Does an FTA have an impact on trade flows?

An empirical analysis of the FTA between the EU and South Korea.

By: Asako Danielsson

Mentor: Mikael Stenkula
Södertörns University | Institution of Social Sciences
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Abstract

This bachelor thesis examines if a Free Trade Agreement (FTA hereafter) has a positive effect or not on trade flows. There are many FTAs in the world beside World Trade Organization (WTO hereafter) membership. Many empirical studies have been performed by different methods and most of them show a significant influence on trade flows. In this thesis the impact on the FTA between the European Union (EU hereafter) and South Korea is studied by using the Gravity Model in period between 2007 and 2016. Dummy variables which capture the impact on the implementation of the FTA since 2011 are constructed into the standard trade Gravity equation. In addition, several dummy variables, such as the distance between countries and culture characteristic variables are utilized.

The results of two different regression models show that both a positive and a negative impact on the EU's import from South Korea and a negative impact on South Korea's import from the EU. Overall, all estimated coefficients used in the models show a significant effect on import trade flows between countries.

Key Words: Free Trade Agreement, The Gravity Model, Trade Liberalization, International Trade, Multilateral trade agreement

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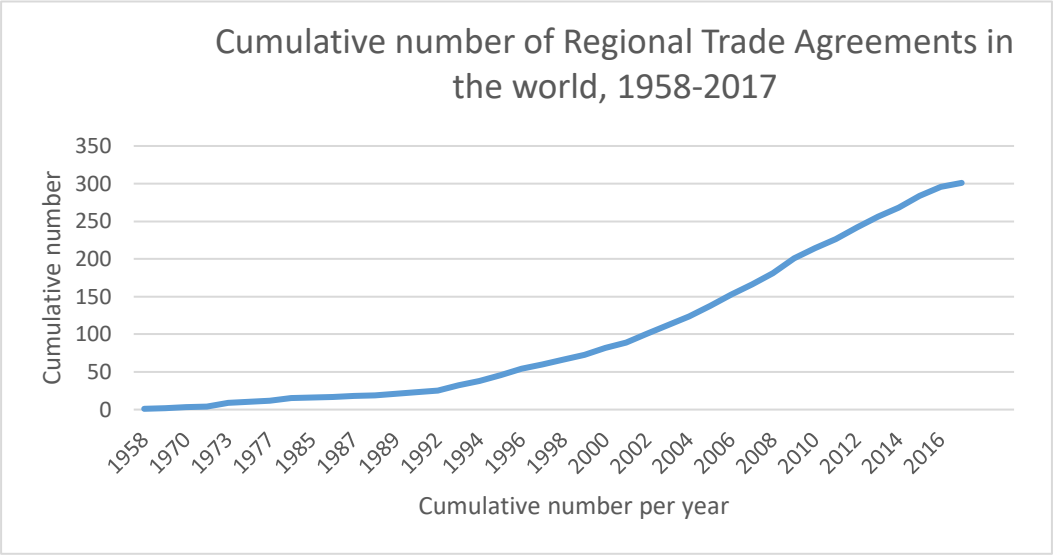
1.Introduction

Globalization has progressed and the trend of promoting international trade has been observed in the past several decades. The General Agreement on Tariffs and Trade (GATT hereafter) was established in 1947 with the aim to reduce trade barrier between nations and agree on rules and policies of international trade to promote trade liberalization. GATT expanded over the year and it has now successfully developed into an intergovernmental organization which consisted of 164 countries in 2017, and has operated under the name WTO since 1995. The WTO is a Multilateral trade agreement which regulates the trade of goods, services and intellectual property. There are many other forms of trade agreements within international trade such as the EU which is a customs union (Feenstra & Taylor 2014; WTO 2017).

Despite the recent major events in trade policy such as the United States of America (U.S. hereafter) withdrawal from the Trans-Pacific Partnership (TPP) and Brexit, the number of FTA has continued to rise. Figure 1 below shows a cumulative number of Regional Trade Agreements (RTA hereafter)[1] which were notified by WTO from 1958 to 2017. According to Figure 1 the number of RTAs has increased rapidly since the early 1990s. The reasons why so many FTAs are created could be because of political relations, the historical background between countries or geographical factors. However, expectation of economic benefits might be among the most important reasons since policy makers and economists regard FTAs as an important policy tool for economic development (Hur & Park 2012). Therefore, it is interesting to investigate how we can measure the economic effects of FTAs. Many empirical studies showed significant effects on trade flows, but the effects vary depending on the scope of a study, short or long-term perspective, and method or techniques of measurement used.

[1] Types of agreement includes FTA, Customs Union, Economic Integration Agreement and "Partial Scope" Agreement.

Figure 1. Cumulative number of RTAs



Note: The Regional Trade Agreements Information System (RTA-IS) notified to the GATT/WTO by date of Entry into Force for the 1958-2017 period.

Source: WTO (2017)

1.1 Problem Statement

Does the FTA have a significant effect on trade flows between the EU and South Korea?

1.2 Study Objective

The purpose of this thesis is to examine whether the FTA, which was implemented in 2011, between the EU and South Korea have a significant impact on trade flows. The empirical methods have been used along with the theory of Gravity Model proposed by Jan Tinbergen (1962)

1.3 Methodology

The empirical part of the thesis is carried out by conducting a Panel data under a period of 10 years, between 2007 and 2016. An extended Gravity trade equation suggested by WTO and UNCTAD (2012) is developed to estimate an effect of the FTA between the EU and South Korea on aggregated level. The dependent variable is import trade flows of goods.[2] The

[2] The samples of data in this study are limited to goods only, although services are also included in the FTA.

independent variables that are included in the analysis are for instance, importer's GDP,[3] exporter's GDP, distance between importer and exporter, cultural and historical specific variables and binary variables which examine the effect of the FTA. The data sources are UN Comtrade, World Bank and CEPII.

1.4 The Thesis Structure

Chapter 2 will present an overview of the FTA between the EU and South Korea as well as the trade relation and statistics between them. The aim is to provide some basic facts and background of the agreement for deeper understanding of the analyses and results described in later part of this thesis.

Thereafter, trade theories will be presented in chapter 3. Theories of the Ricardian model, the Heckscher-Ohlin model will be explained, followed by the Gravity model.

Next, previous studies will follow in chapter 4 where the Gravity model are utilized to assess the impact of WTO and FTAs on trade flows.

An empirical analysis of the EU- South Korea FTA will be found in chapter 5. Here you will find a detailed description of the method and data used including the overview of regression variables and the table of regression results.

Lastly the conclusion of this thesis and discussions will be presented in chapter 6.
Descriptive statistics of the regression is placed in Appendix after References.

[3] Gross domestic product: The market value of final goods and services produced by an economy per year. (Jones 2014)

2. The EU-South Korea Free Trade Agreement and Trade Statistic

In this chapter an overview of the FTA between the EU and South Korea is presented as well as the trade relations between those countries. The trade statistics are taken from the year 2016, which is five years after the implementation.

The FTA between the EU and South Korea was implemented on 1 July 2011. The agreement is the EU's first trade deal with an Asian country and the most comprehensive free trade agreement ever that the EU has negotiated. The agreement covers not only trade in goods but also a wide range of issues such as trade in services, intellectual property rights, sustainable development and investment. There are also specific commitments of non-tariff obstacles for automobiles, pharmaceuticals and electronics. The agreement is expected to promote bilateral trade and economic growth in both the EU and South Korea (European Union 2011).

The EU import statistics with South Korea in 2016

South Korea is the EU's 8th largest importer. Industrial products share 99.3 % of the EU's total import from South Korea and agricultural products shares 0.4 %. The top three import manufacture products from South Korea is machinery and appliances 33.5 %, transport equipment 26.7 % and plastics, rubber and articles thereof 9.4 % (European Commission 2017 a).

The EU export statistics with South Korea 2016

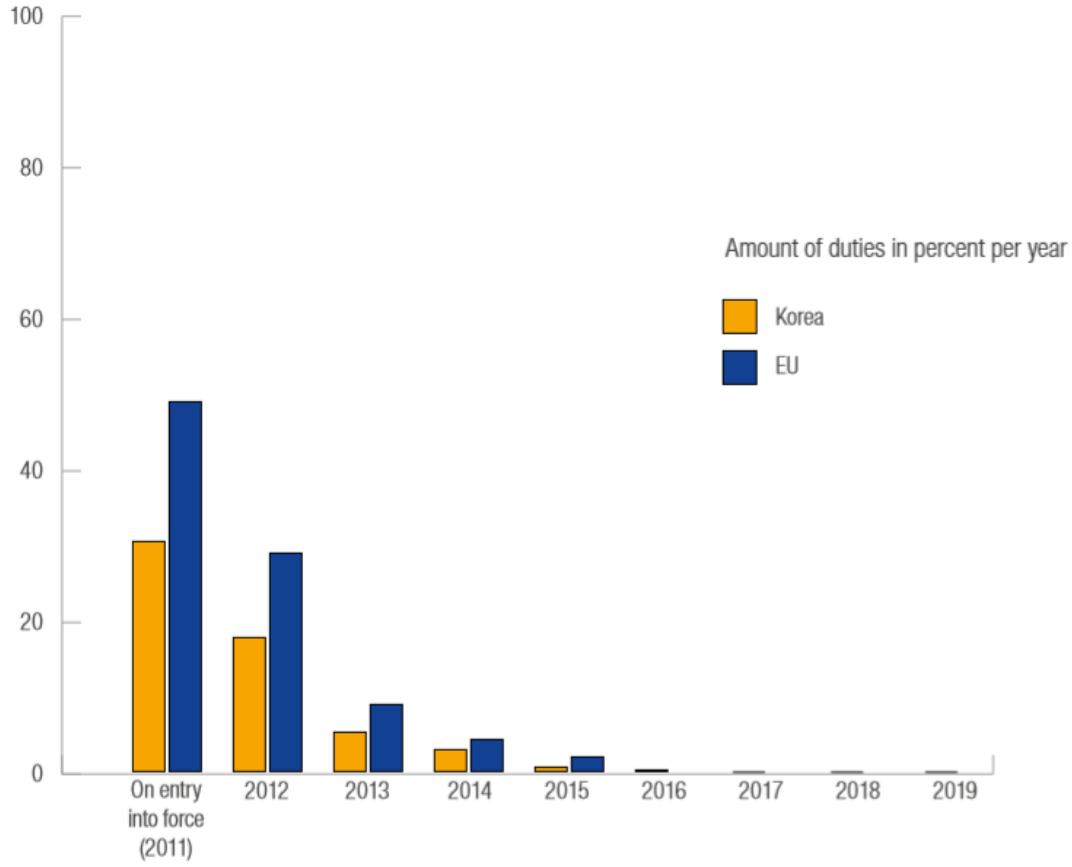
The EU is South Korea's 2nd largest importer. Industrial products share 93.8 % of the EU's total export to South Korea and Agricultural products share 6 %. The top three export manufacture products from the EU to South Korea is machinery and appliances 28.6 %, transport equipment 21.4 % and products of the chemical or allied industries 13.7 %. (European Commission 2017 a).

Figure 2 below shows the Tariff reduction and elimination schedule for the EU and South Korea between 2011 and 2019. According to the graph, 50 % of the EU's customs duties, while 30 % of South Korea's customs duties in import products are scheduled to be eliminated from the start year. Overall, the EU's customs duties are scheduled to be eliminated/redacted in earlier stages than the South Korea's customs duties. Many of the

import products duties should have been eliminated within five years from the start of the implementation. The rest of the import products will be removed by a step by step implementation with a few exceptions in the area of agricultural products where duties will remain (European Union 2011).

In terms of representative import products, 70 % of duties in Machinery and Appliances should have been removed from the start. The EU customs duties for the most sensitive industrial product, which are passenger cars with small sized engines, consumer electronics including TV sets, video recorders and LCD monitors should have been eliminated fully first after five years from the agreement. The duty of cars with large or medium engines are also considered sensitive goods and have a 3 years elimination period. The tariff elimination creates benefit for consumers since the prices will be lower and exporters will be more competitive. The transitional period is considered to allow the domestic producer to increase their productivity and be more competitive in international markets gradually. (European Commission 2010; European Union 2011).

Figure 2. Tariff reduction and elimination schedule



Source: European Union (2011)

3. Theory

This chapter presents international trade theories. The first two theories explain why countries trade with each other while the last theory explain the volume of trade.

3.1 The Ricardian Model

The Ricardian model is an economic theory presented in the beginning of 1800s. David Ricardo explains why two countries gain from trade using the concept of comparative advantage.[4] His approach is that countries will export goods where their production cost is relatively lower and will import goods where their production cost is relatively higher. The countries in that case will specialize in producing the goods where their labor produces relatively efficiently (Krugman, Obstfeld & Melitz 2015).

The pattern of trade between countries is determined by differences in technology across countries, which means that even countries with poor technologies can export the goods in which they have comparative advantage. The utility of each country's import or export is at least as high as it would be in the absence of international trade and hence, all countries experience gains from trade. The assumption of the Ricardian model is rather simple because it uses a single factor of production, labor, and opportunity cost to produce a goods is constant. The model presented in the next section uses several factors of production and the gain from trade becomes more complicated (Feenstra & Taylor 2014).

3.2 The Heckscher-Ohlin Model

The Swedish economists Eli Hecksher and Bertil Ohlin developed the Heckscher-Ohlin model. Unlike the Ricardian model, which assumed that trade relies on technological comparative advantage, the Heckscher-Ohlin Model assumed that the technologies are the same across countries and that countries trade because of differences in factor endowment, such as the amount of labor, capital and land (Feenstra & Taylor 2014). As an example, Koo, Kennedy and Skripnitchenko (2006) explain the pattern of trade in interindustry trade for the U.S. trade with Mexico under North American Free Trade Agreement (NAFTA hereafter). Mexico exports tropical fruits and vegetables to the U.S. as Mexico has a comparative

[4] A country has a comparative advantage in producing a good or service if its opportunity cost of producing the good or service is lower than other countries.

advantage in producing those products because of the weather conditions. On the other hand, the U.S. export grain and oilseed to Mexico as the U.S. has a comparative advantage over Mexico in producing those products because of the differences in soil quality and weather conditions. In addition, Mexico is a labor-abundant country compared to the U.S, while the U.S. is a capital- and technology-abundant country. The U.S. therefore, has a comparative advantage over Mexico in producing capital-intensive goods, for example computers, aircraft and automobiles and leading to export them to Mexico. Mexico will export labor-intensive commodities, for example leather and textile products because Mexico is labor-abundant country, having a comparative advantage over the U.S. in producing those goods (Koo, Kennedy & Skripnitchenko 2006).

Furthermore, the model predicts who will gain and who will lose from trade in the long run because when a country opens for the trade, relative price of the factor used intensively in the export goods goes up and the other factor losses. That is occurred under the assumption that the factors can move freely between the industries (Feenstra & Taylor 2014).

While both the Ricardian model and the Heckscher-Ohlin Model explain the reason for the international trade there is a prominent model for international trade at that time, called the Gravity Model which explain the value of trade (WTO & UNCTAD 2012).

3.3 The Gravity Model

The Gravity model has been used widely as a work-horse of international trade analyses. A Dutch economist and Nobel Laureate, Jan Tinbergen (1962) was first with introducing the "Gravity equation". Tinbergen was trained in physics and the concept of the model derives from the Newton's universal law of gravity. "Just as planets are mutually attracted in proportion to their sizes and proximity, countries trade in proportion to their respective GDPs and proximity" (WTO & UNCTAD 2012).

The original equation of Newton's universal law is

$$F_g = G \cdot \frac{M_1 \cdot M_2}{d^2} \qquad (1)$$

Where,

-M_1 and M_2 are the masses of each two objects.

-d is distance between M_1 and M_2

-Fg is the force of gravity.

-G is a constant that tells the magnitude of relationship for force and mass.

(Feenstra & Taylar 2014)

The larger each object of mass is, or the closer they are to each other, the greater is the force of gravity between them. The trade between countries is similar to Newton's law of gravity, using the GDP of two countries instead of the mass of two objects, and predicting the amount of trade between them instead of the force of gravity. The economic explanations for Gravity equation is the following.

$$\text{Trade} = B \cdot \frac{GDP_1 \cdot GDP_2}{d^n} \qquad (2)$$

Where,

-Trade is the amount of trade (imports, exports or the average of them) between country 1 and country 2.

-B is the relationship between the "Gravity term" which is $GDP_1 \cdot GDP_2$ and Trade.

-GDP_1 is the GDP of country 1, GDP_2 is the GDP of country 2.

-d is the distance between country 1 and country 2.

-The exponent n on distance is used here instead of d^2 in the Newton's law of gravity, since the exact relationship between distance and trade is unknown.

(Feenstra & Taylar 2014)

According to the Gravity equation above, the lager the GDPs of the countries are, or the closer each of the countries are, the greater is the amount of trade between them. Feenstra and Taylor (2014) refer the mechanism of the Gravity model to the implication of monopolistic competition. The monopolistic competition implies that larger countries trade more since they have more varieties of product to produce and also, they have higher demand than smaller countries.

Moreover, they stated that the Gravity equation can be applied to any pair of countries, or even to trade between the districts within one country. As an example, they have applied trade between 10 Canadian provinces and 30 U.S. states. In fact there is a positive relationship between trade volume and size of province or states (measured by GDP), and trade occur much more within Canada than across the border (Feenstra & Taylar 2014).

McCallum (1995) studied the impact of the Canada- U.S. FTA in 1989 and conclude that although the ratio of domestic trade and international trade in Canada fell from 1988 to 1993 because of the FTA, it is still much more trade within Canada than across the border.

Those findings reflect the barriers to trade that occur between countries. The ease of access to the market or the barrier of trade between countries are often called border effects. They include for example, tariffs, policy that affect the trade, geographic factors, such as if the countries share a border and cultural factors such as whether the countries speak a common language that might make trade easier. All of those kind of factors that influence the amount of trade are reflected in the constant B in equation (2) (Feenstra & Taylar 2014).

The logic behind including the geographic factors is the followings. If all else are constant, the countries in case 1 below will trade less between each other than the countries in case 2 below. The reason for this is that the countries in case 1 have easier access to other larger markets and less trade cost than the countries in case 2 with more geographical barrier.

Case 1:
Two countries are surrounded by other larger trading economies, for example Belgium and the Netherlands sharing border with Germany and France respectively as well as by each other.

Case 2:
Two countries are surrounded by oceans, such as New Zealand and Australia or landlocked by deserts and mountains such as the Kyrgyz Republic and Kazakhstan.
(WTO & UNCTAD 2012)

Recent research concerning the theoretical foundation of the Gravity equation highlights that it is crucial to include the specific factor variables, such as common borders and common languages into the equation in order to draw proper conclusions from estimations (WTO & UNCTAD 2012). This thesis takes some of those kind of factors into consideration in the regression model. A detailed variable description is presented under chapter 5.

The Gravity models can be used to assess whether an FTA has a statistically significant effect on trade volume or not, by including a binary variable in the baseline specification, indicating whether or not a pair of countries trading is a member of a FTA (Plummer, Cheong & Hamanaka 2011). The application of the Gravity equation is presented in chapter 5.

4. Previous Studies

There are a wide range of studies which have used the Gravity model of trade to estimate the effects on trade flows. In this chapter three different studies which examine an impact of Multilateral trade agreement are presented.

Rose (2004) has estimated the effect of WTO and General System of Preferences[5] (GSP hereafter) on trade using the Gravity model. He used a large panel data set with 175 countries spanning over 50 years. In addition to the standard Gravity equation, he utilized many structural variables, such as the distance between countries and, the historical trading relations between countries. He also used binary variables to indicate if only one or both countries have WTO membership and to indicate if a country is part of GSP or not. The study showed that the GATT/WTO did not have any substantial effect on trade. On the other hand, he found a positive significant effect on GSP. "Perhaps the GATT and WTO have acted as an international public goods, freeing trade for all countries independent of whether they are members or not" (Rose 2004, p 112) He was one of the first to provide a comprehensive econometrics study on the effects of the postwar multilateral agreements on trade. As he questioned the positive trade effects of the GATT/WTO his research created a controversial political and economic debate. Nenci (2011) criticized that although Rose's work was based on a wide and detailed empirical analysis, the data of study included only the years when the GATT/WTO was in operation and did not offer comparisons with periods before the GATT/WTO was established.

Unlike Rose (2004), Subramanian and Wei (2007) have proven a strong positive impact on the GATT/WTO using the Gravity model. Most of the data and their sources used by Subramanian and Wei are taken from Rose (2004). The main difference in their model compared to Rose's is that they have included time-varying importer and exporter fixed effects adopted by Anderson and van Wincoop (2003)'s method. Their results show that the GATT/WTO have actually served to increase the world trade, possibly by as much as 120 % or about 8 trillion US dollar in 2000 alone. However, the impact is uneven between countries due to asymmetries for bilateral trading patterns according to their study.

[5] Trade agreement which enables developing countries to pay fewer or no duties on export to EU to contribute to their growth (European Commission 2017e).

Parra, Martinez-Zarzoso & Suárez-Burguet (2016) have analyzed the trade impact of multiple FTAs on Middle East and North African countries (MENA hereafter) between 1994 and 2010 using the Gravity model. The study distinguishes between industrial and agricultural trade to take into account if an FTA includes the elimination of tariff for agriculture product or not. The panel data is constructed to control for all time-invariant bilateral factors that influence bilateral trade as well as for the so-called multilateral resistance factors.

They found that FTAs which include agricultural products have more positive effects for MENA countries than those limited to only industrial products. For example, the FTA USA-Morocco and the FTA USA-Jordan include trade liberalization in agricultural goods and the impact of those FTAs showed a positive significant result on export trade flows for MENA.
In the case of the EUMED,[6] it does not include trade liberalization in agricultural goods and they found a negative significant influence on export trade flows for MENA.

According to the authors this reflects that MENA countries have clear comparative advantage for agricultural product and therefore, they pointed out that it is crucial for MENA to give special attention to the inclusion of agricultural goods when negotiating future agreements.

[6] Euro-Mediterranean partnership: The EU and Algeria, Egypt, Israel, Jordan, Lebanon, Libya, Morocco, Palestine, Syria, Tunisia and Turkey (European Commission 2017d).

5. Empirical Analysis of the FTA EU - South Korea

This chapter present the application of the Gravity Model in the case of FTA South Korea and the EU. Statistic software Stata 15 has been used in this study. Firstly, the method and data are explained followed by model specifications, and finally the result and analysis of regression models are discussed.

5.1 Method and Data

The import trade flows between the EU countries and South Korea have been analyzed as the main estimation of aggregate effects of the FTA using Panel data. According to the basic principle of a measurement based on a Gravity equation, it is necessary to include data for all countries in the world to estimate the effect of the interest (WTO & UNCTAD 2012). Therefore, in this sample of the study the data of approximately 180 countries is included. These countries are not only South Korea and the EU countries but also other countries for example, Afghanistan and Zimbabwe. This is sufficient for developing a fundamental basis for the Gravity model data.

The data which have been analyzed covers the period between 2007 and 2016 and are intended to establish whether the FTA had a positive effect on the import trade flows from the EU countries to South Korea and vice versa since 2011, the year of implementation. The length of the analysis period is relatively short for this type of research. Therefore, the results of the analysis only show the short-term effect.

The unit of observation is a pair of countries in a year, for example,

*Observation 1: Import value in **Sweden** from **South Korea** in year **2007***
*Observation 2: Import value in **Sweden** from **South Korea** in year **2008***
.
.
.
*Observation 10: Import value in **Sweden** from **South Korea** in year **2016***
*Observation 11: Import value in **South Korea** from **Sweden** in year **2007***
.
.

*Observation 21: Import value in **South Korea** from **Sweden** in year **2016***

.

.

There are some cases where trade between the countries is not shown in the data. One reason is that there is no trade between the countries. Another reason is that the data is simply missing or reporting error because some countries do not report their trade data annually which is common for the developing countries. How to handle zero trade flow is a much-discussed issue. Even though empirical literatures on trade have adopted various approaches, there is no perfect fix. How to apply the zero trade flow is rather a matter of judgment. It is important to distinguish between whether zero trade reported is really zero trade or simply a missing data (WTO & UNCTAD 2012). In my sample source, UN Comtrade, zero trade flow are treated as missing data and they are not included in the data set.[7] Therefore, I applied the assumption that all missing trade values in a given country-pair and a given year are treated as missing data and thus, left out of the sample. All data sources are presented in table 5.1 below.

5.2 Model Specifications

Two different models are tested in this study, the first is an Ordinary Least Squares (OLS hereafter) regression model. The second is a panel data regression with fixed effect model (country-pair fixed effect) in order to control for all time-invariant variables (such as distance, history and language).[8]

The Gravity equations used in the models are extensions of the original Gravity model taken from WTO and UNCTAD (2012) and additionally the FTA EU- South Korea variables are added to the equation. Robust regression was used in both models to correct heteroskedasticity which was validated by the result of the white test (WTO & UNCTAD 2012). The model specifications are as follows.

Regression model 1- OLS

$$\text{Ln}(X_{ijt}) = \beta_0 + \beta_1\text{Ln}(Y_{it}) + \beta_2\text{Ln}(Y_{jt}) + \beta_3\text{Ln}(D_{ij}) + \text{d}(colony) + \text{d}\,(contig) + \text{d}(comlang\_off) + \text{d}(fta\_kr\_imp) + \text{d}(fta\_eu\_imp) + \alpha_i + \alpha_j + \alpha_t + \varepsilon_{ijt}$$

[7] This is confirmed by UN Comtrade via e-mail on 2017-12-01.
[8] The result of a Hausman test showed that a fixed effects model is preferable to a random effects model.

Regression model 2- Fixed effect

$$\mathrm{Ln}(X_{ijt}) = \beta_0 + \beta_1 \mathrm{Ln}(Y_{it}) + \beta_2 \mathrm{Ln}(Y_{jt}) + d\,(fta\_kr\_imp) + d\,(fta\_eu\_imp) + \alpha_{ij} + \alpha_t + \varepsilon_{ijt}$$

Explanation of specification

i: = importer country

j: = exporter country

t: = time in year

$\mathrm{Ln}(X_{ijt})$: Natural logarithm of import value from country i to country j at time t, value in current US dollar

β_0 = Intercept

$\mathrm{Ln}(Y_{it})$: Natural logarithm of GDP of counties i at time t, value in current US dollar

$\mathrm{Ln}(Y_{jt})$: Natural logarithm of GDP of counties j at time t, value in current US dollar

$\mathrm{Ln}(D_{ij})$: Natural logarithm of Distance from countries' main city i to j, measured in kilometers

d (*colony*): Dummy variable for a Colonial link = 1 if i and j have a colonial link, otherwise = 0

d (*contig*): Dummy variable for contiguity = 1 if i and j share a border geographically, otherwise = 0

d (*comlang_off*): Dummy variable for a common language = 1 if i and j speak common language, otherwise = 0

d (*fta_kr_imp*): Dummy variable for FTA South Korea's import value = 1 if i is South Korea, j is EU country and if year 2011 and later

d (*fta_eu_imp*): Dummy variable for FTA EU country's import value = 1 if i is EU country, j is South Korea and if year 2011 and later

α_{ij}: Country-pair specific intercepts for fixed effects model

α_i: Dummy variable for importer = 1 if country is i, otherwise =0

α_j: Dummy variable for exporter = 1 if country is j, otherwise =0

α_t: Dummy variable for specific year = 1 if time is t, otherwise =0

ε_{ijt}: Error term

Source: WTO and UNCTAD (2012).

Table 5.1 Overview of regression variables, expected outcome and source

Variable	Description	Expected outcome	Source
Ln(*Xijt*)	Import value	Dependent variable	UN Comtrade
Ln(*Yit*)	Importer's GDP	+	The World Bank
Ln(*Yjt*)	Exporter's GDP	+	The World Bank
Ln(*Dij*)	Distance between importer and exporter	-	CEPII
d (*colony*)	Dummy for countries with a colonial link	+	CEPII
d (*contig*)	Dummy for countries with contiguity	+	CEPII
d (*comlang_off*)	Dummy for countries with a common language	+	CEPII
d (*fta_kr_imp*)	FTA dummy for South Korea's import from EU country	+	European Union (2017)
d (*fta_eu_imp*)	FTA dummy for EU countries' import from South Korea	+	European Union (2017)

The dependent variable: [Ln(*Xijt*): import value], explanatory variables: [Ln(*Yit*): importer's GDP], [Ln(*Yjt*): exporter's GDP] and [Ln(*Dij*): distance] are taken into logarithm as the standard way of estimating a Gravity model and the coefficient of these explanatory variables are the parameters of an equation estimated and interpreted as an elasticity (WTO & UNCTAD 2012). For example, the estimated parameters for the importer's GDP indicate the percentage variation in trade as importer's GDP changes by one percent, holding the other variables constant. Feenstra and Taylor (2014) explain in the Gravity equation that the expected effects of the GDP variables are positive since the lager the GDP is the greater the

amount of trade will be. Moreover, the variable of Distance is expected to be negative since the longer the distance is between the counties, the higher the trade cost will be.

The variables, [d (*colony*): the colonial history], [d (*contig*): contiguity] and [d (*comlang_off*): common language] are commonly used for Gravity variables to identify links between countries (Mayer & Zignago 2011). Those kind of culture characteristic variables capture information cost and are expected to have a positive impact on trade. The underlying hypothesis are that firms in countries with a common language, sharing a border or have a colonial history are more likely to know each other and makes it easier to understand each other. Thus, firms are more likely to do business with suppliers or customers (WTO & UNCTAD 2012).

FTA dummies, [d (*fta_kr_imp*): Import value in South Korea from EU country] and [d (*fta_eu_imp*)]: Import value in the EU countries from South Korea] are included to control for the impact of import trade flows since year 2011.[9] More particularly, (*fta_kr_imp*) equals 1 if South Korea is an importer and one of the EU-member countries is an exporter between 2011 and 2016,[10] otherwise 0. The other one (*Fta_eu_imp*) equals 1 if one of the EU-member countries is importer and South Korea is exporter between 2011 and 2016. The idea behind this is to estimate the impact for both sides of change in import values separately. Note that the intra-EU trade is not included in those dummies to limit the evaluation for only the EU-South Korea FTA, not for the EU as a customs union. Those variables are expected to be positive since the FTA is expected to promote trade.

[α_i: importer's dummy] and [α_j: exporter's dummy] are included in OLS model to control all country-specific characteristic. For example, $\alpha_i = 1$ if importer is Sweden, otherwise 0, $\alpha_i = 1$ if importer is South Korea, otherwise 0 and so on for each country (WTO & UNCTAD 2012).

[9] The FTA dummies takes into account from 1st of Jan 2011, although the implementation is from 1st of Jul 2011. The FTA dummies with time period from 1st of Jan 2012 were tested to compare the results. There were however no significant differences in the results.

[10] Country pair: Croatia and South Korea is counted from 2014 which is the year the amendment of the agreement has been done since Croatia joined into the EU in 2013(European Commission 2017 c). Romania is not included due to some missing data.

[α_t : dummy for a specific year] is included in both OLS and fixed model. For instance, α_t = 1 if year = 2007, otherwise 0, α_t =1 if year = 2008, otherwise 0 and so on for each year for sample period between 2007 to 2016 (WTO & UNCTAD 2012). The descriptive Statistics table is presented in Appendix.

5.3 The Results and Analysis

Table 5.2 Regression Results

Dependent variable: limports		
Model	**OLS Model**	**Fixed Model**[11]
Independent Variables		
lgdp_exporter	0.158***	0.253***
	(0.0347)	(0.0304)
lgdp_importer	0.625***	0.746***
	(0.0373)	(0.0327)
Ldist	-1.650***	-
	(0.00834)	
Colony	0.786***	-
	(0.0351)	
Contig	0.560***	-
	(0.0413)	
comlang_off	1.010***	-
	(0.0178)	
fta_korea_imp	-0.318***	0.295***
	(0.0901)	(0.0829)
fta_eu_imp	-0.205**	-0.194***
	(0.0992)	(0.0738)
Constant	5.853***	-10.19***
	(1.135)	(1.112)
Number of observations	204493	204493
R-squared	0.750	0.023 within
F-stat	0.0000	0.0000

[11] Time invariant variables cannot be taken into consideration in the fixed effects model.

Robust standard errors in parentheses Unit of observations is country pair/year. *** p<0.01 ** p<0.05 * p<0.1

The outcome of both models reveals sufficient results as all variables are statistically significant at the 99 % level of confidence with the exception of the *fta_eu_imp* which are at 95 % level. F-test shows that all the coefficients in the model are different than zero.

The coefficient estimates for the GDP variables are expectedly positive, indicating that if the GDP increases, so does trade which confirms the theories of the Gravity model. Moreover, the coefficient on the distance shows a negative sign which is also consistent with the theory that the remoteness between countries has a negative effect on trade.

The dummy variables, *colonial history*, *contiguity* and *common language* have a positive coefficient respectively, indicating that the estimated coefficients have a positive impact on trade. The result supports the previous mentioned hypotheses that the similar characteristic of culture, history and geography facilitate the access of business.

As shown in Table 5.2, *fta_korea_imp* has different results in OLS model and fixed model. In OLS model the variable has a negative sign, and the latter model a positive. Since both are statistically significant as mentioned before, one can admit that the outcome of result varies across the model.[12] Concerning the interpretation of dummy variables, in order to be interpreted as elasticities, the estimated coefficients need to be transformed. For example, the case of *fta_korea_imp* for fixed model, the import flows would increase by [(exp (0.295)-1*100] = 34.3 % if the dummy assigns the value of 1, all else equal (WTO & UNCTAD 2012).

On the other hand, the variable for the FTA EU import show a negative sign in both models. That means the FTA has a negative significant influence on the EU import flows from South Korea, and the results are not in line with expectation. However, there are some empirical studies which have similar results.

[12] As in the fixed effect model the random effects model shows positive significant effects.

Plummer, Cheong and Hamanaka (2011) estimated the trade effect of AFTA using a Gravity model period between 1988-2007. The dummy variable for trade creation showed a negative sign, and the dummy variable for trade diversion showed a positive sign which were the opposite of what were expected. Since both variables were statistically significant the result could be interpreted that AFTA actually had a negative influence for the countries within AFTA and positive effect for extra regional trade.

As another example of similar result, Mid-Term Evaluation of the EU's GSP (European Commission 2017 b) have obtained different signs depending on their regression models used. For example, the dummy variables which examined the effect of GSP had both negative and positive significant signs, depending on model used (OLS model or Fixed Model). They stated that the fixed effects model is preferable since it controls for all time-invariant variables between country pairs.

6. Conclusions and Discussion

The research described in this thesis confirms that the FTA does have a significant effect on trade flows. However, whether the FTA has a positive or a negative influence depends on the econometrics method used.

In the case of the FTA between the EU and South Korea, two regression models have been utilized to examine the effects on import trade flows using the Gravity model. In the regression models, both positive and negative influences on South Korea's import trade flows from the EU were found, and a negative influence on EU's import trade flows from South Korea was found. Another finding was that there were significant relationships between GDP size, geographical distance and trade flows which were in line with the standard trade theory of the Gravity model.

Since the FTA agreement implied an elimination of tariffs for most categories of imported goods, one could argue that the marginal profit for firms would have increased and thus an increase in trade volume is expected. However, there are no clear answers concerning why the EU's import from South Korea has a negative influence between 2011 and 2016 despite the tariff reductions implemented by the FTA.

One possible reason might be that the effects of the tariff eliminations/reductions have a limited impact on trade volume. There are several other possible factors that might influence the demand in international trade e.g. low product cost, labor skills and currency effects. Those factors could neutralize trade cost and therefore tariff elimination might not have a substantial effect for increasing trade volume. Another reason might be that due to complicated tariff rules and heavy trade procedures such as the rule of origin and customs documentation, only few firms understand how to take advantage of the benefit of the FTA.

To summarize, during the survey of this essay, both negative and positive outcomes on trade flows within the impact studies of FTAs/multi regional trade agreements have been observed. These observations have been seen both through own calculations in this study and through previous studies results as presented in this thesis. A possible limitation to this study could be the fact that the time span is limited to 5 years each for pre-FTA implementation and post FTA implementation. Since the tariffs were eliminated progressively under several years (as

shown in figure 2 under chapter 2) it is likely that the full effect of the FTA implementation is still to be seen. It might be so that a longer study period is required to estimate and observe the full effect of the tariff elimination, therefore, a replication of this study to examine the long-term effect of the FTA is suggested for future research.

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8. Appendix

Descriptive Statistics

Variables	Minimum	Maximum	Mean	Std. Deviation
Log of Import values	0	26.9459	14.4706	4.485376
Log of GDP exporter	16.83265	30.55252	24.62156	2.334
Log of GDP importer	17.22634	30.55252	24.9359	2.261006
Log of Distance	4.087945	9.898699	8.659945	0.8150886
Common Laungage	0	1	0.1532834	0.3602613
Contiguity	0	1	0.0206359	0.1421623
Colony	0	1	0.0161959	0.1262286
FTA Korea Import	0	1	0.0007416	0.0272219
FTA EU Import	0	1	0.0007035	0.0265152