,458	***
	0,01		0,01		0,01	
Ln GDP origin	(.)		1,286	***	1,285	***
	.		0,00		0,00	
Ln GDP destination	(.)		0,973	***	0,975	***
	.		0,00		0,00	
Contiguity	0,873	***	2,221	***	2,215	***
	0,03		0,09		0,09	
Common continent	0,144	**	0,697	***	0,697	***
	0,05		0,05		0,05	
Common language	-0,019		2,730	***	2,727	***
	0,04		0,07		0,07	
Common second language	1,221	***	1,510	***	1,500	***
	0,07		0,21		0,21	
Trade Creation	0,840	***	3,566	***	3,404	***
	0,05		0,04		0,04	
Trade Divertion	(.)		1,631	***	1,473	***
	.		0,04		0,04	
Importer-time FE	yes		no		no	
Exporter-time FE	yes		no		no	
Time FE	no		no		yes	
Pseudo R-squared	0,91		0,32		0,32	

Observations	306.176	309.502	309.502

Main results, from left to right PPML with FE results, OLS without FE results and OLS with time FE results. The (.) indicates a variable dropped because of collinearity. *p < 0.1, **p < 0.05, ***p < 0.01.

Firstly, the correlation between the variables included in our main equation does not show any issue (Annex 2).

In table 5 we find strong evidence of positive effects of the treaty on bilateral trade between the EUMS and Canada.

Trade Creation is positive and significant, this indicates that the parties to the treaty have, in general, benefitted from an increase in trade in the agricultural sector taken as a whole. The interpretation of the coefficient is as follows; given that our dependent variable is not in logarithmic form while our regressors are, the coefficients represent a semi elasticity thus we have to apply the exponential function in the following form $100 * (\exp(\beta) - 1)\%$ this means that the presence of CETA increased agricultural trade between its member parties by 131,6%. This is in line with existing literature on the effects of FTAs such as Magee (2017).

Trade diversion, on the other hand is more complicated. The design of the PPML test meant that the variability of Trade Diversion is completely absorbed by the origin year and destination year controls and thus it is not possible to obtain a measurement of the effect. The OLS regressions both with and without time-related fixed effects seem to indicate a positive sign for trade diversion in opposition to our expectations. This, although not definitive is an interesting finding pointing out to a possible generalized positive effect of the treaty not only in the creation of trade between its parties but also with non-parties to the treaty.

Limiting our evaluation at the PPMLHDFE regression we can also comment on the other coefficients. The sign of distance is as expected negative, and its coefficient is significant. GDP, both for origin and destination, suffers of the same issues of trade diversion, the variability is absorbed by our controls and thus it is not possible to measure the outcome. Regarding our geographical dummies they are all consistent with our expectations, with the exception of

Common Language. The presence of a common second language seems to have the strongest effect on trade, followed by contiguity and lastly by the sharing of the same continent. The presence of a common first language has a more ambiguous effect. Both in size and in significance it is not possible to address its impact on trade.

Looking more in detail on the aforementioned OLS regression we can assess that the results, although broadly consistent, show a certain degree of difference. The inclusion of time related FE (third column of table 5) has only a small impact on the estimations obtained without them. The effects of distance on trade appears slightly underestimated when including FE while the effects of Origin and destination GDP are slightly over and underrepresented by the non-controlled analysis.

All the geographical dummies appear to have significant and positive effects on trade. Our analysis indicates that while both cultural (common 1st and 2nd language) and geographical (common continent or shared borders) proximity increases trade, cultural proximity seems to have, cumulatively, a stronger effect. This is very similar to what we can observe in the PPML regression for the same variables, although with the aforementioned small significance of common language.

To give more depth to these evaluations we performed a series of alternative OLS estimations where we considered alternatives to GDP as a measure of economic size (annex 4). In these estimations we find consistent results for trade creation and trade diversion, they are both positive and significant in every alternative specification of the Gravity we implemented. Similarly, our cultural and geographical distance dummies, all show consistently positive and significative effects on trade and confirm our previous finding that cultural distance dummies have, cumulatively, a stronger effect that geographical distance ones.

Furthermore, in order to conclude the OLS-related aspects of this research we present the results of a Breusch-Pagan Test and of a Test aimed at evaluating the impact of Zeroes in our dataset.

The Breusch-Pagan Test, which we perform on the non-standard-error-robust OLS estimates, leads us to refuse the null hypothesis (the residuals are distributed with equal variance) and indicates the presence of heteroscedasticity in the data, thus hindering the validity of OLS estimations. The Probability-Chi-squared comparison is significant at a higher than 99.9% level.

Lastly, drawing from the lessons of the traditional difference-in-difference analysis we also wanted to assess one more hypothesis: that the observed effect is depending on the treaty, and, that the control group and its peculiar characteristics vis-à-vis the treatment group are not defining of the effects of the treaty. To evaluate this consideration, we identified a series of smaller control groups with characteristics that are comparable with the countries interested by the CETA trade agreement. We than evaluate how results variate when altering the control group(s). Therefore, we selected eight groups of nations to each of whom we added the EUMS and Canada. With these nations as a constrain we performed our analysis and found the results in Table 6. Our selection criteria are size of the sample, homogeneity of the sample (be it in the form of geographical proximity or of similar economic conditions), relations with the EU and Canada and lastly relevance to the international trade environment.

In general, when comparing these alternative samples, we can drive three main conclusions: varying the sample has an impact on trade creation but the direction of the effect is not questioned. Varying the sample does not hinder the significance of our regressions. And, lastly, when restricting the analysis of the effects of the treaty it appears to have produced stronger trade creation effects vis-à-vis richer countries or, in general, for countries that account more for the EU's agricultural imports. There seems to be a relationship between higher relative GDP size of countries and higher relative trade creation effects of the treaty. We also have consistent results on stronger, cumulative effects of our cultural distance dummies on trade vis-à-vis our geographical distance ones.

Table 6. *PPMLHDFE and alternative geographical estimations.*

Dependent Variable: Exports

	Baseline estimation	Former Soviet nations	Developing Nations in the Americas	Developing Nations in the Asia and Oceania	Developed Nations	Least Developed Countries	Least Income Countries	High Income Developing Countries	OECD
Ln Distance	-0,828 ***	-0,868 ***	-0,811 ***	-0,837 ***	-0,908 ***	-0,822 ***	-0,822 ***	-0,809 ***	-0,862 ***
	0,01	0,02	0,02	0,01	0,01	0,02	0,02	0,01	0,01
Ln GDP origin	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
	.	.	.	.	.	.	.	.	.
Ln GDP destination	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
	.	.	.	.	.	.	.	.	.
Contiguity	0,873 ***	0,650 ***	0,768 ***	0,774 ***	0,740 ***	0,716 ***	0,712 ***	0,829 ***	0,884 ***
	0,03	0,030	0,04	0,03	0,03	0,03	0,03	0,03	0,03
Common continent	0,144 **	0,770 ***	0,838 ***	0,334 ***	0,300 **	0,516 ***	0,540 ***	0,292 ***	0,472 ***
	0,05	0,090	0,06	0,08	0,12	0,06	0,06	0,06	0,09
Common language	-0,019	0,224 ***	0,129 **	0,021	0,182 ***	0,191 ***	0,193 ***	0,056	-0,117 **
	0,04	0,040	0,05	0,05	0,04	0,04	0,04	0,05	0,04
Common second language	1,221 ***	0,996 ***	0,716 ***	1,648 ***	0,782 ***	0,467 *	0,810 ***	1,598 ***	1,239 ***
	0,07	0,100	0,14	0,10	0,13	0,19	0,14	0,14	0,17
Trade Creation	0,840 ***	1,412 ***	0,677 ***	0,821 ***	1,179 ***	0,329 ***	0,399 ***	0,781 ***	0,960 ***
	0,05	0,110	0,09	0,07	0,06	0,07	0,08	0,07	0,06
Trade Divertion	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
	.	.	.	.	.	.	.	.	.

Importer-time FE	yes	.	yes	yes	yes	yes	yes	yes	yes
Exporter-time FE	yes	.	yes	yes	yes	yes	yes	yes	yes
Pseudo R-squared	0,91	0,930	0,93	0,93	0,94	0,92	0,95	0,92	0,92
Countries	225,00	46,000	51,00	53,00	55,00	63,00	72,00	74,00	77,00
Observations	306.176	61.919	96.338	106.722	130.183	77.864	104.730	122.332	67.291

The table shows the PPML (Poisson pseudo-maximum likelihood) estimation results with constrains imposed on the groups of countries analysed. The first column is the general regression as performed on the general dataset. The (.) indicates a variable dropped because of collinearity. *p < 0.1, **p < 0.05, ***p < 0.01

7. Causal effects evaluation

In assessing the results of our analysis, we decided to ascertain more thoroughly the causal effects of our variables. The debate on the causal effect between trade volumes and the creation of an FTA has indeed been raging for quite some time. Baier and Bergstrand (2007) indeed posed themselves the same question. After all, the traditional gravity equation, when considering the opening of an FTA considers it as an exogenous variable, which, obviously, it is not. The question we pose is thus the following: the strengthening of the trade volumes between the EU and Canada is the reason for the establishment of CETA or is it the effect of the agreement?

We thus performed Vector autoregressive model and deriving from it we arrive at a Granger test[5].

Granger test, results, and interpretation

Table 7. *Results of the granger causality Wald test*

Granger causality Wald test

Equation	Excluded	chi2	df	Prob > chi2
export value	trade creation	6,450	1	0,011
export value	trade diversion	18,100	1	0,000
export value	ALL	24,130	0	0,000
trade creation	export value	.	0	.
trade creation	trade diversion	27,210	1	0,000
trade creation	ALL	27,210	1	0,000
trade diversion	export value	.	0	.
trade diversion	trade creation	66,340	1	0,000
trade diversion	ALL	66,340	1	0,000

[5] We use the standard *var* command on Stata to fit a multivariate time-series regression of each dependent variable on lags of itself and on lags of all the other dependent variables. Furthermore we use the standard *vargranger* command to estimate the Granger causality Wald Test.

The first row of the test clearly indicates at an approximately 1% level (P-value 0.01) that the lagged effects of trade creation influence the export value. Similarly, we could say that trade diversion has a causal effect on export value.

Rows two and three are ambiguous. The Granger causality Wald test is designed to avoid situations in which Chi2 is negative and when these occur it states that the data available is insufficient to perform its analysis, thus it is not possible for us to clearly rule out a causality effect between export value and trade creation or diversion.

There is an unambiguous relation between trade creation and diversion but that is entirely dependent on the design of the two dummies.

Alternatives to the Granger test

Regarding the causality nexus between trade creation and export value, in order to further strengthen our results, we performed an analysis similar to the Granger test, in concept, to confirm the validity of our findings. After creating two alternative variables to trade creation, respectively lagged one and two times, we performed our linear regression and then tested the hypothesis that their coefficients are equal to zero. The null hypothesis will thus be that they are equal to zero while the alternative hypothesis is that they are different from zero with a t-test. The results, chi2(2)=280,34 and Prob>chi2=0,000 seem to suggest the existence of Granger causality between the presence of the trade agreement and trade value.

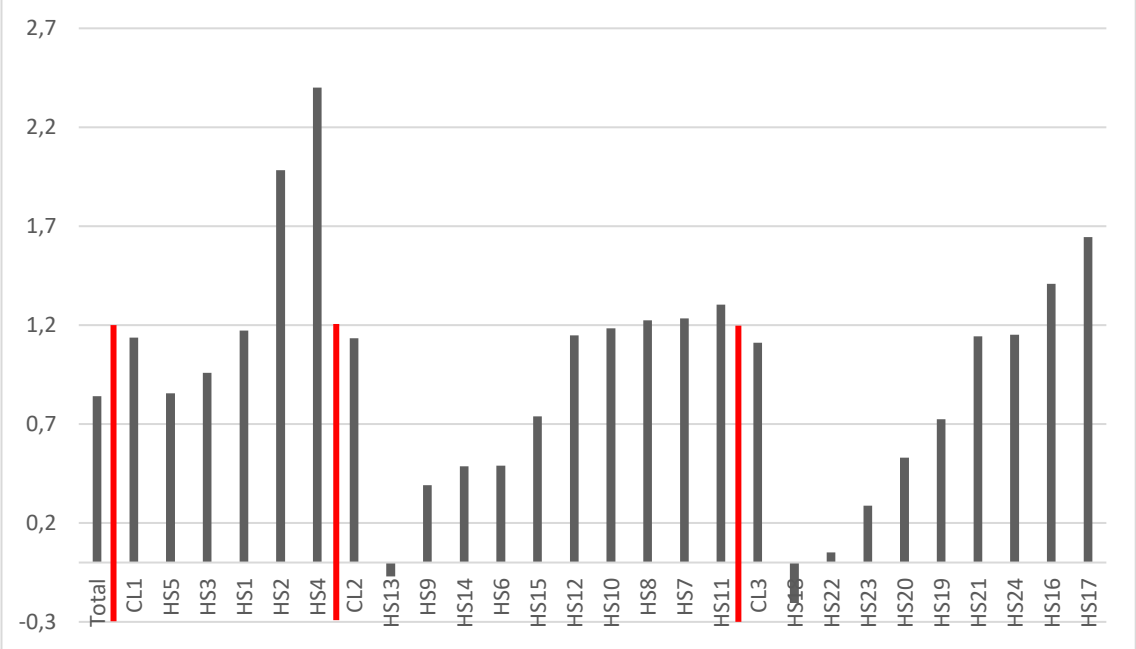
Table 8. *PPMLHDFE baseline estimations and lagged trade creation estimates*

Dependent Variable:	*Exports*		*Exports*	
	PPMLHDFE		**PPMLHDFE**	
	Baseline estimates		**with lagged trade creation**	
Ln Distance	-0,828	***	-0,838	***
	0,01		0,01	
Ln GDP origin	(.)		(.)	
	.		.	
Ln GDP destination	(.)		(.)	
	.		.	
Contiguity	0,873	***	0,874	***
	0,03		0,02	
Common continent	0,144	**	0,149	*
	0,05		0,05	
Common language	-0,019		-0,034	
	0,04		0,03	
Common second language	1,221	***	1,229	***
	0,07		0,08	
Trade Creation	0,840	***		
	0,05			
Trade Divertion	(.)			
	.			
Trade Creation lg1			0,821	***
			0,09	
Trade Creation lg2			0,009	
			0,11	
Importer-time FE	yes		yes	
Exporter-time FE	yes		yes	
Time FE	no		no	
Pseudo R-squared	0,91			
Observations	306.176			

8. Sub-sector analysis

In this section we move a step forward. We investigate separately subsectors trying to identify possible heterogeneous effects of the treaty on trade. In particular, we consider the three main aggregates composing the agricultural sector, namely animals and animal products, vegetables, and foodstuff, and, in addition, categories of products at an even more disaggregated level, namely the 24 groups identified by the HS codes (for a detailed description of the clusters, coefficients and significance levels, please refer to Annex 4). Figure 2 reports as bars the coefficients of trade creation for each of the above-mentioned categories.

Figure 4. *Results from separated estimations at cluster and industry levels, comparison.*



From left to right we have firstly the total coefficient and then the three clusters. In each cluster the first value is the cluster coefficient and the subsequent are the industry coefficients arranged from the smaller to the bigger trade creation effect. HS codes 13, 18 and 22 (the smallest or negative ones) are not significant at, at least a 10% level. All the others are significant at the 1% level apart from 14 (10%) and 23 (5%). For further details, please refer to Annex 4.

Firstly, the figure shows the results already reported in the section above obtained from considering the agricultural sector as a whole.

We than have the first broad subcategory the one of animals and animal products. Overall, the trade creation is very strong in this sector. Trade creation is positive and significant in every code of the spectrum and everywhere HS codes are extremely positive. Code HS2 and HS4 (respectively meat and dairy) appear to be the undiscussed winners of this trade agreement. These industries outperform every other in the transatlantic bilateral trade. In general, we can say that the sector of animals and animal products has achieved sustained increase in every industry with even fish and live animals outperforming several other sectors.

Cluster 2 sees another strong positive effect of the treaty, comparable, on average with cluster 1. Here we have the first negative trade creation effect, referred to HS13 (Lac, gums and resins) although its significant is far below the 90% threshold. The remaining categories can broadly be divided in two, HS codes 6, 9, 14 and 15 (live arboreal species, coffee and tea, vegetable plating and fats) that have a positive yet more contained outlook and HS codes 7, 8, 10, 11 and 12 (vegetables, fruits, cereals, milling products and oil seeds) have seen a stronger effect, for some almost double as those of the first group. Cluster 2, in general, appears to have seen an increase of trade between the parties.

Cluster 3 shows the greatest variability of the three. HS codes 18 and 22 (Cocoa and Beverages) have negative or slightly positive effects. But they are also the only industries where the significance level is below 90%. Broadly speaking we can again divide the sectors in two groups. Sectors 19, 20 and 23 (Preparations of cereals and milk, preparations of vegetables and residues) show a moderate yet significant and positive growth while industries 16, 17, 21 and 24 (Preparations of meat and fish, sugar miscellaneous preparations and tobacco) are in line with the strongest sectors of clusters 1 and 2. Cluster 3, in general, appears to have seen an increase of welfare on average is in line with the other clusters but its higher variability

means that some sectors performed better than most while others lagged behind in comparison with the others.

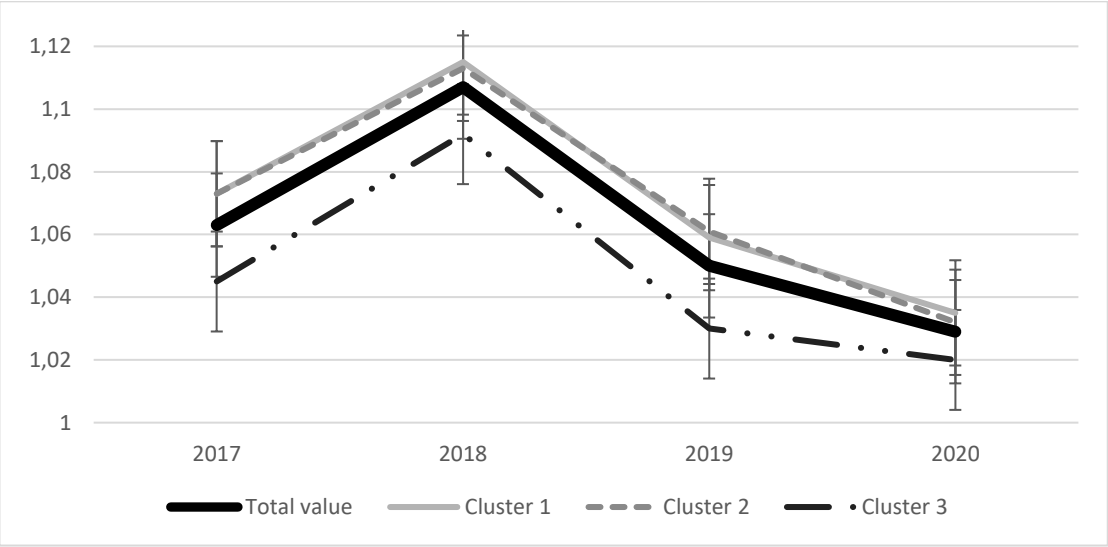
Among the HS codes with a strong significance level the one that sow the greatest growth is HS4 (dairy, eggs, and honey) while the worst performing is HS23 (residue and waste), still strongly positive.

9. Temporal analysis

Similarly, to the previous section, we wanted to test the hypothesis of a difference in the effects of the treaty through time, from 2017, year of the provisional implementation of the treaty to 2020, last year available. We did this on the total of the entire agricultural sector as a whole first and on its three main categories later.

The model we tested is as follows. For every year after the provisional entry into force of the treaty (included 2017) we performed a constrained regression in which we constrained time such that we removed the year(s) before and after the one in question if the treaty was already in force. So, for 2017 we removed all years from 2018 to 2020, for 2018 we removed 2017, 2019 and 2020 and so on.

Figure 5. *Temporal variations of trade creation*



We compare the trend of trade creation across the years after the entry into force (2017, provisional) of the treaty. The years are on the x axis arranged chronologically from 2017 to 2020. On the Y axis we have the values assumed by trade creation. Vertical lines assist in the identification of the levels of the various years.

Across all the Clusters a pattern seems to be repeating. In 2017 trade creation is strong, positive and significant although the late entry into provisional force of the treaty (21 September 2017) might have reduced the overall effect of the year.

In 2018 all Clusters grew significatively across all the spectrum the growth was roughly of 40 points compared to the previous year. The treaty might thus have had a stronger effect in the second year of its implementation compared to the first.

From 2019 the effects of the growth promoted by the treaty start to subdue. Almost all clusters lose roughly 50 points with a stronger effect on cluster 3 (60 points) that seems to diverge negatively from the others. This still places them deeply in positive territory but in a declining path.

Lastly, in 2020, even when depurated for the effects of the pandemic (as per our fixed effects) the decrease in the positive impact of the treaty continues although it seems to flatten. Cluster 3 only loses ten points while the others seemingly seem to flatten.

As to this behaviour we can propose an explanation. As Lakatos and Nilsson (2017) suggest the early rise in effects of the trade agreement can be attributed to certain anticipatory effects. They identify that the reduced uncertainty surrounding trade relations has positive impacts on the likelihood of goods being exported both if they are subject to the negotiation of an FTA and if they are already under an MFN scheme. Both effects are present in the CETA negotiations and our analysis hints at this possibility. They discuss that these anticipatory effects have certain impacts already during the negotiation period and peak at the entry into force of the treaty.

In our situation CETA entered into force in 2017, but in mid-September. Thus, the effects we see in 2017 might be dependent on a mixture of anticipatory effects and early adoption effects while in 2018 the effect is stronger hinting to the stronger nature of adoption effects (as also identified by Lakatos and Nilsson).

10. Conclusions

CETA appears to have had a net-positive impact on EU-Canada, our research shows that the presence of the treaty increased bilateral trade by 131,6% in the years taken in consideration in the agricultural sector.

Nonetheless, the effects of the treaty have not been spread equally through all economic sectors. Animals and animal products appear to have had the biggest increase, followed closely by vegetable products and foodstuff. A few industries have seen a negative impact, namely HS13, -7%, (Lac, gums and resins) and HS18, -23%, (Cocoa and cocoa preparations), although the limited significance (lower than the 10% level) suggests a careful approach. Within the clusters themselves, it is possible to identify "winners" and "losers" of the treaty with a few sectors enjoying more limited growth and others enjoying much stronger trade creation effects.

Our temporal analysis has shown that trade creation after an initial peak in 2018 has started to reduce its impact and might be directed towards a smaller, while still positive, impact on bilateral trade.

A broader evaluation of the negotiations might be useful to put together the broad research that CETA as spearheaded in the international political economy studies with sound economic and mathematic foundations.

Our research enriches the current debate in several areas. Firstly, we provide further confirmation of the validity of the traditional gravity equation and strengthen the findings regarding the limitations of OLS estimation. Secondly, we provide the first comprehensive evaluation of the impacts of CETA on agricultural trade. Thirdly we provide detailed sectoral analysis of agricultural

trade at the cluster and HS2 level and we also use a comparative approach to assess the effectiveness of the treaty over time.

This research leaves room for several future options. A different dataset, broader or focussed on different clusters might yield different results both to question and enrich this work (traditionally this kind of research is focussed on the manufactural sector, and it would be indeed extremely profitable to compare the results of our research with that kind of industries). A country-by-country analysis might also be beneficial. By constraining the dataset in creative ways, we could obtain the creation effects for single countries and groups of countries. We already explore with it in our robustness checks, but this could lead the way to tailor made analysis on single entities.

Furthermore, this could lead on the one hand to a better understanding of the treaty per se and on the other hand we could put this kind of analysis together with the abundant work on the lobbying of certain national groups within the EU to understand their impact on the treaty and, potentially, in future FTAs.

Lastly, addressing the technical constrains of the PPML methodology in order to develop a measure of trade diversion and of possible alternative iterations of trade diversions could help to achieve a better understanding of the welfare effects of CETA and other trade agreements.

In utilizing our finding policymakers should be strengthened in the knowledge that FTAs can indeed provide economic benefits to their parties. Furthermore, given the generalised benefits of CETA for its members in almost all sectors, we advocate for certain forms of support for the sectors that suffered more from the treaty or in general redistribution from the sectors that gained more to the benefit of those that, comparatively, faired more poorly in the treaty. Lastly, although this paper focusses on an ex-post evaluation identifying prematurely the sectors negatively effected from the treaty could have helped in easing its negotiation and implementation.

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Abbreviations

Abbreviation	Extended
CEPII	Centre d'études prospectives et d'informations internationals
CETA	Comprehensive Economic and Trade Agreement
CGE	Computational General Equilibrium
EU	European Union
EUMS	EU Member States
FE	Fixed Effects
FTAs	Free Trade Agreements
GDP	Gross Domestic Product
GMOs	Genetically Modified Organisms
HS	Harmonized System
HS2	Harmonized System 2-digits level
HS4	Harmonized System 4-digits level
HS6	Harmonized System 6-digits level
MTR	Multilateral Trade Resistance
NTBs	Non-Tariff Barriers
OLS	Ordinary Least Squares
PPML	Poisson Pseudo Maximum Likelihood
PPMLHDFE	Poisson Pseudo Maximum Likelihood with multi-way fixed effects
PPP	Purchasing Power Parity
USD	United States Dollar
WTO	World Trade Organization

Index of Tables, Figures and Annexes

Annexes

Annex 1. *Zeros and observations by Cluster and HS code*

Datasets	Group	HS Codes	Zeros	Observations	Ratio
Totals	Totals		268.197	453.600	**59,1%**
Clusters	All		809.543	1.360.800	**59,5%**
	1	HS 01 to 05	270.742	453.600	**59,7%**
	2	HS 06 to 15	269.419	453.600	**59,4%**
	3	HS 16 to 24	269.382	453.600	**59,4%**
HS Codes	HS	ALL	9.578.476	11.340.000	**84,5%**
	1	HS 01 to 05	2.005.745	2.268.000	**88,4%**
	HS1		410.079	453.600	**90,4%**
	HS2		408.106	453.600	**90,0%**
	HS3		384.001	453.600	**84,7%**
	HS4		390.794	453.600	**86,2%**
	HS5		412.765	453.600	**91,0%**
	2	HS 06 to 15	3.919.496	4.536.000	**86,4%**
	HS6		407.003	453.600	**89,7%**
	HS7		381.585	453.600	**84,1%**
	HS8		372.100	453.600	**82,0%**
	HS9		367.928	453.600	**81,1%**
	HS10		399.008	453.600	**88,0%**
	HS11		396.297	453.600	**87,4%**
	HS12		376.429	453.600	**83,0%**
	HS13		410.882	453.600	**90,6%**
	HS14		426.770	453.600	**94,1%**
	HS15		381.494	453.600	**84,1%**
	3	HS 16 to 24	3.409.834	4.082.400	**83,5%**
	HS16		394.966	453.600	**87,1%**
	HS17		379.918	453.600	**83,8%**
	HS18		386.090	453.600	**85,1%**
	HS19		369.692	453.600	**81,5%**
	HS20		369.576	453.600	**81,5%**
	HS21		357.525	453.600	**78,8%**
	HS22		353.667	453.600	**78,0%**
	HS23		397.905	453.600	**87,7%**
	HS24		400.495	453.600	**88,3%**

Annex 2. *Correlation Matrix*

	Exports	*Ln distance*	*Island*	*Contiguity*	*Common continent*	*Common language*	*Common 2nd language*	*Trade Create*	*Trade Divert*	*Time-exp*	*Time-imp*	*WTO exp*	*WTO imp*	*EU exp*	*EU imp*
Exports	100,0 %														
Ln distance	-9,6%	100,0 %													
Island	-3,6%	19,1%	100,0 %												
Contiguity	18,3%	-32,2%	-7,7%	100,0%											
Common continent	0,5%	-26,7%	-9,7%	7,3%	100,0%										
Common language	4,3%	-3,9%	4,1%	5,6%	3,5%	100,0 %									
Common 2nd language	0,2%	-7,3%	-3,2%	9,6%	1,6%	-0,7%	100,0 %								
Trade Creation	11,9%	-17,1%	-3,4%	5,9%	7,5%	0,4%	-0,4%	100,0 %							
Trade Divertion	0,2%	-3,2%	1,3%	-1,2%	-1,9%	0,3%	-0,7%	-1,9%	100,0 %						
Time-exporter	-0,5%	-0,7%	-2,8%	0,1%	0,1%	-2,5%	0,0%	1,4%	-0,4%	100,0 %					
Time-importer	1,1%	-0,7%	0,0%	0,1%	-1,0%	-2,5%	0,0%	1,4%	3,7%	-0,5%	100,0 %				
WTO exporter	4,7%	-6,7%	-31,7%	2,9%	1,1%	-0,6%	-1,3%	5,6%	-1,7%	6,6%	0,0%	100,0 %			
WTO importer	4,1%	-6,7%	0,1%	2,9%	-0,2%	-0,6%	-1,3%	5,6%	15,1%	0,0%	6,6%	-0,4%	100,0 %		
EU exporter	6,7%	-15,1%	-15,5%	1,8%	0,6%	-0,2%	-1,8%	20,9%	-8,3%	5,9%	0,0%	25,2%	-0,1%	100,0 %	
EU importer	6,4%	-15,1%	0,1%	1,8%	1,5%	-0,2%	-1,8%	20,9%	57,0%	0,0%	5,9%	-0,1%	25,2%	-0,5%	100,0 %

Correlation study between the main variables

Annex 3. *PPML and comparisons with alternative OLS estimations, variations in FE*

PPML & OLS estimates: comparisons without FE

Dependent Variable:	*Exports*	*Ln Exports*	*Ln Exports*	*Ln Exports*	*Ln Exports*	*Ln Exports*	*Ln Exports*	*Ln Exports*	*Ln Exports*	*Ln Exports*	*Ln Exports*
	PPMLHDFE	OLS Baseline estimates without FE	OLS Baseline estimates with FE	OLS GDP per capita and population		OLS GDP in PPP		OLS GDP in PPP and population		OLS GDP and Population	
Ln Distance	-0,828 ***	-1,453 ***	-1,458 ***	-1,528 ***	-1,525 ***	-1,377 ***	-1,368 ***	-1,383 ***	-1,372 ***	-1,461 ***	-1,467 ***
	0,01	0,01	0,01	0,01	0,01	0,02	0,02	0,02	0,02	0,01	0,01
Ln GDP origin	(.)	1,286 ***	1,285 ***							1,282 ***	1,281 ***
	.	0,00	0,00							0,01	0,01
Ln GDP destination	(.)	0,973 ***	0,975 ***							1,059 ***	1,064 ***
	.	0,00	0,00							0,01	0,01
Contiguity	0,873 ***	2,221 ***	2,215 ***	2,431 ***	2,442 ***	2,016 ***	2,032 ***	2,194 ***	2,214 ***	2,279 ***	2,273 ***
	0,03	0,09	0,09	0,10	0,10	0,09	0,09	0,09	0,09	0,09	0,09
Common continent	0,144 **	0,697 ***	0,697 ***	0,694 ***	0,704 ***	0,675 ***	0,678 ***	0,796 ***	0,800 ***	0,723 ***	0,724 ***
	0,05	0,05	0,05	0,05	0,05	0,06	0,06	0,06	0,06	0,05	0,05
Common language	-0,019	2,730 ***	2,727 ***	2,496 ***	2,491 ***	3,532 ***	3,522 ***	3,492 ***	3,481 ***	2,694 ***	2,690 ***
	0,04	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07
Common second language	1,221 ***	1,510 ***	1,500 ***	2,428 ***	2,453 ***	0,990 ***	1,015 ***	0,998 ***	1,027 ***	1,551 ***	1,540 ***
	0,07	0,21	0,21	0,23	0,02	0,20	0,20	0,20	0,20	0,21	0,21
Trade Creation	0,840 ***	3,566 ***	3,404 ***	2,035 ***	2,071 ***	3,760 ***	4,004 ***	3,270 ***	3,534 ***	3,435 ***	3,263 ***
	0,05	0,04	0,04	0,05	0,05	0,04	0,04	0,04	0,40	0,04	0,04
Trade Divertion	(.)	1,631 ***	1,473 ***	0,804 ***	0,848 ***	1,463 ***	1,696 ***	1,181 ***	1,437 ***	1,514 ***	1,347 ***
	.	0,04	0,04	0,04	0,05	0,04	0,04	0,04	0,04	0,04	0,04

Ln GDP per capita origin				1,700	***	1,706	***															
				0,01		0,01																
Ln GDP per capita destination				1,454	***	1,458	***															
				0,01		0,01																
Ln Population origin				1,353	***	1,351	***					-0,189	***	-0,196	***	0,006		0,006				
				0,00		0,00						0,01		0,01		0,01		0,01				
Ln Population destination				0,989	***	0,986	***					-0,318	***	-0,318	***	-0,138	***	-0,141	***			
				0,00		0,00						0,01		0,01		0,01		0,01				
Ln GDP PPP origin								1,508	***	1,508	***	1,650	***	1,656	***							
								0,00		0,00		0,01		0,01								
Ln GDP PPP origin								1,143	***	1,138	***	1,389	***	1,383	***							
								0,00		0,00		0,01		0,01								
Importer-time FE	yes		no		no		no		no		no		no		no		no					
Exporter-time FE	yes		no		no		no		no		no		no		no		no					
Time FE	no		no		yes		no		yes		no		yes		no		yes					
Pseudo R-squared	0,91		0,32		0,32		0,32		0,32		0,31		0,31		0,31		0,32		0,32			
Obs	306.176		309.502		309.502		309.502		309.502		283.874		283.874		283.874		283.874		309.502		309.502	

Annex 4. *Trade creation values by industry, detailed.*

Cluster/ HS code	*Description*	*Trade Creation*	*P v.*
Total	**Totals**	**0,8402**	**99%**
CL1	**Animal & animal products**	**1,136**	**99%**
HS1	Live animals	1,173	99%
HS2	Meat and edible meat offal	1,983	99%
HS3	Fish and crustaceans, molluscs, and other aquatic invertebrates	0,959	99%
HS4	Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included	2,401	99%
HS5	Products of animal origin, not elsewhere specified or included	0,855	99%
CL2	**Vegetable products**	**1,133**	**99%**
HS6	Live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage	0,49	99%
HS7	Edible vegetables and certain roots and tubers	1,23381	99%
HS8	Edible fruit and nuts; peel of citrus fruit or melons	1,2248	99%
HS9	Coffee, tea, mate and spices	0,391	99%
HS10	Cereals	1,184261	99%
HS11	Products of the milling industry; malt; starches; inulin; wheat gluten	1,302993	99%
HS12	Oil seeds and oleaginous fruits; miscellaneous grains, seeds, and fruit; industrial or medicinal plants; straw and fodder	1,148	99%
HS13	Lac; gums, resins and other vegetable saps and extracts	-0,07	
HS14	Vegetable plaiting materials; vegetable products not elsewhere specified or included	0,487	90%
HS15	Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes	0,738	99%

CL3	Foodstuffs	1,111	99%
HS16	Preparations of meat, of fish or of crustaceans, molluscs, or other aquatic invertebrates	1,409	99%
HS17	Sugars and sugar confectionery	1,644	99%
HS18	Cocoa and cocoa preparations	-0,205	
HS19	Preparations of cereals, flour, starch, or milk; pastrycooks' products	0,724	99%
HS20	Preparations of vegetables, fruit, nuts or other parts of plants	0,53067	99%
HS21	Miscellaneous edible preparations	1,143	99%
HS22	Beverages, spirits and vinegar	0,051	
HS23	Residues and waste from the food industries; prepared animal fodder	0,288	95%
HS24	Tobacco and manufactured tobacco substitutes	1,1511	99%