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IMPACT OF TRADE FACILITATION ON EXTENSIVE MARGIN

This paper examines the link between trade facilitation and extensive margin for 111 countries over the period of 2008 to 2014. The study employs a panel pseudo-maximum likelihood (PPML) method to estimate the model. We measure trade facilitation using more comprehensive measures of enabling trade index (ETI); market access, border administration, transport and communication infrastructure, and business environment. The novelty in using ETI is a comprehensive index that takes into account the effects of factors, policies, and services facilitating the free flow of goods over borders and to the destination. The paper has four major findings. Our results highlight that better trade facilitation leads the countries to export, import more diversified, and a wider range of products. Second, improvement in the business environment and transport and communication infrastructure in trade facilitation yield the highest return in terms of increasing the number of exported products. Third, border administration coming as the second most important factor in affecting extensive margin. Forth and most interestingly, despite economic integration, there is a considerably stronger effect on the side of exporter's trade facilitation, which shows large unexploited gains, to be reaped on the side of exporter countries trade facilitation.
JEL: F13; O24; C13

1. Introduction

Trade costs in developing countries are still high and factors that hindering trade is substantial. Exporter and importer facing many administrative barriers such as complying with complicated regulations, deal with massive quantity paperwork, repetitive cargo inspections and waiting for prolonged customs clearance (Hornok, Koren, 2015). The ad valorem equivalent of trade cost on average, is estimated to equal 80% in developed and 300% in developing countries (Arvis et al., 2016). Moreover, delays are higher than tariffs

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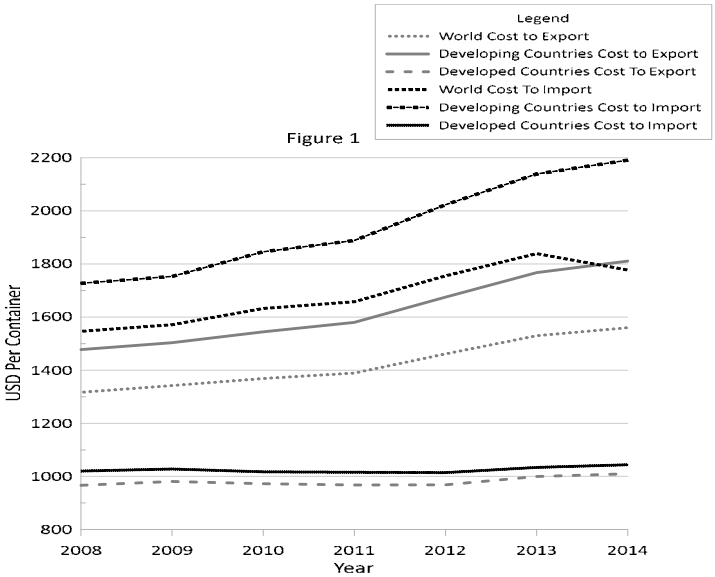
faced by developing country exporters and delay in processing cargo can be equivalent to a country distancing itself from its trade partners by about 70 km (Djankov et al., 2010; Hummels, 2007). Although the Doha Round was successful; however, the tariff cut contributed relatively small to increase the exports in developing countries (Amiti, Romalis, 2007).

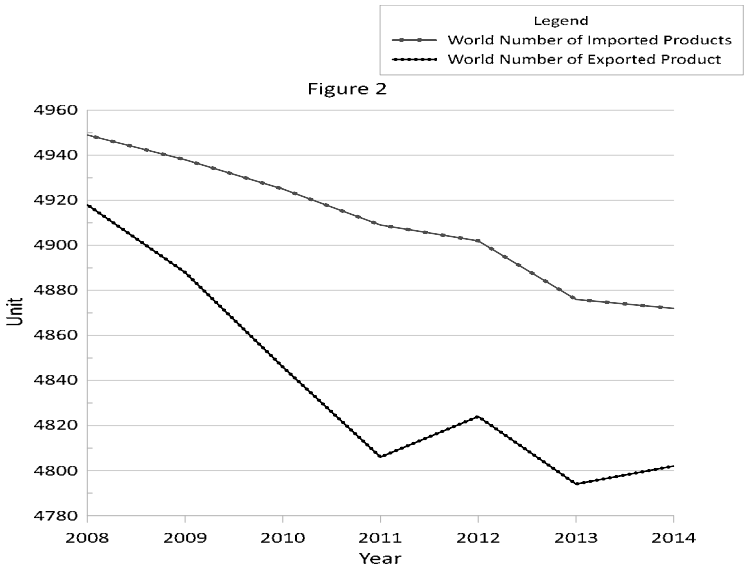
Figure 1 shows the world, developing and developed countries cost to export and import per container. The figure discloses a sharp increase in the cost of export and import of developing countries. It is observed that the cost to export and import per container in developed countries has increased marginally by 5 and 3 percent respectively from 2008 to 2014. On the other hand, developing countries have experienced a severe increase in the average cost to export and import of 22 and 26 percent over the sample period. Figure 2, in turn, shows that the number of products exported and imported in the world since 2008 has reduced from 4,918 and 4,801 units to 4,949 and 4,870 units in 2014, respectively.

World Trade Organization (WTO) initiatives of trade facilitation negotiations in December 2013 at the outset of the Bali Ministerial Conference aimed to address the remaining trade costs and ease the movement of goods and services. Those costs are related to non-tariff barriers such as customs clearance administrative costs, national regulation and documentary requirements for international trade transactions (Dennis, Shepherd, 2011). One aspect of trade facilitation is providing more transparency in terms of information and government regulation. Information incompleteness can reduce extensive margin more than the intensive margin, and that is due to larger obstacles that necessitate more information in introducing new goods (Martincus et al., 2010).

Figure 1



Source: World Integrated Trade Solution (2018).



Source: World Integrated Trade Solution (2018).

With the ratification of two-thirds of WTO member countries, the trade facilitation agreement has entered into force and became an integral part of the WTO working agenda on 22 February 2017. Trade facilitation is often defined in two ways. Firstly, the narrow definition, which includes the border procedures, such as customs procedures or time for the product to cross borders. Secondly, in a broad definition, it refers to processes behind borders such as institutional efficiency, regulatory environment, service (Zarzoso, Ramos, 2008).

There are several ways to measure trade facilitation. Due to the growing importance of trade facilitation at WTO during the last 15 years, many different trade facilitation indicators have been constructed and used following the narrow or broad definition of trade facilitation to reflect the diverse nature and scope of trade facilitation (ESCAP et al., 2015). For instance, Persson (2013), Dennis & Shepherd (2011), Portugal-Perez & Wilson (2012) utilizes the World Bank's Logistics Performance Index (LPI) and Doing Business Indicators (DBI) as proxies in measuring trade facilitation. Beverelli et al. (2015) used the OECD Trade Facilitation Index to measure trade facilitation. Another measurement by Lawrence et al. (2008) is Enabling Trade Index (ETI), a comprehensive index that measures the factors, policies, and services, simplifying the free flow of goods across borders and the destination. As an innovation in this paper, we measure trade facilitation using the Enabling Trade Index that ranks the nations according to factors and policies facilitating the free movement of goods across countries and to different destinations (Geiger et al., 2016).

In the present study, we intend to use the broad definition of trade facilitation because it is believed that production capacity is primarily determined by the country's internal border policies, particularly market economies and development in the business sector infrastructure, therefore, necessitate beyond the border trade procedures (Duval & Utoktham, 2009). By the extensive margin, we mean the change in the export and import quantity of

new goods that not previously exported (Kehoe & Ruhl, 2013). We measure the extensive margin as a number of a country exports to different destinations, which introduced by Hummels & Klenow (2005). The increase in the extensive margin has a necessary consequence on the number of exporters (sectors or firms), degree of specialization and the volatility of the economy to the external shocks. According to Melitz (2003), due to high fixed costs, only a few highly productive firms could manage to export and make enough profits to cover their fixed costs required for export. Therefore, the Melitz model suggests a reciprocal and unilateral decrease in trade cost and market entry cost variables positively associated with extensive margin (Dennis, 2007; Irarrazabal et al., 2010). Entry cost can significantly determine the volume of trade flows between countries (Yeo, Deng (2019).

The remainder of this paper is structured as follows. The next section provides a review of the recent literature on trade facilitation and extensive margin. Section 3 lays out the econometric model and describes the methodology and measurement of variables. Section 4 describes the data and provides summary statistics. Section 5 estimates and presents the results. Section 6 concludes and provides policy recommendations.

2. Literature Review

In the past ten years, there were quite some studies, that examined the role and benefit of trade facilitation facets on different aspects of economics. An important issue that has brought along the attention of researchers by Moïsé & Sorescu (2013) was constructing the indicators which could efficiently capture trade facilitation measures. In this regard trend in the empirical literature is incorporating several aspects of trade facilitation or multi-dimensional model which include barriers explicitly related to trade facilitation (Zaki, 2008). Dennis & Shepherd (2011), Portugal-Perez & Wilson (2012), Persson (2013) and Beverelli et al. (2015), pushed the researches more to this direction.

The literature on trade facilitation generally has divided into two main strands of researches. The first was the link between trade facilitation and trade flows. Previous literature has emphasized more the improvement effect of different trade cost factors on trade flows such as transport cost, borders, and the number of days required to trade (Zarzoso, Ramos, 2008; Huang, 2007; Baier, Bergstrand, 2001; Limão, Venables, 2001). Likewise, other studies linked the improvement in trade facilitation through the effect of transport cost on trade performance (Zarzoso, Ramos, 2008; Raballand et al., 2005). Moreover, A series of research empirically explores the benefit associated with improvements in customs, regulatory environment, and standards harmonization, business mobility, and electronic commerce (Wilson et al., 2002; Van Beers et al., 2003; Grainger, 2008; Terzi, 2011).

Some studies also focused more on the efficient way of trade facilitation implementation. For instance, Grainger (2011) emphasized that trade facilitation is inherently an operation-targeted topic and merits to be approached internationally and not domestically. Iwanow & Kirkpatrick (2009) show, that trade facilitation should accompany with the improvement in regulatory quality and infrastructure to improve the export performance. Djankov et al. (2010); Nordås (2007); Zaki (2008) estimate a gravity model by incorporating different aspects of trade facilitation in developed and developing countries. They found that

transaction time for imports and the number of documents for exports harm trade. Wilson et al. (2005) concluded that improvement in all four forms of trade facilitation such as ports, regulatory barriers, trade and enhancement in customs and use greater e-business of the 'below-average' countries 'halfway' to global average yields an increase in world trade of $377 billion.

The second strand of researches emphasizes the role of trade facilitation on export diversification (intensive and extensive margin) with more limited empirical evidence on the extensive margin. Previous empirical results show the positive impact of trade facilitation on extensive margin Beverelli et al. (2015); Persson (2013). For example, Dennis & Shepherd, (2011) examined the trade facilitation effect on new product margin through market entry and trade facilitation. They concluded that 10 percent reduction in the cost of exporting, international transport or market entry increase diversification by 3, 4 and 1 percent, respectively. Iwanow & Kirkpatrick (2009) find that improvements in on-the-border and behind-the-border policies yield a higher return in terms of increasing manufacturing export performance. Zaki (2008) asserted that trade facilitation improves export diversification in those sectors that are more sensitive to time, such as food, textiles, and electronics.

Martincus et al. (2013) and Hummels & Schaur (2013) shows that delays have a significant negative impact on the growth rate of exports, especially for time-sensitive products and trade in parts and components. In the same way, more, Yadav (2014) find the trade facilitation measures are stronger for promoting parts and components than for final goods trade. Persson (2013) investigated the trade facilitation effect on extensive margin products of the developing countries for two different types of differentiated and homogeneous product for the cross-sectional static data and concluded that export transaction cost proxied by the number of days required to export would rise exported differentiated and homogeneous products by 0.7 and 0.4 percent respectively. On the trade facilitation effect on extensive margin studies such as Beverelli et al. (2015) and Persson (2013) mostly centred on quantifying the cross-sectional effect, which may not represent the comprehensive outlook of trade facilitation capacity. Finally, Feenstra & Ma (2014) investigated the impact of trade facilitation proxies by port efficiency on export variety using gravity regression and concluded that the port efficiency contributes significantly to the extensive margin of exports.

3. Research Methodology

In this section, we used the traditional gravity model augmented with trade facilitation elements to analyzing the impact on the extensive margin of a sample of 111 developed and developing countries from 2008 to 2014. The focus of this study is to find out the linkage between trade facilitation and extensive margin. The empirical robustness of the gravity model made it a modern analytical tool. Although, the gravity equation has been used as a successful analytical instrument in many fields; environment, tourism, single currency initiation, education, and health. However, the model estimation with the traditional technique of OLS has been proved to work insufficiently in detecting zero value trade which can underpin the growth of extensive margin (Felbermayr, Kohler, 2006). The log-linear gravity regression only picks up the first-order approximation and leaves the higher-order

moments in the residuals (Silva, Tenreyro 2006). Therefore, when the variance of the error term in the equation depends on the regressors (e.g. GDP, distance), the conditional expectation of ln(eij) will also depend on the regressors, violating the condition for consistency of OLS.

The gravity model of trade mechanism works in considering only the observations of countries that have strictly positive trade flows. However, in reality, countries do not send all of their products to all other countries, also, larger country sample and a higher level of product disaggregation cause more common zero entries, particularly in developing countries (Dennis, Shepherd, 2011). In this regard, some studies suggest using some techniques to deal with zero trade and biased estimation (Burger et al., 2009; Silva, Tenreyro, 2006). For example, Silva, & Tenreyro (2006) pointed out that using ordinary least square for analyzing the log-linear parameters of gravity model under heteroscedasticity that arise due to Jensen inequality leads to inconsistency and biased estimation of real elasticities. They suggested addressing the constant elasticity model in multiplicative form using Poisson Pseudo-Maximum-Likelihood (PPML) as an alternative estimation technique for overcoming heteroscedasticity and zero value of the dependent variable. Although the PPML model can solve zero trade value, it is not reliable when the number of zero predicted by the estimated model is less than a number of observed zero values (Burger et al., 2009).

In its multiplicative form (for the sake of estimation accuracy), our regression is based on the following gravity model of bilateral trade adapted from Feenstra & Ma (2014):

$$(NEP)_{ijt} = \exp[\beta_0 + \beta_1(OI)_{it} + \beta_2(OI)_{jt} + \beta_3 ln(MA)_{it} + \beta_4 ln(MA)_{jt} + \beta_5 ln(BA)_{it} + \beta_6 ln(BA)_{jt} + \beta_7 ln(TCI)_{it} + \beta_8 ln(TCI)_{jt} + \beta_9 ln(BE)_{it} + \beta_{10} ln(BE)_{jt} + \beta_{11} ln(GDP)_{it} + \beta_{12} ln(GDP)_{jt} + \beta_{13} ln(DIST)_{ij} + \beta_{14}(Border)_{i,j} + \beta_{15}(Colony)_{i,j} + \beta_{16}(Colony\ 1945)_{i,j} + \beta_{17}(CU)_{i,j} + \beta_{18}(LANG)_{i,j} + \beta_{19}(FTA)_{i,j} + \beta_{20}(RTA)_{i,j} + \beta_{21}(EU)_{i,j}] + \lambda_t + \varepsilon_{ijt} \quad (1)$$

Where:

$(NEP)_{ijt}$ dependent variable denotes the exported number of products from country *i* to *j* in year *t*. Overall index (OI) consist of sub-index of Market access, border administration, Transport and Communication Infrastructure and business environment. Market Access (MA) is extend to which the policy and cultural framework of the country welcome foreign goods into the country. Border Administration (BA) is extend to which the administration at the border facilitates the entry of goods. Transport and Communication Infrastructure (TCI) necessary to facilitate the movement of the goods from the border to the destination. Business Environment (BE) regulatory and security environment is impacting the transport business in the country. GDP_i is Gross Domestic Product of country *i*. GDP_j is Gross Domestic Product of country *j*. $DIST_{ij}$ distance between nation *i* and *j*. Border (dummy) is whether countries share the same borders. Colony (dummy) is whether the country had a colonial relationship with its trade partner. Colon 1945 (dummy) is whether countries have common colonizer post 1945. CU (dummy) shows whether two countries *i* and *j* are participating in same Custom Union. LANG (dummy) is whether they have a common official language. Free Trade Agreement (FTA), Regional trade agreement (RTA) and European Union (EU) are dummies show whether two countries share the same agreement. λ_t is a vector with year-specific dummies. ε_{ijt} is the random error term.

In this study, to check the robustness of our results, we utilized the hackman sample selection estimation. The sample selection framework is another way to handle zero observations; therefore, the cause of using sample selection is the same for using PPML. Since OLS dropping the zero value trade due to undefined logarithm of zero hence produce biased and inconsistent parameter estimates and provides unreliable results and, as noted by Heckman (1979), non-random selection of a sample from the population results in ordinary specification error or omitted variables bias. The main idea behind this is that in the existent of selectivity in the model as a result of trade and nontrade data, the coefficient will not represent the entire trading and no trading countries together. Maddala (1983, p. 233-234) suggests that the 'condition for identification for the simultaneous-equations model are well known; namely, Cov (u1, u2) = 0 [i.e. ui, ε_i in this study] or there is at least one variable in Xi not included in Zi. These are the conditions for identification in Heckman's model'. This condition is known as the exclusion restriction and in practice, this is rarely feasible because finding an acceptable exclusion restriction needs judgment.

Studies used different variables to account for exclusion restrictions and check the liability and stability of the results. For example, Disdier and Marette (2010) and Haq et al. (2013) used the insignificant variable in their models as the exclusion based on the argument that excluding insignificant variable will not affect the result of the selection model. Disdier and Marette (2010) used common language while Haq et al. (2013) used Gini variable as the exclusion variable. Yadav (2014) used the entry cost variable to satisfy exclusive restrictions for Heckman's selection estimation. We follow Disdier and Marette (2010) and Haq et al. (2013) the same argument because in most of our estimated model's of OLS, and PPML the common border is statistically insignificant. Therefore, we use this variable for pair countries as the exclusion variable.

4. Data Source

The dependent variable for a number of exported products (NEP) varies between 0 and 5171. We estimate the dependent variable at a level. The superiority of estimating at level is identifying a different set of variables and coefficients to determine the probability of censoring the value of the dependent variable, no multicollinearity problems, in addition, it provides a rationale for zero trade flow (Linders and De Groot, 2006; Martin, Pham, 2015). The number of the exported products are extracted from United Nation Statistic Division Commodity Trade Statistic database (COMTRADE) disaggregated Harmonized System HS6 digit 2002 bilateral trade data. The extensive margin of trade measured by the number of HS6 digit subheading products exported to the destination. For a given country, the accuracy of the import data is higher than the export because the importer country is concern about determining tariff revenue. Therefore, we use mirroring data (using information from the import of partner country or reporter). GDP data is extracted from World Bank.

Table 1 provides descriptive statistics on ETI trade facilitation export and import overall index and sub-index. The main variables are consist of the overall index, Market Access, Border Administration, Transport and Communication Infrastructure and Business Environment. Statistics are reported for both developed and developing countries for five

indexes. Specific statistic characteristics of dependent variables are reported on the level. The mean and standard deviation respectively show the average behaviour as well as the distribution of the corresponding variable. For our sample countries, the score is less for transport and communication infrastructure. Each sub-indicator ranges between 0 and 7 and table shows countries have substantial variation with the best and lowest performance.

Table 1

Descriptive Statistics of Trade Facilitation and Extensive Margin

Variable	Obs	Mean	Std.Dev.	Min	Max
nep	60581	475.56	815.483	0	5132
Exp GDP	60610	5.92	1.75	1.61	1.74
Imp GDP	60610	5.92	1.75	1.61	1.74
Exp-overalindex	60610	4.177	0.719	2.7	6.14
Imp-overalindex	60610	4.177	0.719	2.7	6.14
ExMA	60610	4.087	0.724	1.8	6.66
ImMA	60610	4.092	0.726	1.8	6.66
ExBA	60610	4.256	1.041	2.25	6.56
ImBA	60610	4.256	1.041	2.25	6.56
ExTCI	60610	3.929	1.027	2.01	6.1
ImTCI	60610	3.928	1.026	2.01	6.1
ExBE	60610	4.421	0.766	2.61	6.29
ImBE	60610	4.421	0.766	2.61	6.29
Dist	60610	7473.784	4421.845	105.804	19649.83
Common border	60610	0.023	0.15	0	1
Colony	60610	0.017	0.128	0	1
Colonizer after 1945	60610	0.058	0.234	0	1
Custom union	60610	0.073	0.26	0	1
Common language	60610	0.108	0.31	0	1
RTA	60610	0.276	0.447	0	1
European Union	60610	0.054	0.227	0	1

The sample is restricted to the data on trade facilitation proxies by ETI comprising of Market Access, Border Administration, Transport and Communication Infrastructure and Business Environment as well as other gravity variables. Independent variables in this study measured the level of trade facilitation in each country during the period 2008 onward 2014 and extracted from World Economic Forum. The complete data for the dependent variable "number of exported products" is not available for most of the countries after 2014. However, the measurement of trade facilitation (ETI) is available till 2016. Geographical distance, Common border, Common language, Colony, and Common Colonizer after 1945 are obtained from CEPII. Finally, control variables regarded to trade agreements are extracted from "Mario Larch's Regional Trade Agreements Database", which used in the following paper (Egger, Larch, 2008). Dummy variables in the model are binary that takes 0 and 1 value.

5. Results and Discussion

To examine the role of trade facilitation on the extensive margin, we consider several factors that motivated this study. First, the link between trade facilitation and the extensive margin is indecisive, specifically because trade facilitation requires coordination from all the countries since the supply chain is a process that involves different countries. Second, the implementation of trade facilitation encounter challenge and costs, for example, capital expenditure for trade facilitation range between EUR 3.5 million and EUR 19 million, whereas yearly operating costs is less than EUR 2.5 million (Moïsé, 2013). Therefore, the prosperity of the trade facilitation effect may not be secured and consistent as it relies on economic and geopolitical factors.

Table 2 reports the estimation outcome of the gravity model using OLS and PPML on the overall trade facilitation indicators for developed and developing countries and ranges from 1 to 7 in which 7 shows the best trade facilitation status for a country.

The column (1) of Table 2 presents the logarithm of export for the dependent variable, which leaves out pair countries zero bilateral trade. The column (2) shows Poisson Pseudo Maximum Likelihood (PPML) estimates with the multiplicative error term form and does not assume that conditional variance is proportional to the conditional mean (Silva & Tenreyro, 2006). The PPML is advantageous in naturally accounting for zero trade pairs in the data. The effect of trade facilitation on extensive margin appears positive under both OLS and PPML for all the models.

The expected sign of our primary variable overall trade facilitation for both exporters and importers in the gravity model are statistically significant, indicating the importance of overall trade facilitation on the number of exported and imported products. The results of column (2) show that approximately a 3.4% increase in the number of exported products is expected when there is a 10% improvement in trade facilitation of exporter countries. Moreover, 1.4% further increase in the number of exported products will be achieved when importer countries improve their trade facilitation by 10%. We find support for the theory that trade facilitation has a statistically significant and positive effect on trade margin.

The results hold for all our 4 main variables Market Access, Border Administration, Transport and Communication Infrastructure and Business Environment in table (2) and (4), excluding the results of exporter and importer market access which show significant with a negative sign. The negative sign for market access is reasonable when developing and least developed countries that previously have preferential trade access obtain additional market access (Djankov et al., 2010; Amiti, Romalis, 2007). The first point to note is that all the coefficients in PPML are significantly different than those, resulting from OLS estimates. One of the advantages of using PPML over OLS model is the heteroscedasticity, in which PPML is robust to the heteroscedastic error. In comparison, the PPML coefficient on exporter and importers trade facilitation index, GDP and distance are lower than OLS, suggest a smaller role for all three variables on the extensive margin. OLS estimates of geographical distance and GDP are significantly higher, which supports the findings of past studies such as Krisztin & Fischer (2015) and this happens since OLS significantly exaggerates the role of these variables on trade.

Table 2

Regression Results for Overall Index on Extensive Margin

	(1)	(2)	(3a)	(3b)
	OLS	PPML	Heckman ML	Selection
overalindexexp	0.677***	0.345***	0.640***	0.142***
	(0.017)	(0.013)	(0.017)	(0.024)
overalindeximp	0.373***	0.149***	0.317***	0.370***
	(0.016)	(0.014)	(0.017)	(0.021)
Exp loggdp	0.696***	0.487***	0.663***	0.204***
	(0.006)	(0.007)	(0.007)	(0.008)
Imp loggdp	0.361***	0.206***	0.319***	0.232***
	(0.006)	(0.006)	(0.007)	(0.009)
Log_dist	-0.704***	-0.411***	-0.681***	-0.193***
	(0.022)	(0.025)	(0.020)	(0.026)
Common border	-0.036	-0.101		0.106
	(0.095)	(0.074)		(0.127)
Colony	0.425***	0.335***	0.447***	0.060
	(0.082)	(0.079)	(0.076)	(0.151)
Common colonizer 1945	0.436***	0.303***	0.411***	0.131**
	(0.059)	(0.063)	(0.059)	(0.058)
Custom union	0.524***	0.315***	0.487***	0.439***
	(0.101)	(0.075)	(0.098)	(0.127)
Common language	0.585***	0.232***	0.521***	0.359***
	(0.040)	(0.038)	(0.041)	(0.055)
RTA	0.104***	0.118***	0.102***	0.020
	(0.031)	(0.037)	(0.030)	(0.033)
European union	-0.631***	0.028	-0.497***	-0.879***
	(0.109)	(0.074)	(0.107)	(0.136)
Athrho				-0.764***
				(0.072)
lnsigma				0.254***
				(0.010)
Rho				-0.643
				(0.042)
Sigma				1.289
				(0.013)
Lambda				-0.830
				(0.062)
Wald Test				110.16 (0.0000)***
cons	35.490***	22.113***	35.923***	5.410**
	(1.948)	(2.192)	(1.801)	(2.326)
Obs.	53922	60577	60610	53922
R-squared	0.693	0.602		

Notes: The equations use annual data from 2008 to 2014 and allow for clustering of the error terms over time for country pairs. In OLS regressions, the gravity equation is estimated in its logarithmic form. In PPML, the gravity equation is estimated in its multiplicative form. Bilateral trade cost variables have been corrected for multilateral resistance, according to Baier and Bergstrand (2009). Time dummy is included but not reported for brevity. Models estimated using ordinary least square and Poisson-Pseudo Maximum Likelihood Stata reg & ppml commands. Standard errors are in parenthesis *** p<0.01, ** p<0.05, * p<0.1.

Table 3

Regression Results for Market Access and Border Administration on Extensive Margin

	(1)	(2)	(3a)	(3b)	(4)	(5)	(6a)	(6b)
	OLS	PPML	Heckman ML	Selection	OLS	PPML	Heckman ML	Selection
Exp market access	-0.195***	-0.122***	-0.159***	-0.202***				
	(0.024)	(0.011)	(0.024)	(0.044)				
Imp market access	-0.001**	-0.042**	-0.000	0.181***				
	(0.000)	(0.017)	(0.000)	(0.014)				
Exp border admin					0.528***	0.276***	0.502***	0.153***
					(0.012)	(0.009)	(0.012)	(0.017)
Imp border admin					0.257***	0.117***	0.217***	0.307***
					(0.011)	(0.010)	(0.013)	(0.015)
Exp loggdp	0.825***	0.543***	0.765***	0.214***	0.671***	0.478***	0.647***	0.193***
	(0.005)	(0.006)	(0.006)	(0.008)	(0.006)	(0.007)	(0.007)	(0.008)
Imp loggdp	0.427***	0.236***	0.349***	0.277***	0.359***	0.201***	0.329***	0.222***
	(0.006)	(0.006)	(0.007)	(0.009)	(0.006)	(0.006)	(0.007)	(0.009)
Log_dist	-0.709***	-0.420***	-0.675***	-0.181***	-0.708***	-0.409***	-0.689***	-0.192***
	(0.024)	(0.028)	(0.022)	(0.027)	(0.022)	(0.026)	(0.020)	(0.026)
Common border	-0.039	-0.109		0.134	-0.038	-0.078		0.037
	(0.094)	(0.070)		(0.126)	(0.094)	(0.074)		(0.129)
Colony	0.439***	0.345***	0.474***	0.089	0.424***	0.315***	0.440***	-0.050
	(0.082)	(0.077)	(0.075)	(0.141)	(0.083)	(0.080)	(0.078)	(0.150)
Common colonizer 1945	0.425***	0.322***	0.384***	0.125**	0.442***	0.303***	0.422***	0.135**
	(0.065)	(0.063)	(0.064)	(0.055)	(0.059)	(0.063)	(0.058)	(0.059)
Custom union	0.499***	0.254***	0.443***	0.418***	0.533***	0.324***	0.502***	0.396***
	(0.100)	(0.070)	(0.100)	(0.155)	(0.100)	(0.076)	(0.098)	(0.121)
Common language	0.564***	0.257***	0.473***	0.362***	0.586***	0.240***	0.536***	0.369***
	(0.044)	(0.037)	(0.044)	(0.054)	(0.040)	(0.038)	(0.041)	(0.056)
RTA	0.109***	0.122***	0.110***	0.012	0.093***	0.120***	0.091***	0.048
	(0.034)	(0.037)	(0.033)	(0.034)	(0.031)	(0.037)	(0.031)	(0.035)
European union	-0.563***	0.236***	-0.356***	-0.770***	-0.650***	-0.012	-0.544***	-0.855***
	(0.112)	(0.072)	(0.110)	(0.162)	(0.107)	(0.075)	(0.106)	(0.132)
Athrho				-1.147***				-0.587***
				(0.056)				(0.077)
lnsigma				0.355***				0.230***
				(0.008)				(0.011)
Rho				-0.816				-0.528
				(0.018)				(0.055)
Sigma				1.426				1.258
				(0.012)				(0.013)
Lambda				-1.165				-0.665
				(0.034)				(0.075)
Wald Test				410.64				58.30
				(0.0000)***				(0.0000)***
_cons	35.480***	22.794***	36.058***	4.348*	37.371***	22.677***	37.447***	5.993***
	(2.104)	(2.389)	(1.916)	(2.368)	(1.941)	(2.231)	(1.801)	(2.355)
Obs.	54107	60801	60830	54107	53922	60581	60610	53922
R-squared	0.647	0.585			0.699	0.606		

Notes: The equations use annual data from 2008 to 2014 and allow for clustering of the error terms over time for country pairs. In OLS regressions, the gravity equation is estimated in its logarithmic form. In PPML the gravity equation is estimated in its multiplicative form. Bilateral trade cost variables have been corrected for multilateral resistance, according to Baier and Bergstrand (2009). Time dummy is included but not reported for brevity. Models estimated using ordinary least square and Poisson-Pseudo Maximum Likelihood Stata reg & ppml commands. Standard errors are in parenthesis *** p<0.01, ** p<0.05, * p<0.1

However, both GDP for exporters and importers are statistically significant and positive, whereas distance has a negative effect on the trade, which is consistent with the concept of gravity theory. The border effect is insignificant for all tables. The empirical evidence shows that the border could also have no significant effect. For incidence, Dalton (2017) implicitly indicates that the highest increase in export and import was between Austria and the countries that have no common border. In our model, the variable Common colonizer shows whether the country had a common colonizer after 1945 and that is different from variable Colony, which indicates whether a country has ever had a colonial link. Colony, Common Colonizer, Custom Union, and Common language are all statistically significant and compatible with the theory. The variable Custom Union (CU) turn to be also significant for the trade of developed and developing countries. The regional trade agreement (RTA) variable is significant for the trade between developed and developing countries showing a positive impact on the trade margin. Finally, the EU trade agreement effect on the extensive margin shows negative with statistically significant effect probably the reason is that 22 out of 111 countries are in EU and their foreign trade policy is unanimous, and any country obligated to go through EU trade regulation and policy in its relationship with other countries. The negative sign of the EU agreement is not unusual, for example, Frankel et al. (1997) find that the European community over many years has had a considerable negative impact on the bilateral trade flows of its members (see Table 6.4, p. 136, and Table 6.5a, p. 141 in Frankel, Stein, Wei, 1997).[5]

5.1 Robustness Check

To verify the robustness of our results, we use the Heckman selection maximum likelihood model. The strategy for the application of the model is that it is including two equations. First is the outcome equation that shows the relationship between extensive margin and amount of trade with those of control variables. The second is the selection equation which shows whether we observe bilateral trade or not and explicitly concerns about the probability of trade (Disdier, Marette, 2010). In practice, both models are estimated simultaneously using the maximum likelihood method or two-step.

Table 2, 3, 4 column 6a report the estimation outcome of the Heckman selection model on the trade facilitation main indicators and its components. To deal with county-pair unobserved heterogeneity and account for the multilateral trade resistance effect, we follow the proposed procedure by Baier and Bergstrand (2009). The third and fourth columns respectively show the trade equation and selection equation for Heckman ML that both are the function of trade cost. The positive and significant sign of the selection equation parameters points out that the probability of trade increases with the improvement in the trade facilitation of exporters and importers. On the other hand, the estimated parameters with negative sign on the trade cost parts within the selection model indicate that the chance to trade diminishes when the trade cost factors increase. All the variables of the selection equations for developing and developed countries are significant except variable Common border and historical Colony. Moreover, the results of the Heckman selection indicate that all outcome parameters in PPML are robust, excluding the discrepancies on the side of regional trade agreements (RTA) with the baseline model.

[5] This fact has been reported by Tenreyro (2007).

Table 4

Regression Results for Transport and Communication Infrastructure and Business Environment on Extensive Margin

	(1)	(2)	(3a)	(3b)	(4)	(5)	(6a)	(6b)
	OLS	PPML	Heckman ML	Selection	OLS	PPML	Heckman ML	Selection
Exp TCI	0.555***	0.305***	0.532***	0.066***				
	(0.013)	(0.011)	(0.013)	(0.018)				
Imp TCI	0.303***	0.122***	0.255***	0.308***				
	(0.013)	(0.012)	(0.013)	(0.018)				
Exp business environment					0.434***	0.345***	0.403***	0.073***
					(0.015)	(0.013)	(0.015)	(0.018)
Imp business environment					0.233***	0.149***	0.213***	0.078***
					(0.015)	(0.014)	(0.015)	(0.016)
Exp loggdp	0.631***	0.446***	0.599***	0.213***	0.758***	0.487***	0.712***	0.203***
	(0.007)	(0.007)	(0.008)	(0.009)	(0.006)	(0.007)	(0.006)	(0.008)
Imp loggdp	0.324***	0.191***	0.286***	0.201***	0.395***	0.206***	0.331***	0.273***
	(0.007)	(0.007)	(0.008)	(0.010)	(0.006)	(0.006)	(0.007)	(0.010)
Log_dist	-0.702***	-0.416***	-0.679***	-0.188***	-0.705***	-0.411***	-0.678***	-0.176***
	(0.022)	(0.025)	(0.020)	(0.026)	(0.023)	(0.025)	(0.021)	(0.025)
Common border	-0.033	-0.113		0.146	-0.034	-0.101		0.142
	(0.095)	(0.073)		(0.133)	(0.096)	(0.074)		(0.121)
Colony	0.418***	0.315***	0.442***	-0.066	0.430***	0.335***	0.459***	-0.075
	(0.082)	(0.079)	(0.076)	(0.170)	(0.082)	(0.079)	(0.075)	(0.138)
Common colonizer 1945	0.426***	0.301***	0.398***	0.127**	0.428***	0.303***	0.394***	0.121**
	(0.059)	(0.063)	(0.058)	(0.058)	(0.062)	(0.063)	(0.062)	(0.057)
Custom union	0.524***	0.308***	0.484***	0.413***	0.516***	0.315***	0.467***	0.409***
	(0.100)	(0.075)	(0.097)	(0.121)	(0.104)	(0.075)	(0.102)	(0.136)
Common language	0.591***	0.240***	0.525***	0.332***	0.578***	0.232***	0.500***	0.359***
	(0.041)	(0.038)	(0.041)	(0.053)	(0.042)	(0.038)	(0.042)	(0.055)
RTA	0.103***	0.140***	0.100***	0.009	0.107***	0.118***	0.105***	0.005
	(0.031)	(0.037)	(0.030)	(0.033)	(0.032)	(0.037)	(0.031)	(0.033)
European union	-0.642***	-0.061	-0.504***	-0.823***	-0.604***	0.028	-0.432***	-0.836***
	(0.107)	(0.075)	(0.105)	(0.132)	(0.114)	(0.074)	(0.111)	(0.144)
Athrho				-0.781***				-0.957***
				(0.068)				(0.066)
lnsigma				0.253***				0.306***
				(0.010)				(0.010)
Rho				-0.653				-0.743
				(0.039)				(0.029)
Sigma				1.288				1.358
				(0.013)				(0.013)
Lambda				-0.842				-1.009
				(0.057)				(0.048)
Wald Test				128.56 (0.0000)***				206.27 (0.0000)***
_cons	38.774***	24.213***	39.022***	6.125***	34.681***	22.113***	35.432***	4.324***
	(1.964)	(2.213)	(1.809)	(2.300)	(2.026)	(2.192)	(1.848)	(2.252)
Obs.	53922	60581	60610	53922	53922	60577	60610	53922
R-squared	0.694	0.612			0.672	0.602		

Notes: The equations use annual data from 2008 to 2014 and allow for clustering of the error terms over time for country pairs. In OLS regressions, the gravity equation is estimated in its logarithmic form. In PPML the gravity equation is estimated in its multiplicative form. Bilateral trade cost variables have been corrected for multilateral resistance, according to Baier and Bergstrand (2009). Time dummy is included but not reported for brevity. Models estimated using ordinary least square and Poisson-Pseudo Maximum Likelihood Stata reg & ppml commands. Standard errors are in parenthesis *** p<0.01, ** p<0.05, * p<0.1

The null hypothesis of F-statistic tells that the model has no explanatory power. The p-value of the model for F-statistic is 0.000, which shows the value of the coefficient is different from zero. The test of the error between two equations is shown by *rho,* which use to decide the existence of the selection biased. Since the coefficient of *rho* estimation in Table 4 is -0.64 the null hypothesis of *rho=0* are rejected and the applying OLS yield biased results; therefore, Heckman provides more efficient and consistent estimates. Alternatively, the significant sign of *Athrho* supports the choice of the Heckman model and the existence of sample selection. *Lambda*, the testing of significance of the parameter associated with the ratio (i.e., the ratio of means of two random variables) in the model, is an outcome of *(rho*sigma)*. Wald test also witnesses significant sign, which is an indication of the right level of model explanation. The interpretation of *rho* and *Athrho* estimation can be seen through all the tables and their significance in all the models indicates that ignoring zero trade results in biased estimation.

6. Conclusion

We aim to contribute to the line of research by using the composite Enabling Trade Index, an alternative comprehensive measure for trade facilitation. On the other hand, we used highly disaggregated data in measuring trade margin. Our results highlight that better trade facilitation leads the countries to export, import and it became more diversified with a wider range of products. Despite economic integration, there is a considerably stronger effect on the side of exporter's trade facilitation, which shows large unexploited gains to be reaped on the side of exporter countries. Making more effort on facilitating trade and reducing the trade restrictions by exporter countries can increase the gain from trade. However, multilateral initiatives should be considered by all the countries involving in trade facilitation in order to make it successful.

Moreover, results show that on both the exporter and importer side, the business environment that represents the comprehensive regulatory and security environment has the greatest impact on the extensive margin. Quantitatively, improvement in the business environment and transport and communication infrastructure in trade facilitation yield the highest return in term of increasing the number of exported products. Border administration coming as the second most important factor in affecting extensive margin. As it has highlighted in majority of researches, the importance of considering the cost of trade facilitation implementation. This study did not estimate the cost of trade facilitation implementation, which may overestimate the potential gain of the policy.

Future studies should also concentrate on the way to simulate more countries toward economic integration, specifically by reducing fixed entry cost in order to reap more benefit from trade facilitation. Trade facilitation not only needs collective actions by all the participating countries but also further economic integration from all non-participating parties. The more companies supply and participate to sell abroad, the more they benefit from trade facilitation measures. Reforms in terms of introducing, modernizing and intensifying Information and Communication Technology (ICT) such as e-Customs services are important for developing and least developed countries in order to reduce the use of paper documents and customs bureaucracy customs procedures.

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APPENDIX A

List of 111 Developed and Developing Countries

Albania	Algeria	Argentina	Armenia
Australia	Austria	Azerbaijan	Bahrain
Bangladesh	Belgium	Benin	Bolivia
Bosnia and Herzegovina	Brazil	Bulgaria	Burkina Faso
Burundi	Cambodia	Cameroon	Canada Guyana
Chile	China	Colombia	Costa Rica
Croatia	Cyprus	Czech Republic	Denmark
Dominican Republic	Ecuador	Egypt	El Salvador
Estonia	Ethiopia	Finland	France
Germany	Greece	Guatemala	Guyana
Honduras	Hong Kong SAR	Hungary	India
Indonesia	Ireland	Israel	Italy
Jamaica	Japan	Jordan	Kazakhstan
Kenya	Korea Rep	Kuwait	Kyrgyz Republic
Latvia	Lesotho	Lithuania	Luxembourg
Madagascar	Malaysia	Mali	Mauritania
Mauritius	Mexico	Moldova	Mongolia
Morocco	Mozambique	Namibia	Nepal
Netherland	New Zealand	Nicaragua	Nigeria
Norway	Oman	Pakistan	Panama
Paraguay	Peru	Philippines	Poland
Portugal	Qatar	Romania	Russian Federation
Saudi Arabia	Senegal	Singapore	Slovenia
Slovakia	South Africa	Spain	Sri Lanka
Sweden	Switzerland	Thailand	Tunisia
Turkey	Uganda	Ukraine	United Arab Emirates
United Kingdom	United States	Uruguay	Venezuela
Vietnam	Zambia	Zimbabwe	