CHARLES UNIVERSITY

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Department of Economic Science

Master's Thesis

2019 **Lennart Classen**

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Comprehensive Trade Agreement between Asymmetric Partners

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Has the Asymmetric Free Trade Agreement resulted in Trade creation and Trade diversion effects?

Master's thesis

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Study programme: International Economics and Political Studies

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Year of the defence: 2019

Declaration

1. I hereby declare that I have compiled this thesis using the listed literature and resources only.

2. I hereby declare that my thesis has not been used to gain any other academic title.

3. I fully agree to my work being used for study and scientific purposes.

In Prague on 31 July, 2019 Lennart Classen

Reference

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Abstract

Free Trade Agreements and particularly Asymmetric ones have been discussed controversially for several decades now. The Latin American region has increased their efforts to integrate their economies in the international arena. The Andean Community being a customs union in Latin America signed a Free Trade Agreement with the European Union in 2013. Being an asymmetric trade deal, this thesis examined whether it has resulted in trade creation and trade diversion effects already.

Looking at the results, I can clearly reject the notion of negative effects as a consequence of the trade agreement. Considering the entire, but also the agricultural and manufactured economic sectors, I found statistically significant trade creation effects. Concerning trade diversion effects, the results were not statistically significant and additional research in the future seems required.

Keywords

Gravity Model, Asymmetric Free Trade Agreement, Trade creation, Trade diversion, Andean Community, EU, Panel Econometrics

Title

Comprehensive Trade Agreement between Asymmetric Partners

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Institute of Economic Studies

Master thesis proposal

In the first part of the thesis I will present a literature review on the effects of free trade agreements in the Western hemisphere over the last decades, focusing on trade agreements with asymmetric eco-nomic structures. I will further examine additional free trade agreements of the ANDEAN community, for example with MERCOSUR and Canada. To assess the effects on trade creation and diversion of the establishment of the ANDEAN Community on its members, as well as the effects of the implementation of the free trade agreement on the count-ries Colombia and Peru I will use gravity models.

Preliminary Scope of the Thesis

Latin America is meanwhile the fifth largest trading partner of the European Union. Over the last de-cade we could witness increasing efforts of both parties to deepen their trade relations, especially since the relations with the US have recently become more difficult.

Within Latin America, the ANDEAN community represents one trading bloc and a free trade agree-ment among the EU and Peru and Colombia was implemented in 2013. Recently Ecuador also joined the agreement, leaving Bolivia as the only outsider. Considering the preferential treatment that all other ANDEAN community member countries will soon enjoy, it increases the pressure on Bolivia to also join the agreement and creates an opportunity of further deepen the trade relations among both parties.

This paper will assess the general impacts of the ANDEAN community member countries since the establishment of the customs union, with regard to its intra-community as well as extra community tra-de developments.

It will further assess the impacts of the free trade agreement with the EU had so far on Peru and Colombia, as well as the potential benefits it could have on Ecuador and Bolivia.

Working hypotheses:

1.Positive economic impacts for member countries of the ANDEAN community since the establishment of the customs union

2.General positive economic impacts for the member countries that have implemented the free trade agreement with the EU

3.Member Countries of the Andean community that have not yet implemented the trade deal will also economically benefit from it.

Outline:

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Acronyms

CACM	Central American Common Market
CEPII	Centre d'Etudes Prospectives et d'Informations Internationales
CMEA	Council for Mutual Economic Assistance
DESTA	Design of Trade Agreements
EBA	Everything But Arms
EEC	European Economic Community
EU	European Union
FDI	Foreign Direct Investment
FEM	Fixed-Effects Model
FTA	Free Trade Agreement
GATS	General Agreement on Trade in Services
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GSP	Generalised Scheme of Preferences
H-O	Heckscher-Ohlin
IIT	Intra-Industrial Trade
LAFTA	Latin American Free Trade Association
LSDV	Least Square Dummy Variable
MRT	Multilateral Resistance Term

NTB	Non-tariff barriers
PTA	Preferential Trade Agreement
REM	Random-Effects Model
TPP	Trans-Pacific Partnership
TTIP	Transatlantic Trade and Investment Partnership
WDI	World Bank Development Indicators
WITS	World Integrated Trade Solution
WTO	World Trade Organization

1. Introduction

Over the last decades we could witness a boost in free trade agreements (FTA). The importance of international supply chains making use of particular regional comparative advantages, paired with globalisation processes facilitating interconnected production processes contributed to this significant increase in bilateral trade agreements.

An additional reason boosting the amount of FTA's is the stall of the Doha negotiations at the multilateral level for meanwhile more than two decades. Since certain rules of the World Trade Organisation (WTO) seem outdated from todays perspective, country blocs started their own initiatives and increasingly engaged in bilateral agreements. The effects of trade agreements have meanwhile been discussed for several decades. The majority of studies seem to find overall positive effects on trade. However, there are also studies that stress the potential negative effects for individual member states or trade blocs of FTA's. Particularly, FTA's among developed and developing countries and their potential asymmetric economic affects have been examined more regularly over the past decade.

This paper will assess whether the comprehensive trade agreement between the European Union (EU) and the Andean Community countries Peru and Colombia has resulted in trade creation and trade diversion effects under asymmetric economic conditions.

The method I will use is a micro-founded augmented, as well as disaggregated Gravity Model with country-pair and time fixed effects. Being a widely recognised tool to assess trade creation and trade diversion effects, the Gravity Model includes variables like, distance, Gross Domestic Product (GDP), colony, common language and dummies for the membership in the FTA. In order to properly assess the impact of the FTA on trade diversion and trade creation effects, I will examine the period 1997-2017 using a bilateral panel dataset of 183 countries. The data used in this paper

comes from the databases World Integrated Trade Solutions (WITS), World Bank Development Indicators (WDI), Centre d'Etudes Prospectives et d'Informations Internationales (CEPII) and Design of Trade Agreements (DESTA).

The result of this thesis is that there have been trade creation effects as a result of the FTA. The results are statistically significant and the presented robustness checks support the main conclusion. At the disaggregated level, I also found positive trade creation effects. The outcomes for the trade diversion effects were not as clear and future research is necessary to properly assess these effects.

To the best of my knowledge this thesis represents the first available ex-post econometric analysis covering the FTA between the EU- and the Andean Community and it provides additional perspectives about the performance of the agreement. Considering the results until today, the parties involved should be encouraged to further integrate the two trade blocs and foster closer economic integration.

The structure of the thesis is as follows. In chapter 2, I will outline the historical and current trade relations of the Andean Community countries Peru and Colombia with the EU and describe main provisions of the comprehensive trade agreement. In chapter 3, I will first outline the developments of the gravity model since 1962 and how micro-foundations have been added to it. I will further present existing literature on FTA's, with a focus on asymmetric ones.

In chapter 4, I will present the econometric specifications of the gravity equation that will be used to examine the effects on trade creation and trade diversion among asymmetric partners. Chapter 5 deals with the Sources of Data being used for the analysis, before I will present the estimation results in chapter 6. Chapter 7 will cover the analysis and interpretation of the estimated results.

Lastly, I will provide concluding remarks and answer the posed research question. I will also provide limitations of the thesis and present areas where future research could focus on.

2. Trade relations EU- Andean Community countries Peru and Colombia

2.1 Economic structures and Trade patterns between the EU and Andean Community countries Peru and Colombia

The FTA between the EU and the Andean Community represents an asymmetric one, since the economic sizes of the two trade blocs differ significantly. Looking at Table 1 (World Bank Development Indicators, 2019), we can see the exports, imports and the GDP of the EU, Colombia and Peru in the year 2012, being the year the FTA was signed. The total GDP of Peru and Colombia together only represents 2.8% of the EU-GDP. Also imports and exports only represent a fraction of EU values. As a consequence, already before the agreement entered into force, the overall impact of the FTA on the European economy was expected to be smaller than for the Peruvian and Colombian economy (Francois et al., 2012, p. 6).

Table 1: Exports, Imports and GDP - FTA Member Countries (2012)

	Exports (BoP, cur. US$)	Imports (BoP, cur. US$)	GDP (const. 2010 US$)
EU	7,366	6,984	17,239
Colombia	68	69	319
Peru	52	48	166

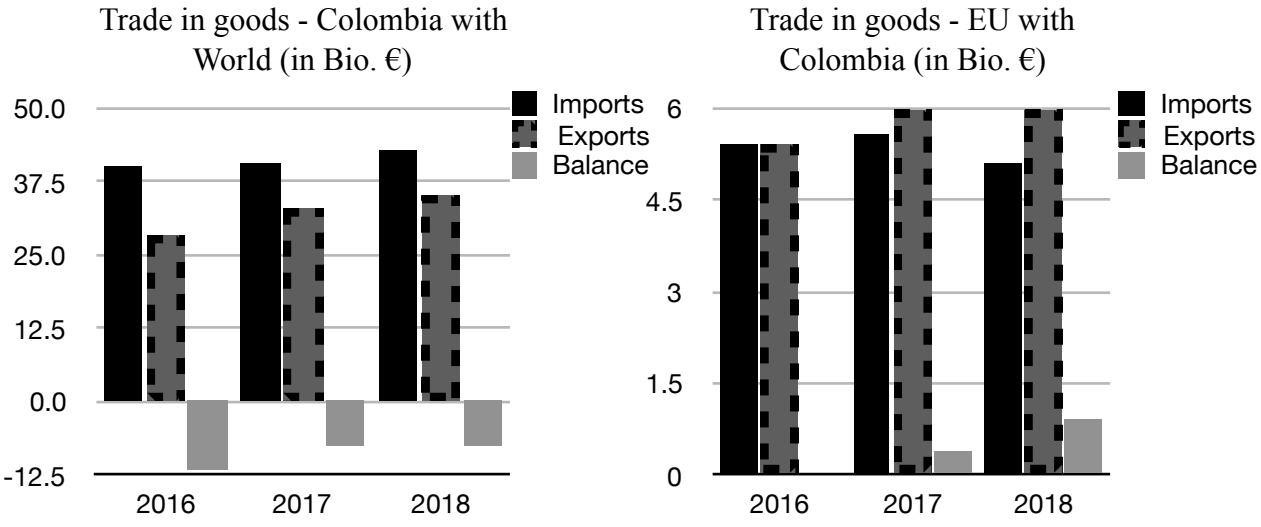
Own illustration, based on „World Bank Development Indicators, 2019“

The patterns of production of the trade blocs also differ significantly. Within the EU-28 countries almost 75% of the value added shares are attributable to services. Colombia with a level of 67% and particularly Peru with only 44.7% have very different patterns of production. On the other hand, agriculture and food products only contribute 5.5% to the value added in the EU28, but 18%- and 24.9% for the case of Colombia and Peru respectively (Francois et al., 2012, p. 8). The different

patterns for the two trade blocs are not surprising since more developed economies typically have higher shares of value added in services.

The next issue I will briefly examine are the trade dynamics between the EU, Colombia and Peru over the period 2002-2018. If we are looking at Figure 1, we can see the developments of trade in goods of Colombia with the world on the left side and on the right side the trade developments of Colombia with the EU. The worldwide import volume of Colombia has increased by more than 10% and the export volume by almost 30%. Regarding bilateral trade with the EU, imports from Colombia have reduced by 6.6%, while EU-exports to Colombia increased by about 10%. Colombia has a trade deficit of 7.9$ Billion worldwide and of 0.9$ Billion with the EU. The most important Colombian import products from the EU are machineries, transport equipment and chemicals. In terms of Colombian exports to the EU market, agricultural products, food and raw materials, as well as fuels and mining products are most important to mention (European Commission, 2019c).

Figure 1: Trade relations Colombia/World, Colombia/EU

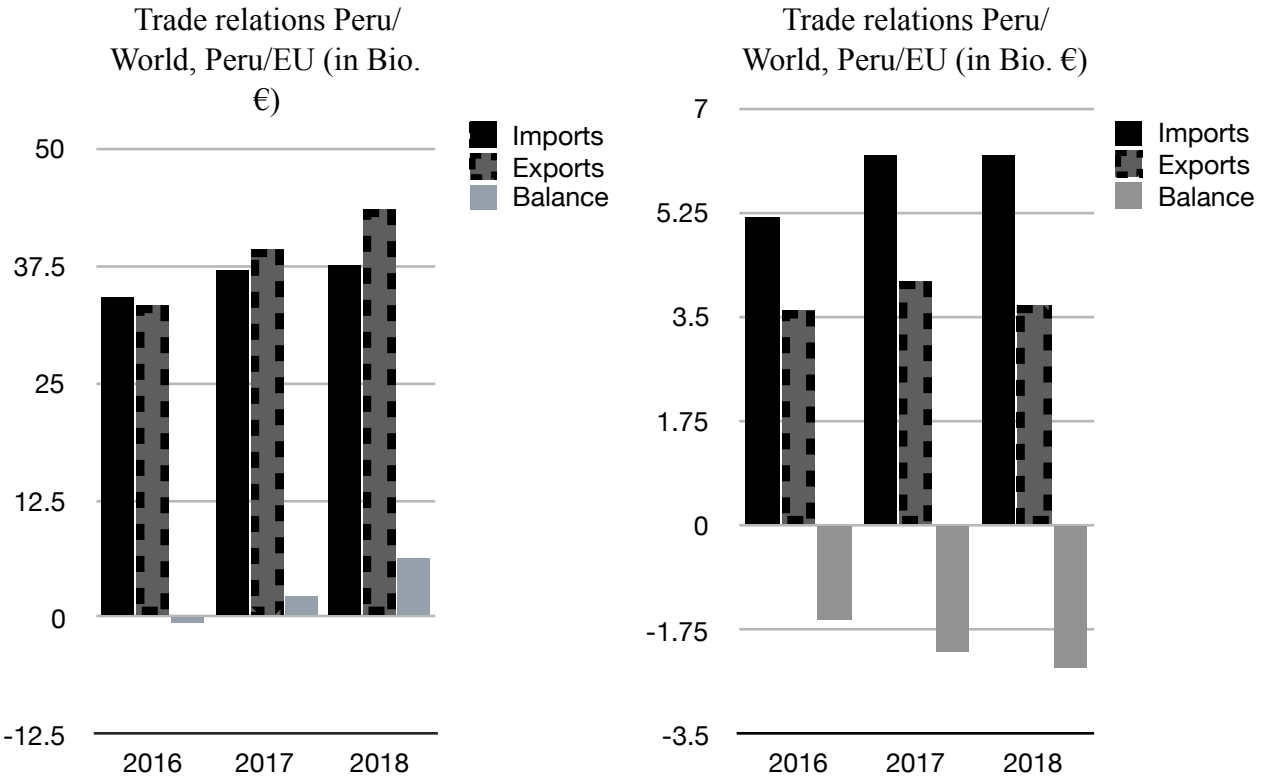


Own illustration, based on „European Commission, 2019c“

In contrast, to worldwide trends, the trade deficit with the EU could not be reduced during the period 2016-2018. To draw comprehensive conclusions a longer period needs to be examined

though. Looking at the statistics of Peru (Figure 2), we can see that the country has increased its worldwide imports of goods by 20% between 2016-2018, while exports even increased by 45% over the same period. As a consequence, the trade account improved from a deficit of 0.6$ Billion to a surplus of 7.6$ Billion. Regarding EU trade relations with Peru, we can see at Figure 2 that the imports from Peru increased by 1$ Billion between 2016-2018 and the exports by 0.1$ Billion. The trade deficit of the EU increased to 2.4$ Billion as a consequence (European Commission, 2019d).

Figure 2: Trade relations Peru/World, Peru/EU



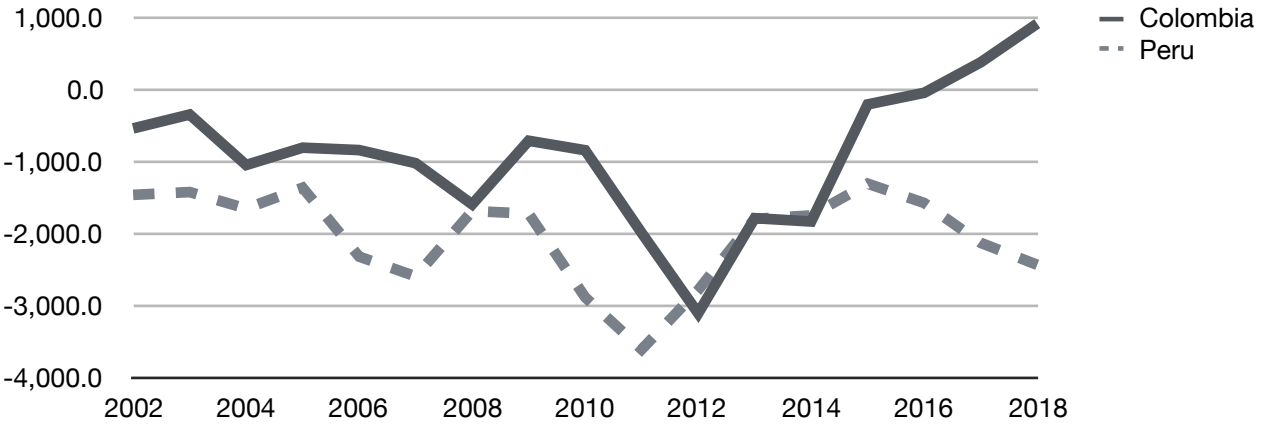
Own illustration based on „European Commission, 2019d"

In case of the country Peru, the bilateral trade developments with the EU are similar to the global ones. The country managed to significantly increase its global import- and export volumes and achieved a trade surplus in 2017 and last year. The same tendency can be observed for the trade relations with the EU. Peru had already achieved a trade surplus in 2016 and managed to continuously increase it between 2016-2018 (European Commission, 2019d).

Considering a longer period, it becomes obvious that between 2002-2010 the trade balance of Peru and Colombia with the EU followed more or less similar trends. Both countries managed to increase their trade surplus with the EU substantially during the period 2008-2012, followed by a reduction in 2013. Between 2014-2018 the trends were exactly the opposite however. While Peru improved its trade balance with the EU, Colombia recently had a trade deficit of almost 1$ Billion (Figure 3). Whether the FTA had an impact on these developments and potentially Peru has benefited more from the agreement than Colombia, will be evaluated at a later point.

potentially a more favourable one on Peru than on Colombia will be evaluated at a later point.

Figure 3: Trade Balances EU-Peru, EU-Colombia, 2002-2018 (in Mio $)



Own illustration, based on „World Bank, 2019“

2.2 The FTA between the EU, Peru and Colombia - Main Contributions

The EU has intensified its efforts regarding FTA's over the last decades and particularly over the last years. Apart from the FTA's with Japan, Canada and Mexico[1] that have already entered into force, the EU is currently negotiating FTA's with Vietnam, Singapore, Australia, Mercosur and New Zeeland (European Commission, 2019e).

[1] The first FTA between the EU- and Mexico entered into force in 2000. Last year the parties agreed on an update of the FTA (European Commission (2019e)

Meanwhile, the region Latin America has become the 5th largest trading partner of the EU. Several Latin American countries have experienced an economic transformation since the early 2000's (European Parliament, 2016). The important trade relationships are also illustrated by the increasing efforts towards signing FTA's with Mercosur, Mexico and in 2013 the Andean Community.

The Andean Community is an unfinished customs union and was established in 1969 by the Cartagena Agreement. Its goals are an integrated, inclusive and independent development of the Andean Community countries, but also Latin America as a whole. Current members of the customs union are Bolivia, Colombia, Ecuador and Peru (Comunidad Andina, 2019b). In 2013, the EU signed a comprehensive trade agreement with the countries Peru and Colombia. Initially, the negotiations started with all four member countries, however, no agreement could be achieved with Bolivia and Ecuador. While Ecuador joined the multi-country agreement in 2016, Bolivia has remained as the only outsider until today (European Commission, 2019b). Since the agreement with Ecuador is still quite new and conclusions about trade effects difficult, this thesis will only consider the EU, Peru and Colombia for the trade effects of the FTA.

Parties involved reached an agreement in 2012 and it entered into force in 2013. The FTA consists of a multitude of sections. One of them deals with the gradual liberalisation of trade in goods in line with guidelines of the General Agreement on Tariffs and Trade (GATT) from 1994. Specifically, trade shall be facilitated through customs and trade facilitations, standards, technical regulations and conformity assessment procedures. Trade in services shall be progressively liberalised in line with the General Agreement on Trade in Services (GATS) and investments reinforced by a liberalisation of current payments and capital movements. Further, government procurement markets of the countries were opened reciprocally. The parties agreed on a substantial liberalisation on trade in goods. The extent of liberalisation differed depending on the sector.

The vast majority of goods will benefit from a tariff free access to Peru and Colombia after the enforcement, but some products will be fully liberalised only after a longer period of up to 17 years. Other products got a one-time tariff reduction of 10 to 20 per cent, no reduction, or quotas were established (Francois et al., 2012, p. 3). Important to mention are Agriculture and Food Products, as well as manufacturing products. Both sectors are still subject to tariffs. The transition period for EU agricultural exports to Peru and Colombia will last until 2027. By then, 85% of exports will be duty-free. In terms of manufactured exports, the EU can export about 70% of its products tariff free to Peru and Colombia. Tariff rates for the key sectors machineries and motor vehicles will be removed within 8 years from 35% to 0% (European Parliament, 2012, p. 12). Regarding Peruvian and Colombian exports to the EU, the overall concessions are not as high as for EU exporters, since the countries had already enjoyed large scale tariff concessions under the Generalised Scheme of Preferences (GSP) + regime (European Parliament, 2012, p. 27).

However, both countries gained additional access for agricultural products like for example bananas, sugar, rice and rum. Furthermore, manufactured exports had tariff free access to EU markets from the day the agreement entered into force (European Commission, 2012, pp. 3-4).

3. Literature Review

3.1 Development of gravity model specifications

3.1.1 Literature on the gravity model until 2003

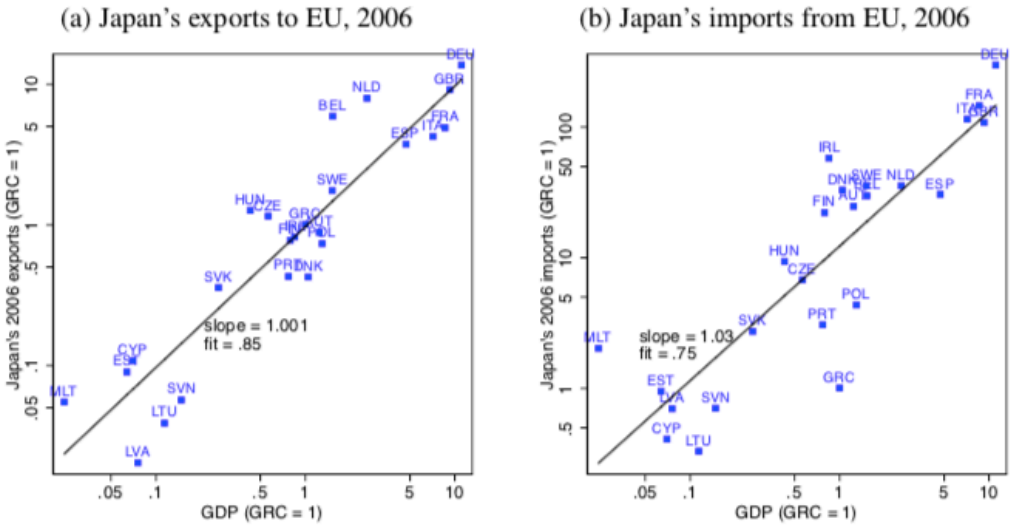
The literature on gravity models examining bilateral trade patterns has meanwhile become very extensive. Gravity models have proven to provide high levels of empirical robustness and thereby provided additional insights to the topic of trade patterns. The original gravity model was inspired

by Newton's physical theory. Two bodies attract each other in proportion to their particular masses and inversely by the square of the distance between them. This provision from physics was subsequently used by Tinbergen in 1962 to explain bilateral trade flows and patterns between two economies by considering both of them as organic bodies. They are attracted in proportion to their economic size and inversely related to their physical distance. Nowadays, Tinbergen's model is often referred to as the simple gravity model (Kepaptsoglou et al., 2010, pp. 1-3). It denotes bilateral trade between country i and j as:

$$ln\ X_{ij} = b_o + b_1\ ln(Y_i) + b_2\ ln(Y_j) + b_3\ ln(t_{ij}) + e_{ij} \quad (1)$$

X_{ij} is the bilateral trade between country i and j, Y indicates the GDP of country i and j, t_{ij} is the distance between i and j and e_{ij} the error term (Anukoonwattaka, 2016). The key point is that bilateral trade rises with economic size, as has been proven by plenty of cases. In Figure 4 (a), the exports of Japan to the EU in relation to the GDP of its EU trading partners are illustrated. Figure 4 (b) shows Japan's imports from the EU relative to the GDP of the trading partners. The figures show that there is almost a unit elasticity and strong correlation between both variables.

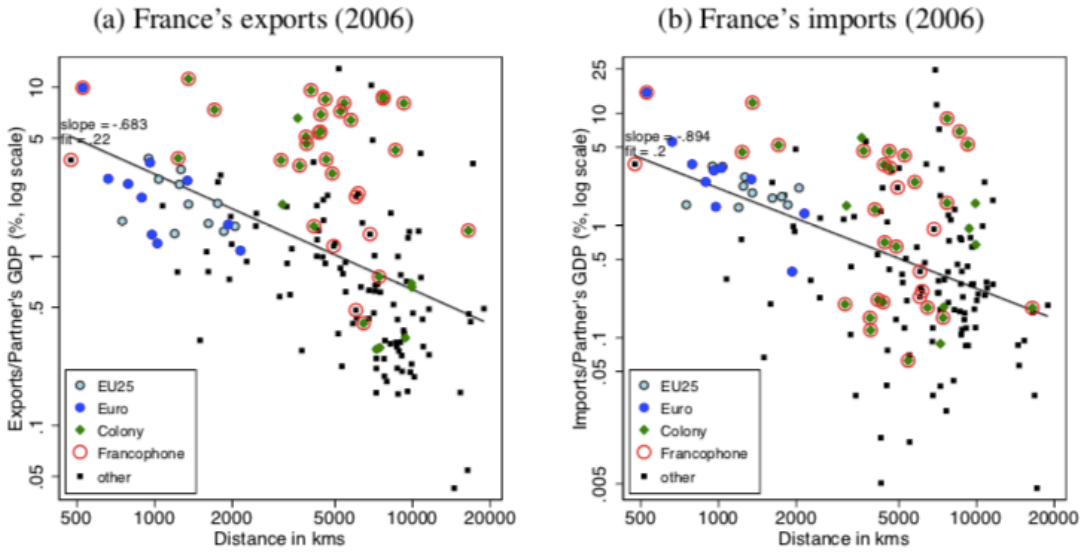
Figure 4 - Trade and size relationship - EU-Japan



Source „Head & Mayer, 2013, p. 7"

Also the second main empirical relationship of the simple gravity equation that trade is inversely related to distance, has proven to be accurate in many cases. As can be seen in Figure 5, the export- and import volumes of France reduce the higher is the country's distance to the respective trade partner.

Figure 5: Trade and distance relationships - France



Source „Head & Mayer, 2013, p. 7"

Despite the high explanatory power of the model, it lacked a profound theoretical foundation at that time. Subsequent publications by Linnemann (1966) and Aitken (1973) were also not grounded in sound theoretical considerations. At the end of the 1970s however, scholars started to develop a theoretical base for the model (Kepaptsoglou et al., 2010, p. 2).

Important to mention is the publication by Anderson (1979). He was among the first researchers, who derived theoretical explanations of the gravity model that were backed by economic theory. He differentiated goods by their country of origin and provided a pure-expenditure system model and a trade-share-expenditure system model. In the pure-expenditure system model, countries specialise in one good with no tariffs or transport costs. Further he assumed identical Cobb-Douglas

preference functions for all products. Hence, there are identical expenditure shares and unit income elasticities. The trade-share expenditure system model, accounted for differences in traded and non-traded goods (Anderson, 1979, pp. 108-110).

Later on, additional publications came out and proved that gravity equations can in fact emerge from a variety of trade theories. Important to mention are the contributions by Bergstrand (1985 & 1989). He laid out a gravity model that was a direct implication of the monopolistic trade model by Krugman (1979). In Bergstrand's model, countries can be identical, but will still be trading different kinds of products, because of a consumer preference for product variety. Hence, goods are not anymore differentiated by location of production as in Anderson's provision. The location of firms is now endogenously determined and countries specialise in a set of products (WTO, 2012, p. 104). In Bergstrand's second publication (1989), he extended the micro-foundation and focused on per capita-incomes, instead of considering the entire exporter- and importer incomes and incorporated factor endowment variables (Bergstrand, 1989).

Deardoff (1998) also added theoretical considerations and derived bilateral trade volumes from the Heckscher-Ohlin (H-O) model. Based on H-O theory, a country will export those goods that require the relative intensive use of the input the country is endowed to. Hence, high-income countries will tend to export capital-intensive goods and low-income countries labour intensive goods. Simultaneously, input and product prices do not differ, since a factor-price equalisation is achieved via trade. Based on Deardoff's (1998) provisions bilateral trade will increase more when countries with different factor endowments engage in trade.

Furthermore, Eaton & Kortum (2002) managed to derive a gravity specification from a Ricardian trade model. It was based on differences in technology and included the role of geography. Their findings indicated that comparative advantages result in opportunities for gains in trade, however,

the realisation of these gains is significantly influenced by particular geographical barriers. Their equation captured these phenomenas by relating worldwide bilateral trade flows to parameters of technology and geography (Eaton & Kortum, 2002, pp. 1174-1175).

Important to mention is also the contribution by Mc Callum (1995). He was among the first researches who examined the impact of borders in delimiting bilateral trade. Using bilateral trade patterns between Canadian provinces and US states, he added a dummy variable equal to one for inter-provincial trade and zero for province-to state trade. By applying the new specification, he found out that trade among Canadian provinces is approximately twenty times larger than trade between Canadian provinces and U.S. states. Even though his results were later found to be overestimated, the publication was still important in further improving the gravity model specification during that time (Anderson & Van Wincoop, 2003, p. 174).

3.1.2 Development of the gravity model since 2003 - Emergence of micro-foundations of the model

Following the attempts to conceptualise the gravity model, Anderson & Van Wincoop (2003) provided the key publication for establishing a micro-founded gravity model in the academic arena. They were the first who included a Multilateral Resistance Term (MRT) in a specification. It refers to the average trade barrier of a region with the rest of the world. As previously noted by Anderson (1979), the higher the average trade barrier of two regions with the rest of the world, the more the two regions or countries will engage in trade. However, Anderson & Van Wincoop (2003) criticised the lack of attendance towards theoretical justifications and pursued an attempt to properly account for the border effect. Gravity equations should not just account for a bilateral- but also a multilateral-resistance. Their results show that bilateral trade flows are primarily explained by relative- and not absolute bilateral trade costs. Hence, the bilateral trade is explained by comparing

these trade costs to costs with third countries. In other words, the propensity of country j to import from country i depends on j's cost for i's exports, relative to its total resistance to imports (inward resistance) and the resistance of i's exports in country i (outward resistance). Leaving out the MRT will therefore lead to biased estimates (Anderson & Van Wincoop, 2003 pp. 176-178). The inclusion of the MRT's is their most important contribution and started the revolution of micro-founded gravity models.

Using their gravity equation and data from 1993, borders led to a 44% reduction in US-Canadian bilateral trade and a 29% reduction of trade with other industrialised countries. Particularly in cases of small economies like Canada, a marginal increase in their trade barrier, had a significant impact on its MRT levels, whereas larger economies like the US are not as much affected. The reason is that increasing barriers to trade affects the entire trade pattern of a country. Since Canada is a small open economy, international trade is more important than for the case of a large economy. If the US increases its barrier to international trade, it does not affect intra-trade, which in the case of the US has a larger impact than for a small country (Anderson & Van Wincoop, 2003, pp. 174-177).

In 2006, Baldwin & Taglioni (2006) managed to generalise Anderson & Van Wincoop's (2003) MRT variable and made it usable for panel data as well. The main issue with Anderson & Van Wincoop's (2003) contribution was that the application was quite laborious due to its non-linearity. An additional problem that Baldwin & Taglioni (2006) identified was the previously used assumption that $\Omega_i = P_i^{1-\sigma}$ holds for all countries. Ω_i stands for the openness of the world towards i's export, while $P^{1-\sigma}$ is country i's openness towards imports from the world. Intuitively any set of Ω_i and $P^{1-\sigma}$ must be proportional. However, Anderson & Van Wincoop (2003) even argued that they are equal. This was the main contribution of Baldwin & Taglioni (2006) who showed that both parameters must be proportional in any case, but the factor of proportionality depends on the

particular GDP and trade costs. In order to get rid of the correlation, which they referred to as „golden mistake“, we can use nation dummies. It would mean, that there is a dummy of one for all trade flows involving a specific nation. They also introduced the usage of pair dummies to correct for the golden mistake. The dummy is one for all observations of trade between a given pair of countries.

In case we only have a cross-sectional data set, we can use binary nation- or pair dummies. In case we have a large bilateral panel data set, Baldwin & Taglioni (2006, pp. 22-24) highlighted the importance of including time-varying exporter- and importer dummies. Depending on the period, we will get a corresponding amount of dummies to assess time-varying individual effects (WTO, 2012, p. 108). They also emphasised the issue of using the US aggregate price index as a deflation of nominal trade values. Since there are global trends in inflation rates, it is not accurate to use them and it would lead to biased results. A solution is the inclusion of time dummies that corrects the misuse of the deflator. Baldwin & Taglioni (2006, pp. 5-7) referred to this issue as the bronze medal mistake.

Since panel data provides much more information about bilateral trade patterns, they did not just aimed at proving the inadequacy of previous publications, but also provided a working tool for improving the results. The silver mistake refers to a misuse of averaging unidirectional trade flows. While using unidirectional trade flows is general accurate, it is necessary to use the geometric average meaning the average of the logs and not the arithmetic average (Baldwin & Taglioni, pp. 6-8).

3.1.3 Approaches on how to estimate a Gravity model

In this subchapter I will lay out approaches on how to estimate a micro-founded gravity model. As a first step, it is important to include variables in the gravity model that have proven to have certain

explanatory power. Apart from the very basic variables GDP and distance, it has become common to include the following additional variables for trade costs:

common official language, colonial relationships, common land borders and common coloniser. (WTO, 2012, p. 107). Further variables can be added to more specific models, but more to that later. As mentioned before, the start of the micro-founded gravity models was marked by the publication of Anderson & Van Wincoop (2003). They were the firsts, who noticed a fundamental problem with the previously applied specifications and tried to solve the border puzzle by introducing MRT's to the equation. Their main critic was that so far, authors had only used remoteness indexes, instead of a variable that properly accounts for trade barriers with all bilateral partners and is connected to theory. The result of the misconduct was an omitted variable bias (Anderson & Van Wincoop, 2003, pp. 170-174). Their final gravity equation in a world of N countries with a variety of goods, differentiated by the country of origin, is as follows:

$$X_{ij} = \frac{Y_i Y_j}{Y} \left(\frac{t_{ij}}{\pi_i P_j}\right)^{1-\sigma} \quad (2)$$

Y_i and Y_j stand for the GDP of the particular countries, whereas Y is worlds GDP. t_{ij} are the import costs in country j for products of country i, $\sigma > 1$ is the elasticity of substitution, π_i is exporter's outwards- and P_j is importer's inward multilateral resistance term. Outward multilateral resistance π_i captures the fact that exports from country i to country j are affected by trade costs across all possible export markets. The same applies for the inward multilateral resistance term P_j. The imports of country i from country j will depend on the trade costs across all possible suppliers. Hence, a change in trade cost among two countries, can have an effect on bilateral trade relationship with other countries, because of relative prices.

Due to the multiplicative nature of gravity equations, we use natural logarithms and end up with a log-linear regression that can be run by an ordinary least square regression:

$$ln\ x_{ij} = a_0 + a_1 ln\ Y_i + a_2 ln\ Y_j + a_3 ln t_{ij} + a_4 ln \pi_i + a_5 ln P_j + \varepsilon_{ij} \qquad (3)$$

a_0 is a constant term, $a_3 = 1 - \sigma$, and ε is the error term.

The key issue with estimating the equation are the inward- and outward MRT's. Since they do not correspond to particular price indices, they are not observable. This urges us to find an estimation approach that considers the effects of both variables in order to avoid biased results. Anderson & Van Wincoop (2003), estimated every multilateral price term individually for every country and used a non-linear least squares technique. While their provisions were a breakthrough at that time, the implementation of the approach was still quite complex and not suitable for panel data sets.

Instead, the most common approach to address the unobservable MRT's for panel data is the one by Baldwin & Taglioni (2006) with country fixed effects for the importer and exporter.

These country dummies will account for the country-specific characteristics. Since the model uses time-varying effects it further accounts for potential changes in the MRT over time. If we are more interested in the coefficients of time-invariant variables, using random effects estimation would be the preferred model, since fixed-effects erase time-invariant variables. However, the decision on whether we use a random, fixed, or pooled OLS estimation, is done after we have implemented several statistical tests. More details about the different models and the required statistical tests, will be provided in chapter 4. Another issue that arises when gravity models are used is endogeneity, especially when we aim at measuring the impact of trade policies. In the area of FTA's, it is unlikely that these agreements are entirely exogenous. Countries are likely to engage in FTA's with countries or trading blocs, they are already trading a lot with. In that case, the dummy used for the FTA would

be correlated with the error term and result in an endogeneity bias. There is no easy fix to this issue, however the use of country-pair fixed effects reduces the bias. The problem with time-varying omitted variables remains as an issue though (WTO, 2012, pp. 117-119).

Furthermore, we need to take care of zero values in our dataset. Particularly in large datasets, it is very likely that there is some amount of missing data. To deal with the issue, we can for example leave them out and not modify it. When estimating the dataset with fixed effects and random effects, the zeros will drop automatically. Furthermore, we can replace missing values by zeros and then replace the zero values by 1 USD. A further possibility is to replace the missing values by zeros and then use the Poisson Pseudo-Maximum Likelihood Estimator (PPML). Another sophisticated approach is the one from Helpman et al. (2008). They first use a Probit equation to get the entry costs for firms to particular export markets. In their second stage they use a gravity model with positive trade values and the results of the first stage.

The gravity model is often used to estimate trade creation and trade diversion effects of FTA's. In order to account for these effects, it is crucial to consider the MRT's to capture third country effects. To test trade creation and trade diversion effects, we construct two dummy variables and include them in our log-linear function. The augmented gravity equation looks as follows:

$$\begin{aligned} lnX_{ijt} = {} & \beta_0 + \beta_1 l_{it} + \beta_2 l_{jt} + \beta_3 ln(dist_{ij}) + \beta_4 cont_{ij} \\ & + \beta_5 lang_{ij} + \beta_6 ccol_{ij} + \beta_7 col_{ij} + \beta_8 landlock_{ij} \\ & + \beta_9 OneinM_{ijt} + \beta_{10} BothinM_{ijt} + \varepsilon_{ijt} \end{aligned} \qquad (4)$$

The dummy $BothinM_{ijt}$ is one when both countries are members of the same FTA. If the coefficient of β_{10} turns out positive and statistically significant, we have a case of intra-FTA trade creation. It suggests that intra regional trade has benefited from the FTA and trade levels are at higher levels than without the agreement.

The dummy $OneinM_{ijt}$ is one when the importer i is a member of the FTA, but exporter j not.

Positive values for β_9 and β_{10} represent an overall trade creation effect of the FTA and not just intra-FTA trade creation.

A positive β_{10} and negative and β_9 indicates a decrease in trade between member and non-member countries, while intra-FTA trade increases. This is defined as a trade diversion effect (Carrére, 2006 ; Martínez Zarzoso et al. 2009).

There is a risk, that FTA's are endogenous variables as well. As previously mentioned, FTA's may be created as a consequence of increasing trade flows and not create trade flows themselves (WTO, 2012, p. 117).

In addition, even if no trade creation effects have been found, there can still be multiple other positive effects of the agreement. Particularly in recent years the scope of FTA's has been broadened and now imply issues like human rights, sustainability measures or democratic values (Bartels, 2013).

3.2 Literature review of Free Trade Agreements

3.2.1 General provisions on Free Trade Agreements

Over the last decades we have seen an unprecedented surge of FTA's in the world. Based on latest data there are currently 1,007 treaties of preferential trade commitments in place (Dür et al., 2014). In general, FTA's are defined as reciprocal trade agreements between two or more partners (WTO, 2019). While the scope and aim of particular agreements may differ, the overall objective is usually to achieve an economic integration that goes beyond a pure deduction of tariffs. The perception of FTA's has recently moved towards a more sceptical one. The failures of the Transatlantic Trade and Investment Partnership (TTIP) and the Trans-Pacific Partnership (TPP) or the renegotiations of the

North American Free Trade Agreement (NAFTA), provide some illustrative examples of the more difficult negotiation conditions of FTA's nowadays. FTA's had been controversially discussed ever since, however, the recent rise in opposition may, among other factors, derive from the impression that past one's have not resulted in the economic benefits projected by policy-makers (Baier et al., 2019, pp. 206-207).

A recent contribution by Rodrik (2018) examined the impact of lobbying interests on FTA creation and provided enriching insights on the topic. He stresses the issue that nowadays, FTA's encompass a lot more than a pure reduction of tariffs like for example patent rules, health- and safety regulations, labor standards or investor courts. According to Rodrik (2018) the reason for the inclusion of these additional areas are mostly lobbying efforts by powerful economic sectors. The trend towards including services in FTA's for example came from the financial sector in the US. Since liberalising the service sector requires changes in the domestic sector, rent-seeking levels were higher than in the case of trade in goods. On the other hand, some areas have remained untouched and the reason are again powerful lobbying groups. An example is the tax- and subsidy competition for large firms (Rodrik, 2018, pp. 84-88). The uneven liberalisation, arguably in favour of powerful groups, may have contributed to the suboptimal reputation of FTA's as well.

They are often examined by using augmented gravity models and in particular by looking at its trade creation and trade diversion effects. These phenomenas were first covered by Viner (2016) who examined cases with customs unions to account for these dynamics. He emphasised that welfare can be increased by trade creation and reduced via trade diversion. The welfare determinants he highlighted were elasticities of demand and supply, geographical proximity of the trade bloc members and the relative number of substitute products produced by the members. Endoh (1999) estimated trade creation and trade diversion effects of the European Economic

Community (EEC), the Council for Mutual Economic Assistance (CMEA) and the Latin American Free Trade Association (LAFTA). He used a simplified gravity equation and included dummies for the membership in one of the trade blocs. For the EEC he observed positive trade creation and negative trade diversion effects, while LAFTA and CMEA had trade diversion effects.

Subsequently, Egger (2004) did a study on assessing trade bloc effects with panel data. His main critic was that the regional trading bloc parameters where estimated using a fixed-effects analysis, that only accounted for time-variant changes, but left out potential long-run trade creation and trade diversion effects. He therefore pursued a two-stage fixed effects procedure and a modified model based on Hausman & Taylor's approach (1981). He further used a bilateral panel dataset consisting of exports of OECD economies to 47 countries and assessed the effects of a NAFTA- and a EEC membership. Based on his results, there were no significant effects on exports in the short-term. In the long-term however, he found substantial trade creation effects.

Another publication by Baier & Bergstrand (2004) highlighted the role of economic size. The larger and more similar the economic size, the larger their trade creation effect, caused by exploitation of economies of scale. Further, the wider the differences in their relative factor endowments the larger the trade creation, due to a H-O comparative advantage. The findings of Baier & Bergstrand (2004) were further supported by Egger & Larch (2008). In case FTA's result in trade creation despite similar factor endowments, the Linder hypothesis is confirmed. Linder questioned the empirical validity of H-O and argued that countries with identical preferences and factor endowments will trade relatively more with each other (Peridy, 2005, p. 132). Especially, after the influential publication of Baier & Bergstrand (2007) it has been widely established, that FTA's are at least beneficial for its member countries. In their publication they also aimed at accounting for the possibility of endogeneity in the design a/o creation of FTA's. Using a panel data set and average

treatment effects for FTA's, they found out that the positive effects was five to six times higher than in case of using the previous estimation technique. Hence, when the FTA effects are properly accounted for, bilateral trading volumes are doubled after 10 years. It also meant that estimations of FTA effects had been underestimated by researchers before (Baier & Bergstrand, 2007).

To further investigate potential trade diversion and trade creation effects, Dai et al. (2014, p. 323) run an extended gravity model specification, with a bilateral fixed effect approach by Baier & Bergstrand (2007) and a PPML estimator proposed by Silva & Tenreyro (2006). Using a panel dataset of manufacturing trade and FTA's for 64 countries they found, as in previous studies, significant trade creation effects. Regarding trade diversion, the effects were particularly strong for imports from non-FTA members. On average, FTA member countries reduced their imports from non-member countries by 57,3%. Exports were not as strongly affected, which is partly explained by the occurrence of fixed costs when entering a foreign market. Therefore, it is rather unlikely that exporters will easily withdraw their activities when a new FTA is set up (Dai et al., 2014, p. 323).

While trade creation effects are seen as a very likely outcome of FTA's, trade diversion effects are more controversially discussed and studies have found mixed results (Dai et al., 2014, p. 321). In the following I will discuss the issue of asymmetric FTA's in Latin America and focus particularly on NAFTA and Mercosur.

3.2.2 Asymmetric Free Trade Agreements

In this section I will present the literature and viewpoints of asymmetric FTA's and then focus on asymmetric ones for Latin America. The term asymmetric FTA refers to partners with different economic backgrounds. In the existing literature, the term asymmetric partners is also increasingly referred to as North-South agreements. Whereas „North" stands for high-income countries and South for low-income countries. There was a growing concern that North-South agreements

potentially result in asymmetric economic benefits, which is the reason why researches have been focusing more on that issue recently (Sherov-Ignatiev & Sutryin, 2019).

FTA's among South-South partners have similar relative factors and are economically smaller. Based on a contribution by Egger & Larch (2008, p. 386), FTA's between South-South countries have less potential for welfare gains than North-South, or North-North agreements. A North-South agreement where partners have different factor endowments, is particularly beneficial for South countries due to the newly gained access to a significantly larger market (Egger & Larch, 2008). However, an important factor for the economic outcomes of North-South agreements are the Rules of Origin (ROO). They have the potential to significantly limit the market access. Based on a paper by Estevadeordal & Suominen (2005), North-South agreements contained substantial levels of ROO's, limiting the market access and therefore reducing the potential gain for Southern FTA members. On the other hand, many Southern countries have been enjoying special tariff regimes when trading with Northern countries. Particularly least developed countries often fall under the GSP, GSP+ or Everything But Arms (EBA) clauses, which significantly reduces their tariff rates when trading with the EU or other highly industrialised countries. Generally North-South trade agreements have the ability to integrate economies with different technological capabilities and factor endowments. They further provide a larger market for developing countries and are therefore likely to reap more benefits for South- than for North countries (Krueger, 1999). At the same time, restrictive ROO's that often just apply for some sectors, can substantially undermine potential gains in trade for South countries (World Bank, 2005).

Apart from direct gains in trade, the issue of technology transfer as a consequence of North-South trade has been debated extensively. Grossman & Helpman (1991) found evidence for an increase in the total factor productivity as a consequence of North-South trade. The level of integration

constitutes another important factor. According to Schiff & Winters (2003) South-North agreements have a deeper integration on average than South-South ones. Apart from tariff levels, they involve measures for competition policy, investors rights, product standards or intellectual property rights. Via these measures South members are believed to benefit significantly from improved governance and policy credibility, increased Foreign Direct Investment (FDI) flows and accelerated transfer of technology. The uneven bargaining power of rich countries can however become problematic for South countries. North countries may succeed in setting the agenda and force South countries to accept their standards, even if these measures significantly reduce their potential for gains in trade. Via these means, North-South agreements have the potential to become a playing field for concessions outside the scope of trade agreements, as a consequence of the asymmetric bargaining power. Restrictive ROO's disproportionally affecting developing countries provide an illustrative example in that regard (Panagariya, 1999).

Also Rodrik (2018, p. 79) emphasised the possibility of Northern countries using FTA's as a playing field for pushing forward their agenda. A further publication by Peridy (2005) examined the effects of EU preferential trade preferences for a selection of mediterranean countries. Apart from Israel, the countries examined were developing countries, making it basically a North-South agreement. It was the attempt to integrate the new trade theory by Helpman and Krugman (1985) and provisions by Van Wincoop (2003) and Deardoff (1998) discussed in chapter 3.1.3. Using a generalised fixed-effect model, a Hausman and Taylor Random effect model, as well as a dynamic GMM model, he found that the agreement has resulted in significant gross trade creation effects for the Mediterranean countries in terms of their exports to the EU. The observed EU-export share to Mediterranean countries was at 43.1%, however, without the trade agreement the values were at 31.4% - 34.5% (Peridy, 2005, pp. 126-127). Another important contribution on that topic was done

by Demir & Dahi (2012). They examined the impact of Preferential Trade Agreements (PTA) on trade in manufactured goods in developing countries. At the same time they studied the different effects of North-South and South-South trade agreements. Using the standard gravity model methodology for a total of 28 developing countries, they found out that entering a PTA has a positive and significant impact on the exports of a country's manufacturing sector, which is in line with existing research on aggregate trade effects. However, when separating effects of South-South and South-North PTA's, only South-South agreements had robust positive effects for exports. South-North PTA's were either insignificant or negative (Demir & Dahi, 2012, pp. 22-23).

Previous critique had mainly been directed at the reduction of independent policy decision-making for Southern countries when engaging in North-South FTA's. However, experts argued that the restricted policy freedom is the price developing countries have to pay in order to gain access to a larger market (Demir & Dahi, 2012, p. 23). In the second part of the subchapter, I will focus on asymmetric FTA's involving Latin American countries. The most prominent one in the region and potentially even on a worldwide basis is NAFTA.

3.2.3 Asymmetric Free Trade Agreements in Latin America

Coming to FTA's in Latin America, one of the most prominent ones is arguably NAFTA. Signed in 1994 it represented the first asymmetric FTA in the region and served as a template for following agreements in Latin America, as well as in the world (Villareal & Ferguson 2013, p. 2). If we only look at trade volumes between the members, we can see that they have substantially increased since the agreement was signed. Between 1994 and 2014, US-merchandise trade with Canada increased from $100.2 billion in 1993 to $632.3 billion in 2013. For the case of Mexico, merchandise trade with the US increased from $81.5 billion in 1993 to $506.7 billion in 2013 (Villareal & Fergusson,

2013, pp. 9-10). Looking at early contributions on trade creation and trade diversion effects of the agreement, two often quoted papers are from Krueger (1999) and Fukao et al (2003). Krueger (1999) found trade creation as well as trade diverting effects from NAFTA, while Fukao et al. (2003) also found trade creation effects, but diversion effects only at the disaggregated level. Especially in the sectors textiles and apparel from Mexico, trade diversion effects at the expense of Asian supplier were found.

If we look at subsequent publications on trade effects of NAFTA, studies have mostly found trade creation effects only. Montenegro & Soloaga (2006), Martínez-Zarzosso et al. (2009) or Bejan (2011) all found substantial trade creation effects as a result of NAFTA. Due to the developments in the beginning of the 2000s these studies were using gravity model specifications in line with provisions by Anderson & Van Wincoop (2003), improving the accuracy of the regression results.

Caliendo & Parro (2015) did a further study and evaluated the trade and welfare effects of tariff changes caused by NAFTA. Based on their results, Mexico had by far the largest welfare gains and increases in intra-bloc trade, while Canada even experienced a marginal reduction of 0.06% in welfare.

Another important trade bloc in the region is Mercosur. However, despite its undoubted regional importance, the FTA with the EU is still under negotiation and no agreement with another major economy like the US, China, or Japan has been signed as of today (European Commission, 2019e).

Mexico is one of the most active Latin American countries when it comes to international FTA's. In the year 2000 it was also the first country in the region that signed a FTA with the EU (European Commission, 2019e). The results of the FTA regarding its trade creation- and trade diversion effects have been mixed however. Slootmaekers (2004) examined the agreement for the period 1980-2003 and found trade creation, but no trade diversion effects. Urata & Okabe (2007) examined a longer

period from 1950-2005 and found trade creation- as well as trade diverting effects.[2] They examined a multitude of FTA's and based on their results, the EU-Mexican FTA, was among the few ones with trade diverting effects as well. Additional studies covering the EU-Mexican FTA are from Bacaria-Colom et al. (2013)[3] and the European Commission (2017). Both contributions found trade creation effects, while not examining trade diversion outcomes.

The publication by the European Commission (2017) represents an ex-post evaluation and focused on effects of Non-Tariff Barriers (NTB), to check whether the agreement has resulted in trade creation effects beyond tariff reductions. Based on their results, only the sectors transport equipment and petrochemicals achieved these additional trade creation effects (European Commission, 2017, p.193).

Apart from Mexico, Chile has been the most active country in the region regarding bilateral agreements. The country for example signed a FTA with the EU in 2003 (Florensa et al., 2015, p. 335). As in the case of the EU-Mexican FTA, the European Commission pursued an impact assessment to examine the effects of the FTA for the period 2001-2009. Concerning the results, the economic impact on the EU is quite limited. However, some sectors have still benefited.[4] The authors conclude that even though the EU does not seem to have benefited a lot at first fight, the FTA has prevented a crowding out effect of trade with Chile, especially because the country also signed a FTA with the US. The estimation is that due to the FTA, EU-imports from Chile are 25% higher and Chilean imports from the EU 40% higher. Over the same period, exports to other Latin American countries decreased by 3% and to the US by 1%. Hence, the authors argue that trade diversion effects have dominated for the FTA (European Commission, 2012, p. 68). Chilean imports

[2] Urata & Okabe (2007) used an integrated two-stage approach. It involved the examination of trade patterns before and after the FTA by using indicators of intra-FTA interdependence and an estimation of a gravity equation to separate the impact of FTAs on bilateral trade flows.

[3] They used a sample of 60 countries over the period of 1994-2011 and found substantial trade creation effects for both agreement partners over the period

[4] e.g. Wine industry, some agricultural products (European Commission, 2012, p. 215)

from the EU were found to have a higher elasticity of substitution than EU-imports and were therefore more price-sensitive (European Commission, 2012a, pp. 13-15). A further publication by Jean et al. (2014) found mostly benefits for the Chilean economy. Based on their contribution, above all unskilled labour in the sectors fruits, wine and fishery has benefited since 2003.

3.2.4 Free Trade Agreements including the Andean Community

Until now, the Andean Community has only signed an international trade agreement with the EU. Further FTA's with for example Mercosur, or India are still under negotiation and member countries of the Andean Community continue to pursue extensive individual efforts towards signing FTA's outside scope of the customs union. An example for these efforts is the Pacific Alliance (Comunidad Andina, 2019a).

Since I will examine the effects of the FTA on the EU, Peru and Colombia, I will present research that examined the effects of FTA's that Peru and Colombia signed individually with northern countries, as well as available research about the EU-Andean Community trade agreement. Bermeo-Velasquez (2016) examined unrealised trade potential of Peru using a gravity model and a dataset of 186 countries for the period 1990-2011. Based on his findings, Peru has for example unrealised trade potential with the US, or Canada. The country has already signed FTA's with both countries, but it seems that it has not sufficiently used the potential of the FTA until now.

Another paper published by Martin-Mayoral et al. (2016) analysed the effects of four regional integration agreements being Mercosur, Andean Community, Central American Common Market (CACM) and NAFTA. They found out that the Andean Community has contributed to trade creation effects for its member countries, but at lower levels than in the case of CACM and NAFTA. Further, Henao-Rodríguez et al. (2017) examined the determinants of Intra-Industrial Trade (IIT) between Colombia and various other countries. They found that, among other points, market size is

negatively related to the IIT level. Consequently, due to the fact that the US has a significantly larger market size, IIT was at low levels. Since Colombia has recently signed multiple FTA's with bigger economies or trade blocs, the possibilities for IIT creation effects are therefore limited.

Wang & Badman (2016) also investigated determinants for Peru's export performance. Highlighting the sharp increase of exports between 1994 - 2015, they used an augmented gravity model and analysed the impact of regional trade agreements and its effect on the export performance. Based on their findings the membership in the Andean Community has contributed to higher exports for Peru.

Very recently another paper was published by Ahcar (2018) who examined Colombia's trade potential with the EU after the implementation of the FTA in 2013. Using a gravity model with time-varying fixed effects, he for example found unrealised trade potential for Colombian exports to the EU countries France, Germany, Greece, Sweden. Furthermore, he also found additional possibilities for gains in EU-exports to Colombia (Ahcar, 2018, p. 174).

3.3 Derivation of hypothesis and contribution of thesis

Subchapter 3.1 has outlined the developments of gravity model specifications since Tinbergen first used it in 1962. The specifications have improved a lot since then and theoretical considerations were incorporated. Based on the literature review, I derive the following hypotheses:

Hypothesis 1: As indicated by the influential paper of Baier & Bergstrand (2007) as well as multiple other studies like for example the ones by Dai et al. (2014) and Egger & Larch (2008), FTA's are generally very likely to result in trade creation effects. Baier & Bergstrand (2007) further found out that trade volumes are likely double 10 years after the enforcement of the FTA. Since the trade agreement between the EU and the Andean Community has not completed that amount of time yet, it is unlikely that trade volumes have doubled already. However, positive effects are likely to be found.

Therefore, the claim of H1 is that the FTA has resulted in overall trade creation effects. It will be falsified or corroborated by looking at the results of specific coefficients in the first specification, which will be explained further in chapter 4.

Hypothesis 2: Based on H-O theory, countries with different factor endowments should have larger trade creation effects than countries with relatively similar ones. In the case of the EU and the Andean Community we can suspect quite different factor endowments. As mentioned in chapter 2, the structure of the economies is quite different. While the EU is highly specialised in the service sector, Peru and Colombia still generate a significant share of their value added in the agricultural- and industrial sector.

The claim of H2 is that the trade creation effects resulting from the FTA of the EU, Peru and Colombia are higher than the trade creation effects for Mercosur found by a study of García et al. (2013). The member countries of Mercosur have relatively similar factor endowments. Therefore the resulting trade creation effects of the FTA are expected to be smaller than for the case of the EU-Andean Community FTA. The claim will be tested by looking at specific coefficients of the first regression and comparing them to the results of García et al. (2013).

Hypothesis 3: The effects of FTA's on trade diversion were not as straightforward as for the case of trade creation. Nonetheless, if we consider the FTA's of EU with Chile and Mexico, the results had a tendency towards trade diversion effects.

Hence, the claim of H3 is that trade diversion effects have taken place as a result of the FTA. The claim is tested by looking at coefficients of the first specification in chapter 4.

Hypothesis 4: As outlined in chapter 2.2, some products of the manufacturing sector are still subject to tariff rates. Still, the FTA has led to an improved markets access in the sector and is expected to benefit trade.

Therefore, the claim of H4 is that the FTA has resulted in overall trade creation effects in the manufacturing sector. The claim is tested by looking at specific coefficients of the second specification.

Hypothesis 5: Also agricultural products are partly subject to tariff rates under the FTA and full liberalisation will take effect by 2030. However, also for that sector, the FTA has led to additional tariff concessions.

The claim of H5 is that the FTA has resulted in overall trade creation effects in the agricultural sector. The claim is tested by looking at coefficients in the third specification.

Hypothesis 6: The individual impact on the member countries of the FTA is expected to be positive due to the general expected trade creation effect of FTA's. The claim of H6 is that the FTA had a positive impact on the trade flows of Peru and Colombia with the EU. The claim is tested by looking at coefficients in the fourth specification.

Hypothesis 7: As previously mentioned, the FTA is expected to have a positive impact on the member countries. This does not only entail Peru and Colombia, but also the EU.

The claim of H7 is that the FTA has resulted in positive effects on trade for the EU. The claim is tested by looking at coefficients of the fifth specification.

Hypothesis 8: It is further expected that small economies are likely to benefit more from liberalising trade than large countries (Alesina, 2005, pp. 1520). In comparison to the EU, Peru and Colombia are small economies and international trade is more important for them than for the EU countries that already have access to a large internal market. The resulting positive impact is therefore expected to be higher for Peru and Colombia than for the EU.

The claim of H8 is that the positive impact on trade of the FTA is higher for Peru and Colombia than for the EU.

It is tested by looking at coefficients of specification 4 and 5.

The EU- Andean Community comprehensive trade agreement signed with Peru and Colombia in 2013 has not been examined extensively yet. While the EU did an ex-ante Computable General Equilibrium analysis, ex-post analyses involving Peru, Colombia and the EU as a whole have not been implemented. Therefore, the contribution of this paper is to assess the trade creation and trade diversion effects of the trade agreement since 2013. I will do that by considering multiple specifications that include the aggregated, as well as the disaggregated level.

As discussed before, trade creation effects were found for most asymmetric and symmetric FTA's and are therefore expected for the FTA under investigation as well.

By using the MRT's provided by Anderson & Van Wincoop (2003) and the gravity model specification of Baldwin & Taglioni (2006) with fixed-effect estimators for time-varying coefficients and a large group of countries over many years, I will try to end up with reliable results for the trade creation and trade diversion effects of the FTA between the EU- and the Andean Community.

4. Methodology

Panel data is generally the preferred approach in order to capture specific unit of observation effects, temporal effects, or both. Furthermore, it is important to decide whether fixed-effects, random-effects, or pooled OLS have to be used.

As briefly mentioned in subchapter 3.1.3, fixed effect models (FEM) assume that there are certain unobservable characteristics for each unit of the sample, not measured by any variable. This is the unobserved heterogeneity. It is further assumed that the unobserved heterogeneity is constant for a particular exporter across all importers and vice versa. To account for that, there are two common approaches. The first one is the Least Square Dummy Variable (LSDV) approach, where a dummy

variable for every country in the sample is included in order to be able to account for individual characteristics. The disadvantage is that we have a lot of variables and consequently a significant loss in the degrees of freedom. That is why the within-group estimation, where we subtract from each variable the temporal mean, has become more common. When the FEM with within group estimation is being used, MRT's are replaced with dummy variables for each country pair and simply added as explanatory variables to the model. The advantage of using FEM's is that the unobserved heterogeneity can be correlated with our explanatory variables, but will still not bias the results. The disadvantage is however, that time-invariant variables are not considered and simply drop out (Shepherd, 2016, p. 23).

In my case, I am primarily interested in analysing the effects of the FTA between the EU and the Andean Community on trade. Since the variables of interest are time-varying, the disadvantage of the within-group estimation does not seem to pose a significant problem.

The Random effect model (REM) supposes that constant terms as well as the slope are the same across all observations. Hence, the variance of the error term accounts for differences between units and periods and the constant value. If we assume that there is some degree of correlation between the unobserved heterogeneity and our independent variables, FEM is the preferred approach and otherwise REM. REM's would generally be the preferred approach, when the interest lies with time-invariant coefficients of the equation, in order to separately account for time-invariant variables, without having perfect collinearity. However, the random effect model is only consistent under quite restrictive conditions. A requirement is that MRT's are normally distributed, but theory does not provide any information on that. It is one reason why FEM's have been much more common in practice than REM's after all (Shepherd, 2016, p. 28).

In order to decide between FEM's and REM's as well as OLS, multiple statistical tests need to be conducted though. First of all, I will run a regression with country-pair and time fixed effects and implement a F-test in order to decide between fixed effects and OLS. Subsequently, I will conduct an estimation with random effects and then the Breusch-Pagan Lagrange Multiplier, to decide between random effects and OLS. If the f-test for the fixed effects turn out significant, fixed-effects are better than OLS. If the Breusch-Pagan test turns out significant, random effects are better than OLS. In case fixed- and random effects turn out significant, I will run the Hausmann test to decide which one to use. If the null hypothesis of the Hausman test is rejected, I will use the FEM, if not the REM (Park, 2011).

Another issue that needs to be dealt with are zero values. Since I will estimate a log-linear specification, zero trade flows will drop out of the model. As explained in subchapter 3.1.3, there are different options available to deal with zero values.

The first one is to drop the observations with zero trade. It is the accurate approach, if zero values are randomly missing data or rounding errors. In these cases, they do not have a significant impact on our results, meaning they can be ignored for the estimation. However, if zero values are actually zero trade or we have cases of systematic rounding errors, simply dropping them would lead to biased results.

In order to check for this phenomena, additional tests need to be implemented. One of them is the replacement of zero values with 1 USD and then estimate it with FEM, REM or pooled OLS. I will first test the dataset for fixed effects, random effects and pooled OLS and then replace zero trade flows with 1 USD to check for the robustness of the first results.

Based on the literature review presented, the specification I will use to estimate the trade creation and trade diversion effects of the EU-Andean FTA is closely related to the contribution of Anderson & Van Wincoop's (2003) theoretical model, as well as Baldwin & Taglioni's (2006) contribution:

$$\begin{aligned} lnX_{ijt} = {} & \beta_0 + \beta_1 lnY_{it} + \beta_2 lnY_{jt} + \beta_3 lnD_{ij} + \beta_4 ComBor_{ij} \\ & + \beta_5 LANG_{ij} + \beta_6 Ccol_{ij} + \beta_7 col_{ij} + \beta_8 landlock_{ij} \\ & + \beta_9 FTAone_{ijt} + \beta_{10} FTAboth_{ijt} + \eta_{ij} + \gamma_t + \varepsilon_{ijt} \end{aligned} \qquad (5)$$

X_{ijt} is the dependent variable and the value of country i's imports from country j in year t. We could also write it as country j's exports to country i. In order to account for the bronze medal mistake presented by Baldwin & Taglioni (2006) it is measured in nominal terms.

β_0 is the constant, Y_{it} and Y_{jt} are the first independent variables and stand for the nominal GDP in each country. These variables measure the effect of the economic size on trade. The coefficients of both variables are expected to be positive, since larger economies are expected to trade more.

D_{ij} is the distance between country i and j and is a proxy for transport costs. The variable is expected to have a negative influence on trade, since transport costs are expected to rise the higher the distance.

The following five trade cost variables are expressed as dummies and aim at capturing factors potentially influencing the volume of trade between country i and j.

$ComBor$ takes the value one when countries i and j share a common border and zero otherwise. The coefficient of the variable is expected to be positive.

$Lang$ is one when countries share a common language and zero otherwise. The coefficient is also expected to be positive.

$ccol$ takes the value one when the countries had a common coloniser in the past. The coefficient is expected to be positive.

col takes the value one, when one country was the coloniser of the other at one point. The coefficient is also expected to be positive.

$landlock$ takes the value one when one of the countries is a landlocked country. The coefficient is expected to be negative.

To also capture trade diversion and trade creation effects, I include the variables $FTAone_{ijt}$ and $FTAboth_{ijt}$.

$FTAone_{ijt}$ takes the value one when one country is part of the FTA and zero otherwise.

The variable $FTAboth_{ijt}$ takes the value one when both countries are part of the FTA and zero otherwise.

$FTAboth_{ijt}$ is expected to be positive. As presented in chapter three, FTA's usually result in trade creation effects. Therefore when both countries are part of the agreement we expect a positive impact on trade.

A negative sign of the coefficient of $FTAone_{ijt}$ would imply a decrease in trade between members and non-members of the FTA. The outcome of the coefficient of $FTAone_{ijt}$ is not obvious. However, as previously mentioned a certain level of trade diversion is more likely. Hence, a negative coefficient is expected. The variable η_{ij} is a country-pair fixed effect to measure the time-invariant bilateral factors influencing nominal trade flows specific to each country-pair, whereas γ_t captures the unobservable characteristics that are time-varying. Further ε_{ijt} is the error term.

Importer- and exporter time-varying fixed-effects will not be included in my specification. As indicated by Baldwin & Taglioni (2006, p. 23) and the WTO (2012, p. 110) their values are unlikely

to vary significantly over relatively short sample periods. Hence, since I am only examining the time period 1997-2017, leaving them out is unlikely to lead to biased results.

Relating the specification to the hypotheses presented in chapter 3.3, H1 is tested by looking at the coefficients of the variables $FTAboth_{ijt}$ and $FTAone_{ijt}$. If both coefficients turn out positive the hypothesis is corroborated. If one of the two turns out negative it is falsified.

H2 is tested by looking at the coefficient of $FTAboth_{ijt}$ and $FTAone_{ijt}$. Subsequently I will compare the outcome of the variables to the corresponding variables estimated by Gracía et al. (2013). If the overall trade creation effect is higher than the one estimated by García et al. (2013), H2 is corroborated, if not it is falsified.

H3 is tested by looking at the coefficients of $FTAboth_{ijt}$ and $FTAone_{ijt}$. If the coefficient of $FTAboth_{ijt}$ turns out positive and the coefficient of $FTAone_{ijt}$ negative, there is a trade diversion effect and the hypothesis is corroborated, if not it is falsified.

As mentioned in chapter 2.2, some economic sectors are already benefiting from a full liberalisation of tariffs, whereas other sectors are still facing partly substantial tariff rates. The effects of the agreement on different economic sectors may consequently be quite different.

To assess effects on different sectors of the economy, the second specification will be as follows:

$$\begin{aligned} lnX_{ijt} = {} & \beta_0 + \beta_1 lnY_{it} + \beta_2 lnY_{jt} + \beta_3 lnD_{ij} + \beta_4 ComBor_{ij} \\ & + \beta_5 LANG_{ij} + \beta_6 Ccol_{ij} + \beta_7 col_{ij} + \beta_8 landlock_{ij} \\ & + \beta_9 FTAone_{ijt} + \beta_{10} FTAboth_{ijt} + \eta_{ij} + \gamma_t + \varepsilon_{ijt} \end{aligned} \qquad (6)$$

The only difference to the first specification is that the dependent variable lnX_{ijt} now only captures imports of country i from country j in the manufacturing sector.

H4 is tested by looking at the coefficients of the variables $FTAboth_{ijt}$ and $FTAone_{ijt}$. If the coefficients turn out positive, the FTA has resulted trade creation effects in the manufacturing sector and H4 is corroborated. If one of the coefficients turns out negative the hypothesis is falsified.

Apart from the manufacturing sector, agricultural products are still partly subject to tariffs. Hence, the specific effects of the FTA on the sector may yield interesting results and I will therefore run the following specification:

$$\begin{aligned} lnX_{ijt} = \beta_0 + \beta_1 lnY_{it} + \beta_2 lnY_{jt} + \beta_3 lnD_{ij} + \beta_4 ComBor_{ij} \\ + \beta_5 LANG_{ij} + \beta_6 Ccol_{ij} + \beta_7 col_{ij} + \beta_8 landlock_{ij} \\ + \beta_9 FTAone_{ijt} + \beta_{10} FTAboth_{ijt} + \eta_{ij} + \gamma_t + \varepsilon_{ijt} \end{aligned} \quad (7)$$

The only difference to the first specification is that lnX_{ijt} stands for agricultural imports of country i from country j.

H5 is tested by looking at the coefficients of $FTAboth_{ijt}$ and $FTAone_{ijt}$. If both coefficients are positive, there is a trade creation effect in the agricultural sector. In that case, H5 is corroborated. If one of the coefficients turns out negative the hypothesis is falsified.

In order to assess the individual effects of the FTA on Peru and Colombia, as well as potential asymmetric economic effects among FTA members, I will also estimate the following specification:

$$\begin{aligned} lnX_{ijt} = \beta_0 + \beta_1 lnY_{it} + \beta_2 lnY_{jt} + \beta_3 lnD_{ij} + \beta_4 ComBor_{ij} \\ + \beta_5 LANG_{ij} + \beta_6 Ccol_{ij} + \beta_7 col_{ij} + \beta_8 landlock_{ij} \\ + \beta 9 FTACOL_{ijt} + \beta_{10} FTAPER_{ijt} \beta_{11} COLother_{ijt} \\ + \beta_{12} PERother_{ijt} \eta_{ij} + \gamma_t + \varepsilon_{ijt} \end{aligned} \quad (8)$$

The variable $FTAboth_{ijt}$ from the first specification is replaced by two variables, $FTACOL_{ijt}$ and $FTAPER_{ijt}$.

$FTACOL_{ijt}$ takes the value one in case Colombia is involved in a bilateral trade with an EU member country and the trade happened after 2013. Similarly $FTAPER_{ijt}$ takes the value one if Peru is involved in a bilateral trade with an EU member country. I only consider the EU countries as trading partners and not other Andean Community countries, since different rules apply for trade among Andean Community countries.

The variables aim at capturing the country specific effects of the trade agreement on Peru and Colombia. I expect positive coefficients for both of them.

The variable $FTAone_{ijt}$ is replaced by $COLother_{ijt}$ and $PERother_{ijt}$.

$COLother_{ijt}$ takes the value one in case Colombia is importing or exporting from a non-FTA country.

$PERother_{ijt}$ takes the value one if Peru is involved in bilateral trade with a non-FTA country. In case the coefficient of $FTAPER_{ijt}$ turns out positive and the coefficient of $PERother_{ijt}$ negative there is a trade diversion effect. The same holds true for the variables of Colombia.

The outcome, as in the first specification is not entirely clear, but a certain level of trade diversion is more likely. Hence, I expect positive coefficients for $FTACOL_{ijt}$ and $FTAPER_{ijt}$ and

negative coefficients for $COLother_{ijt}$ and $PERother_{ijt}$.

H6 is corroborated if the coefficients of the variables $FTACOL_{ijt}$ and $FTAPER_{ijt}$ are positive. If they turn out negative, H6 is falsified.

In order to be able to draw comparisons of the specific effects on agreement members, I will further run the following specification:

$$\begin{aligned} lnX_{ijt} = \beta_0 + \beta_1 lnY_{it} + \beta_2 lnY_{jt} + \beta_3 lnD_{ij} + \beta_4 ComBor_{ij} \\ + \beta_5 LANG_{ij} + \beta_6 Ccol_{ij} + \beta_7 col_{ij} + \beta_8 landlock_{ij} \\ + \beta 9 FTAEU_{ijt} + \beta_{11} EUother_{ijt} \\ + \beta_{12}\eta_{ij} + \gamma_t + \varepsilon_{ijt} \end{aligned} \quad (9)$$

The difference to the previous equation are the variables $FTAEU_{ijt}$ and $EUother_{ijt}$.

$FTAEU_{ijt}$ takes the value one if an EU member country is exporting to Peru or Colombia, or when an EU member country is importing from Peru or Colombia.

The variable aims at capturing the specific effects of the FTA on the EU. I expect a positive value for the coefficient of $FTAEU_{ijt}$, because of the presumed positive effect of the FTA on trade.

$FTAother_{ijt}$ takes the value one if an EU member country is exporting or importing to a non-FTA member country. The variable aims at capturing the effect of the FTA on third country trade flows. A positive coefficient for $FTAEU_{ijt}$ and negative one for $EUother_{ijt}$ would mean there is a trade diversion effect. While the outcome is also not entirely obvious, I still expect a certain level of trade diversion and therefore a negative coefficient for $EUother_{ijt}$.

H7 is tested by looking at the coefficient of the variable $FTAEU_{ijt}$. If the coefficient is positive, H7 is corroborated, in case of a negative result the hypothesis is falsified.

H8 is tested by looking at the coefficients of the variables $FTACOL_{ijt}$, $FTAPER_{ijt}$ and $FTAEU_{ijt}$.

If the coefficients of $FTACOL_{ijt}$ and $FTAPER_{ijt}$ turned out higher than the coefficient of the variable $FTAEU_{ijt}$, H8 is corroborated and the FTA had a more positive effect on the smaller economies. If the coefficient of $FTAEU_{ijt}$ is higher than for $FTAPER_{ijt}$ and $FTACOL_{ijt}$, the positive effect of the FTA was higher for the EU and the hypothesis is falsified.

5. Sources of Data and Collection

My sample contains a bilateral panel data set of 183 countries for the period 1997 - 2017. Due to the previously mentioned advantages of estimations with panel data, they have been established for analysing FTA's over the last decades in the academic debate. They allow for the analysis of specific effects on the unit of observation being the country, temporal effects, or both. Hence, in contrast to cross-section analysis, relationships among variables can be captured over time. In order to assess world trade effects I have aimed at using a large dataset.

The range selected includes a period of sixteen years before the creation of the FTA and five years after the enforcement, in order to capture trade patterns for both time-periods.

The final dataset consists of a bilateral panel dataset with a total number of 691,740 observations.

Peru and Colombia enjoyed the special GSP tariff treatment from the EU prior to signing the FTA. Therefore, it is particularly important to consider a longer period before 2013, to be able to accurately assess the effects of the FTA.

The GDP data for the period, measured in current dollars at current exchange rates, comes from the WDI database.

I use bilateral import trade data for the mentioned period from the WITS database. There are also many studies using bilateral export data. However, for the selected panel dataset, I have found a higher level of data availability for imports. Furthermore, the advantages of using bilateral import data has been highlighted by for example the WTO (2012, p. 37).

The bilateral covariates distance, common language, border, common coloniser, former coloniser and landlocked are taken from the CEPII database.

Information on whether a country belongs to the EU, or the Andean Community is extracted from the European Commission website (European Commission, 2019b).

6. Estimation and empirical results:

The results of the regression of the first specification are presented in Table 2.

Table 2: Fixed- Random and Pooled OLS regressions - Augmented GM

	1) Fixed effects X_{ijt}	2) Random effects X_{ijt}	3) Pooled OLS X_{ijt}
ln_gdp_e	0.4323 *** (0.0111)	1.0736 *** (0.0051)	0.3344 *** (0.154)
ln_gdp_i	0.8803 *** (0.0119)	0.9982 *** (0.0052)	0.7633 *** (0.0168)
$FTAone_{ijt}$	0.0113 (0.0120)	0.1456 *** (0.0117)	0.1048 *** (0.0161)
$FTAboth_{ijt}$	0.1324 *** (0.0279)	0.2824 *** (0.0287)	-0.0356 (0.0359)
lnD_{ij}	-	-1.400 *** (0.0171)	-1.5600 *** (0.0055)
$ComBor_{ij}$	-	1.1464 *** (0.1032)	0.5257 *** (0.0261)
$LANG_{ij}$	-	0.8647 *** (0.0400)	0.7354 *** (0.0127)
$Ccol_{ij}$	-	0.5295 *** (0.0467)	0.9306 *** (0.0155)
col_{ij}	-	1.3166 *** (0.1151)	1.041 *** (0.0298)
$landlock_{ij}$	-		-0.4607 *** (0.0240)
constant	- 24.6416 *** (0.3969)		-8.5170 *** (0.4966)
Observations	406,108	406,108	406,108
R-squared	0.4418	0.6695	0.7490
F-test	33.78	-	-

*Source: own illustration; Note: Robust standard error in parentheses, *** p<0.01, ** p<0.05, * p<0.1*

I have used country-pair and time fixed effects in the first column of Table 2. In order to decide if a fixed-effect or pooled OLS estimation is better, I implement a F-test of the FEM. It turns out significant with a value of 33.78 (Table 2). Hence, the null hypothesis rejected and I conclude that a FEM is better than a pooled OLS estimation.

Subsequently, I examine if the REM is the preferred option over a pooled OLS by implementing the Breusch-Pagan test. The null hypothesis is that variances across entities are zero. Based on the results (Appendix A), I reject the null hypothesis. There are differences among the countries in the sample and a random effect estimation is consequently the better model for the specification. Since random- and fixed effects turned out significant, I will pursue a Hausman test in order to decide which of the models is better. The null hypothesis is that neither the FEM- nor the REM is correlated with any of the independent variables. In case the null hypothesis is rejected, random effects violate the Gauss-Markov theorem and would result in inconsistent and biased estimates. If there is a correlation with independent variables only the FEM remains consistent. The Hausman test therefore checks for a consistent, but less efficient model. The null hypothesis is that the coefficients estimated by the efficient REM are the same as the ones estimated by the consistent fixed effect estimator.

Based on the results of the Hausman test (Appendix B), the null hypothesis is rejected, because prob>chi 2 is < then 0.05. Hence, using random effects would lead to biased results and I will instead use a FEM.

Table 3: Zero Trade Flows - 1st specification

	1) Fixed effects X_{ijt}	2) Fixed effects model (with 1 USD) X_{ijt}
ln_gdp_e	0.4323 *** (0.0111)	0.2182 *** (0.01159)
ln_gdp_i	0.8803 *** (0.0119)	0.7651 *** (0.0116)
$FTAone_{ijt}$	0.0113 (00120)	0.1907 *** (0.0144)
$FTAboth_{ijt}$	0.1324 *** (0.0279)	0.0565 *** (0.0399)
constant	- 24.6416 *** (0.3969)	-20.2794
Observations	406,108	675,615
R-squared	0.4418	0.4156
F-test	33.78	28.14

*Source: own illustration ; Note: Robust standard error in parentheses, *** p<0.01, ** p<0.05, * p<0.1*

In order to address the issue of zero trade flows as well, I run another regression where I replace zero trade flows with 1 USD. The results are illustrated in the second column of Table 3. As mentioned before, the downside of adding a small amount for zero trade flows, is that there is no theoretical base for the manipulation of the data and the resulting estimates may end up biased. However, the results in Table 3 can provide certain general trends. The coefficients of the GDP's of the exporter and importer remained positive and statistically significant, which improves the robustness of the results. Also the coefficient of $FTAboth_{ijt}$ remained positive and statistically significant. While the value has reduced significantly, the general trend is confirmed by the regression with 1 USD for zero trade flows, which improves the credibility of the previous results. Pursuing with the analysis of the results with country-pair and time-fixed effects (Table 3, 1st Column) the coefficients for the GDP variables of the exporter and importer are positive. It means

that the larger the economies, the larger will be the bilateral imports. Further the size of the economy of the importing country is more important than the one of the exporting country. A 1% increase in the GDP of the importing country increases imports by 0.88%, whereas a 1% increase in the GDP of the exporting country increases imports in country i from the exporting country j by only 0.43%. The results are in line with empirical contributions of the gravity model and our previously laid out expectations. However, usually the coefficients for the GDP's are expected to be around one and particularly the exporter GDP is significantly lower.

All the time-invariant variables included in the specification drop out, since we estimated with a FEM. The coefficient of variable $FTAone_{ijt}$ is positive with a value of 0.011, but not statistically significant. The insignificant result may stem from various factors. First of all, since I have used a large dataset and the relative trade share of the FTA in comparison to the whole panel is quite small, it might have resulted in an overall insignificant coefficient. Second of all, the variable may simply be insignificant for that particular FTA. Lastly, the insignificant result may stem from other factors that were not considered by this specification. Unfortunately it is not clear at this point, which of the presented factors is the decisive one for the outcome of the variable in the first column of Table 3.

The coefficient of variable $FTAboth_{ijt}$ is positive with a value of 0.1324 and statistically significant. Since it is a dummy variable, we take the coefficient from equation (9) and do the following calculation (Rosenfeld, 2002) :

$$exp(0.1324) - 1 = 0.1416 \qquad (10)$$

Holding other variables fixed, we can now derive the percentage change in imports following a membership of the FTA. If both countries are members of the FTA, bilateral imports of country i from country j increase by 14.16%. The positive and significant coefficient of $FTAboth_{ijt}$ and the insignificant result for the variable $FTAone_{ijt}$ means that H1 is corroborated and the FTA has led to

an overall trade creation effect. It is in line with economic theory that has highlighted the beneficial effect of FTA's on trade.

H2 stated that trade creation effects will be larger when FTA member countries have relatively different factor endowments. I falsify this hypothesis. The variable $FTAboth_{ijt}$ has a coefficient of 0.1324 and the variable $FTAone_{ijt}$ is statistically insignificant, while García et al. (2013, p. 343) found statistically significant coefficients of 1.247 and 0.301 for the corresponding variables. Hence, overall trade creation effects of Mercosur have been larger than for the FTA under investigation, despite relatively similar factor endowments.

Concerning H3 and the expectation of trade diversion effects, the hypothesis is falsified, because the coefficient of the variable $FTAone_{ijt}$ did not turn out statistically significant and the FTA has consequently not resulted in trade diversion effects. As mentioned before, the result may stem from various factors that cannot be further clarified at this point.

The first specification considered the entire FTA. In order to have a more detailed analysis, I will now pursue specifications that only consider bilateral imports in the manufacturing- and the agricultural sector.

The results of the 2nd specification that uses bilateral imports in the manufacturing sector as the dependent variable are presented in Table 4.

Table 4: Fixed- Random and Pooled OLS regressions - Manufacturing sector

	1) Fixed effects X_{ijt}	2) Random effects X_{ijt}	3) Pooled OLS X_{ijt}
ln_gdp_e	0.3603 *** (0.0113)	1.0887 *** (0.0053)	0.2850 *** (0.0152)
ln_gdp_i	0.9582 *** (0.0118)	0.8970 *** (0.0054)	0.8406 *** (0.0161)
$FTAone_{ijt}$	0.0953 *** (0.0124)	0.2234 *** (0.0122)	0.1157 *** (0.0161)
$FTAboth_{ijt}$	0.1461 *** (0.0286)	0.2969 *** (0.0287)	0.2214 *** (0.0357)
lnD_{ij}	-	-1.3879 *** (0.0181)	-1.6242 *** (0.0054)
$ComBor_{ij}$	-	1.1824 *** (0.1081)	0.7472 *** (0.2512)
$LANG_{ij}$	-	0.8366 *** (0.0424)	0.8085 *** (0.0125)
$Ccol_{ij}$	-	0.5243 *** (0.0494)	0.8987 *** (0.0152)
col_{ij}	-	1.2350 *** (0.1202)	0.8048 *** (0.2882)
$landlock_{ij}$	-	-0.6815 *** (0.0288)	-0.3330 *** (0.2363)
constant	-25.5529 *** (0.3992)	-29.833 *** (0.2539)	-10.8977 *** (0.4810)
Observations	378,003	378,003	378,003
R-squared	0.3081	0.6508	0.7714
F-test	36.85	-	

*Source: own illustration ; Note: Robust standard error in parentheses, *** p<0.01, ** p<0.05, * p<0.1*

I will again run the required tests to decide which approach is the accurate one for the model. To decide between fixed-effects and OLS, I'll conduct a F-test. It turns out significant with a value of 36.85 (Table 4). Hence, I reject the null hypothesis and fixed-effects are better than OLS for the specification. Secondly, I check whether random effects are better than OLS by implementing the Breusch & Pagan test.

Based on the results (Appendix C) the null hypothesis is rejected, there are differences among the countries in the sample and random effects are better than OLS.

I now implement the Hausman test to decide between fixed and random effects.

The results of the Hausman test (Appendix D) reveal that prob>chi 2 is < then 0.05. Hence, the null hypothesis is rejected, using random effects would lead to biased results and I will pursue with the FEM.

Table 5: Zero Trade Flows - 2nd specification

	1) Fixed effects X_{ijt}	2) Fixed effects model (with 1 USD) X_{ijt}
ln_gdp_e	0.3603 *** (0.0113)	0.1283 *** (0.0070)
ln_gdp_i	0.9582 *** (0.0118)	0.2063 *** (0.0070)
$FTAone_{ijt}$	0.0953 *** (0.0124)	0.1163 *** (0.0087)
$FTAboth_{ijt}$	0.1461 *** (0.0286)	0.1660 *** (0.2407)
constant	-25.5529 *** (0.3992)	-6.1722 *** (0.2323)
Observations	378,003	675,615
R-squared	0.3081	0.2716
F-test	36.85	90.05

*Source: own illustration ; Note: Robust standard error in parentheses, *** p<0.01, ** p<0.05, * p<0.1*

To account for zero trade flows, I replace the zeros with 1 USD. The amount of missing values in the 2nd dataset is larger than in the first specification, which is typical for more disaggregated trade flows. Important to mention is that the coefficients of the variables $FTAone_{ijt}$ and $FTAboth_{ijt}$ remained positive and statistically significant when the zeros are replaced by 1 USD. It further confirms the robustness of the first regression. Concerning the exporter- and importer GDP, the results seem to be unusual. It points to the fact that the zeros need to be properly modelled by the

approach of Helpman et al. (2008) or a PPML presented by Silva & Tenreyro (2006). These approaches are beyond the scope of this paper and can be pursued by future research on this topic.

Coming to the results of the regression with country-pair and time fixed effects (Table 5, 1st Column), the results for the GDP's of the exporter and importer are positive and statistically significant. However, as in the previous specification, particularly the coefficient for the GDP of the exporter is quite low.

$FTAone_{ijt}$ has a positive and contrarily to the first specification, statistically significant coefficient of 0.0953. Also the coefficient of the variable $FTAboth_{ijt}$ is positive with a value of 0.1461.

Since the coefficients of $FTAboth_{ijt}$ and $FTAone_{ijt}$ turned out positive, I corroborate H4 and the FTA has resulted in overall trade creation effects in the manufacturing sector. With a value of 0.1461, the positive effect is higher than in the first specification, when the entire economy was considered.

Furthermore, since the coefficient of $FTAone_{ijt}$ turned out positive and statistically significant, we can state that no trade diversion effects resulted from the FTA.

I now come to the third specification, where the bilateral imports in the agricultural sector are considered.

Table 6: Fixed- Random and Pooled OLS regressions - Agricultural sector

	Fixed effects X_{ijt}	Random effects X_{ijt}	Pooled OLS X_{ijt}
ln_gdp_e	0.1606 *** (0.1257)	0.7251 *** (0.0063)	0.1218 *** (0.0181)
ln_gdp_i	0.8194 *** (0.1269)	0.8317 *** (0.0063)	0.6907 *** (0.0184)
$FTAone_{ijt}$	-0.2080 (0.1338)	0.0900 *** (0.0131)	0.0665 *** (0.0185)
$FTAboth_{ijt}$	0.3229 *** (0.2824)	0.4447 *** (0.2820)	0.3825 *** (0.0380)
lnD_{ij}	-	-1.0997 *** (0.0209)	-1.456 *** (0.0063)
$ComBor_{ij}$	-	1.7034 *** (0.1205)	0.7792 *** (0.0272)
$LANG_{ij}$	-	0.6783 *** (0.0495)	0.6420 *** (0.0144)
$Ccol_{ij}$	-	0.2631 *** (0.0594)	0.9324 *** (0.0181)
col_{ij}	-	1.7404 *** (0.1337)	1.2077 *** (0.3073)
$landlock_{ij}$	-	-0.8852 *** (0.0343)	-0.4110 *** (0.2935)
constant	-17.5595 *** (0.3992)	-22.5780 *** (0.2925	-5.3823 *** (0.5665)
Observations	316,695	316,695	316,695
R-squared	0.2279	0.4774	0.6538
F-test	37.46	-	

*Source: own illustration ; Note: Robust standard error in parentheses, *** p<0.01, ** p<0.05, * p<0.1*

To decide between fixed-effects and OLS, I'll conduct a F-test. It turns out significant with a value of 37.46 (Table 6). Hence, I reject the null hypothesis and fixed-effects are better than OLS for the specification.

Secondly, I check whether Random effects are better than OLS by implementing the Breusch & Pagan test. Based on the results (Appendix E) I reject the null hypothesis. There are differences among the countries in the sample and random effects yield better results than OLS.

Lastly, I pursue the Hausman test to check if fixed- or random effects are better. Only fixed effects turn out consistent under Ho and Ha (Appendix F). Hence, I reject the null hypothesis and fixed effects is the appropriate method.

Table 7: Zero Trade Flows - 3rd specification

	1) Fixed effects X_{ijt}	2) Fixed effects model (with 1 USD) X_{ijt}
ln_gdp_e	0.1606 *** (0.1257)	0.0777 *** (0.0090)
ln_gdp_i	0.8194 *** (0.1269)	0.4590 *** (0.0090)
$FTAone_{ijt}$	-0.2080 (0.1338)	0.1926 *** (0.0112)
$FTAboth_{ijt}$	0.3229 *** (0.2824)	0.4509 *** (0.0309)
constant	-25.5529 *** (0.3992)	-10.0110 *** (0.2980)
Observations	378,003	675,615
R-squared	0.2279	0.2973
F-test	36.85	48.52

*Source: own illustration ; Note: Robust standard error in parentheses, *** p<0.01, ** p<0.05, * p<0.1*

I now come to the issue of zero trade flows in the dataset (Table 7). Also for this case, the coefficients of all variables have changed. The amount of zero values is higher than for the 1st regression, but lower than for the second one.

Looking at the results of the GDP's of the exporter and importer, the coefficients are once again quite low and additional analysis would be required to analyse the results. The coefficient of the variable $FTAboth_{ijt}$ only changed marginally and remained positive and statistically significant. It

proves that the result of the regression with country-pair and time fixed effect is robust and I can use the result for further interpretation.

The coefficient for the variable $FTAone_{ijt}$ changed to a positive and significant value. In order to further interpret the variable, a proper modelling of zero trade flows using the approach of Helpman et al. (2008) or a PPML by Silva & Tenreyro (2006) would be required, which, as mentioned before, is beyond the scope of this paper.

Turning now to the results of Table 7, first column, coefficients for the importer- and exporter GDP values turned out positive and statistically significant. Following similar trends, the impact of the exporter GDP has decreased to 0.1606, while the importer GDP is at similar levels with a coefficient of 0.8194.

The coefficient of $FTAone_{ijt}$ turned out negative, but statistically insignificant, making further interpretation difficult.

The coefficient of $FTAboth_{ijt}$ turned out positive and statistically significant. With a coefficient value of 0.3229 it is higher than in the previous two specifications. Using the same transformation approach as for equation (10)[5], the result is that if both countries are part of the FTA, bilateral imports increase by 38.11%. The coefficient for the variable with 1 USD for zero trade flows, even turned out higher. While interpretation of the regression has to be done with caution due to the theoretical weakness of the approach, the general trend of the variable is nonetheless confirmed.

Since the coefficient of $FTAboth_{ijt}$ turned out positive and statistically significant and the one of $FTAone_{ijt}$ insignificant, the FTA has resulted in an overall trade creation effect and H5 is corroborated. In order to get additional insights about the FTA on particular member states, I will now run the following regression (Table (8):

[5] e (0.3229) -1 = 0.3811

Table 8: Fixed, random and Pooled OLS regressions - Effects PER & COL

	Fixed effects X_{ijt}	Random effects X_{ijt}	Pooled OLS X_{ijt}
ln_gdp_e	0.4253 *** (0.0110)	1.0681 *** (0.0051)	0.3185 *** (0.0152
ln_gdp_i	0.8728 *** (0.0117)	0.9923 *** (0.0052)	0.7450 *** (0.0165)
$FTACOL_{ijt}$	0.0067 (0.1168)	-0.0120 (0.1143)	0.0646 (0.1652)
$FTAPER_{ijt}$	0.0801 (0.1170)	0.0212 (0.1145)	0.1308 (0.1656)
lnD_{ij}	-	-1.4075 *** (0.0171)	-1.6009 *** (0.0055)
$COLother_{ijt}$	0.2253 * (0.1325)	-0.2390 *** (0.0912)	-0.8553 *** (0.0894)
$PERother_{ijt}$	0.3930 *** (0.1345)	-0.1076 (0.0921)	-0.9070 *** (0.0906)
$ComBor_{ij}$	-	1.1524 *** (0.1032)	0.5261 *** (0.0260)
$LANG_{ij}$	-	0.8531 *** (0.0401)	0.7362 *** (0.0127)
$colony_{ij}$	-	1.3493 *** (0.1151)	1.0389 *** (0.0298)
$comcol_{ij}$	-	0.5022 *** (0.0470)	0.9217 *** (0.0155)
$landlocked_{ij}$	-	-0.8231 *** (0.0273)	-0.4606 *** (0.0240)
constant	- 24.3041 *** (0.3846)	-30.5049 *** (-0.2416)	-7.7790 *** (0.4819)
Observations	406,108	406,108	406,108
R-squared	0.4379	0.6690	0.7492
F-test	34.01	-	-

*Source: own illustration ; Note: Robust standard error in parentheses, *** p<0.01, ** p<0.05, * p<0.1*

As in the previous specification, I will first decide whether fixed, random or pooled OLS is the adequate model. I'll compare fixed effects to OLS and implement a F-test. It turns out significant with a value of 34.01. Hence, the null hypothesis is rejected and fixed-effects are better than OLS for the specification. Based on the results of the Breusch-Pagan test (Appendix G), the null

hypothesis can be rejected. I conclude that there are significant differences among the countries in my sample and random effects are better than OLS. Since Random- and fixed- effects proved to be better than OLS, I will now implement a Hausman test.

The results (Appendix H) indicate that Prob>chi 2 is < then 0.05, therefore using random effects would lead to biased results and I will instead use a country-pair and time-fixed effect model.

Table 9: Zero Trade Flows - 4th specification

	1) Fixed effects X_{ijt}	2) Fixed effects model (with 1 USD) X_{ijt}
ln_gdp_e	0.4253 *** (0.0110)	0.1942 *** (0.0114)
ln_gdp_i	0.8728 *** (0.0117)	0.7414 *** (0.0114)
$FTACOL_{ijt}$	0.0067 (0.1168)	0.0802 (0.1694)
$FTAPER_{ijt}$	0.0801 (0.1170)	0.3266 ** (0.1694)
$COLother_{ijt}$	0.2253 * (0.1325)	0.5628 *** (0.1925)
$PERother_{ijt}$	0.3930 *** (0.1345)	0.5024 *** (0.1925)
constant	- 24.3041 *** (0.3846)	-19.1869 *** (0.3760)
Observations	406,108	675,615
R-squared	0.4379	0.4016
F-test	34.01	28.61

*Source: own illustration ; Note: Robust standard error in parentheses, *** p<0.01, ** p<0.05, * p<0.1*

Looking at the results in Table 9, the values have changed significantly. The coefficients of the GDP's for the exporter and importer have reduced. Particularly the value for the exporter represents an unusual result. The coefficient for the variable $FTACOL_{ijt}$ remained insignificant after zero trade values are replaced with 1 USD.

The coefficient for the variable $FTAPER_{ijt}$ remained positive as in the previous specification and further has become statistically significant at a 95% confidence level.

With a value of 0.3266, it is significantly higher than the result in Table 8 (first column) and it definitely spreads some doubts about the accuracy of the indicator. Having in mind that replacing zero trade values with 1 USD may lead to biased estimates, interpretation on this result has to be done with caution. Therefore, since in the first regression the variable did not turn out statistically significant, I will abstain from further analysing the result.

The coefficients of $COLother_{ijt}$ and $PERother_{ijt}$ maintained the positive results and remained statistically significant. Hence, the robustness of the results of the regression with country-pair and time fixed effects are further improved.

H6 is falsified, since the coefficient of the variables $FTAPER_{ijt}$ and $FTACOL_{ijt}$ turned out insignificant. There are various potential reasons for the insignificance, as has been discussed before. Furthermore, no trade diversion effects can be observed when the countries Peru and Colombia are examined individually, since $PERother_{ijt}$ and $COLother_{ijt}$ have positive coefficients.

The fifth specification outlined in chapter 4, deals with the specific effects of the FTA on trade flows for EU member countries. The results of the regression are illustrated in Table 10.

Table 10: Fixed, random and Pooled OLS regressions - Effects EU

	Fixed effects X_{ijt}	Random effects X_{ijt}	Pooled OLS X_{ijt}
ln_gdp_e	0.4290 *** (0.0111)	1.0686 *** (0.0051)	0.3185 *** (0.0152
ln_gdp_i	0.8743 *** (0.0117)	0.9925 *** (0.0052)	0.7450 *** (0.0165)
$FTAEU_{ijt}$	-0.0511 (0.0793)	-0.4467 (0.0795)	0.0646 (0.1652)
$EUother_{ijt}$	-0.0534 *** (0.0131)	-0.0119 (0.0123)	0.1308 (0.1656)
lnD_{ij}	-	-1.4107 *** (0.0171)	-1.6009 *** (0.0055)
$ComBor_{ij}$	-	1.1406 *** (0.1032)	0.5261 *** (0.0260)
$LANG_{ij}$	-	0.8503 *** (0.0400)	0.7362 *** (0.0127)
$colony_{ij}$	-	1.3601 *** (0.1152)	1.0389 *** (0.0298)
$comcol_{ij}$	-	0.5059 *** (0.0469)	0.9217 *** (0.0155)
$landlocked_{ij}$	-	-0.8205 *** (0.0273)	-0.4606 *** (0.0240)
constant	- 24.4097 *** (0.3859)	-30.4976 *** (0.2417)	-7.7790 *** (0.4819)
Observations	406,108	406,108	406,108
R-squared	0.4393	0.6686	0.7492
F-test	33.92	-	-

*Source: own illustration ; Note: Robust standard error in parentheses, *** p<0.01, ** p<0.05, * p<0.1*

As indicated in Table 10, the F-Test turned out significant with a value of 33.92. The null hypothesis is therefore rejected and fixed-effects are better than OLS for the specification.

The Breusch-Pagan test (Appendix I) confirms that there are significant differences among the countries in the sample. Hence, the null hypothesis is rejected and random effects are better than OLS. The subsequent implemented Hausman test to decide between random and fixed effects

reveals that Prob>chi 2 is < then 0.05 (Appendix J). Consequently only the usage of fixed effects does not lead to biased results.

To address the issue of zero trade flows, I will run another regression where I replace the zeros by 1 USD (Table 11).

Table 11: Zero Trade Flows - 5th specification

	1) Fixed effects X_{ijt}	2) Fixed effects model (with 1 USD) X_{ijt}
ln_gdp_e	0.4290 *** (0.0111)	0.1990 *** (0.0115)
ln_gdp_i	0.8743 *** (0.0117)	0.7420 *** (0.0115)
$FTAEU_{ijt}$	-0.0511 (0.0793)	0.0380 (0.1147)
$EUother_{ijt}$	-0.0534 *** (0.0131)	-0.1001 *** (0.0156)
constant	- 24.4097 *** (0.3859)	-19.2832 *** (0.3764)
Observations	406,108	675,615
R-squared	0.4393	0.4007
F-test	33.92	27.89

*Source: own illustration ; Note: Robust standard error in parentheses, *** p<0.01, ** p<0.05, * p<0.1*

The coefficients of the GDP for the exporter and importer remained positive and statistically significant, which improves the robustness of the estimates in Table 10, first column. As in previous regressions, the coefficients for the GDP's turned out lower than expected.

Concerning the variable $FTAEU_{ijt}$, no statistically significant trade effects for the EU could be observed.

On the other hand, the coefficient of the variable $EUother_{ijt}$ turned out negative and statistically significant as in the previous regression, improving the robustness of the first result. Hence, EU

trade with non-FTA members had a negative influence on trade flows. It does not mean that there is a trade diversion effect resulting from the FTA with the Andean Community though. Since no statistically significant positive effects could be found for $FTAEU_{ijt}$, interpretations on potential trade diversion effects cannot be done either.

H7 is falsified, since no positive impacts of the FTA on the EU could be found.

H8 is also falsified, since I could not find a higher positive impact of the FTA on Peru and Colombia than for the EU.

A summary of all variables that were being used for the fixed effects regressions with- and without zero trade flows can be found in the Appendix (Appendix J).

7. Analysis of results

Considering the relatively early examination of the FTA, the results presented in chapter 6 are promising for the future trade developments between the two trading blocs. Despite a still ongoing transition period, I found statistically significant and positive trade creation effects as a result of the FTA. At the same time, no trade diversion effects could be found.

The low share of trade flows of the FTA in comparison to total trade flows considered in the dataset might be the reason for the partly statistically insignificant results. It is also possible that the results are actually insignificant. Additional external factors not considered by the specification are another potential reason for the outcome.

The fact that trade creation effects of the Mercosur trade bloc were found to be larger than for the FTA examined, contradicts H-O provisions, however there are multiple additional factors potentially influencing the outcome than only factor endowments. The depth of the agreement may have worked positively for the trade creation effects of Mercosur, as well as the earlier enforcement

of the customs union in 1991. The fact that H-O provisions are contradicted by the results also means that the Linder hypothesis is confirmed. As mentioned in chapter 3.2.1 he questioned the empirical validity of H-O ideas and argue that more similar factor endowments will experience larger trade creation effects.

When only the manufacturing sector considered, I have also found overall trade creation effects. as well. They even turned out higher than at the aggregated level. The results for the particular sector are remarkable, given the fact that there are still tariffs in place for EU-exports to Peru and Colombia, while both Latin American countries are already enjoying tariff-free access to the EU market. As mentioned in chapter 2.2, about 70% of EU manufactured exports entered tariff free upon the agreement entered into force and until 2030 all products will be relieved from tariffs. A factor that very likely has contributed to the positive development are the tariff reductions for machineries and motor vehicles. While tariffs are still imposed, the rate has already dropped sharply from 35% to less than 10% (European Parliament, 2012, p. 12). Trade diversion effects have not resulted from the FTA in the manufacturing sector. It is a positive result, because it means no trade has been deviated, but actually been created by the FTA.

Concerning the third specification, where only the agricultural sector is considered, the estimated trade creation effect is also higher than in case of the first specification. The result is surprising given the fact that both sides still impose trade restrictions on products of the sector. By 2030, only 85% of EU agricultural exports will be tariff free under current provisions of the trade deal (European Parliament, 2012, p. 12). Regarding Peruvian and Colombian agricultural exports, there are also transition periods in place, even though both countries have already gained from a significantly better access for key sectoral products like bananas, sugar, rice and rum. Despite ongoing trade restrictions, all member countries have benefited from better access to the other

market and it partly explains the positive impact found in the third regression. Apparently, the mentioned agricultural products are important export commodities for Peru and Colombia and while I have just mentioned four products, it may still have a significant overall impact. The results for the trade diversion effects turned out insignificant and do not require further interpretation at this point.

The fourth and fifth specification aimed at capturing the individual effects on the EU, Peru and Colombia. Regarding its impact on the countries Peru and Colombia, the respective coefficient turned out positive, but not statistically significant. For the country Peru the result turned positive when zero values were replaced by 1 USD. However, interpretations should be pursued with caution due to the theoretical weakness of adding 1 USD to the equation. When Peru and Colombia were trading with non-FTA countries the effect on trade was positive, rejecting the possibility of trade diversion effects. Instead the FTA with the EU has potentially contributed to higher levels of international economic integration for the countries.

The impact of the FTA on EU trade flows did not turn out statistically significant as well. When the EU is trading with non-FTA member countries the impact on bilateral imports was found to be negative, which points towards a potential trade diversion impact. However, the negative impact was marginal and since we could not find a positive impact of the FTA on the EU, it is unclear if there has been a trade diversion effect resulting from the agreement.

In chapter 2.1, where I discussed the trade relations between the EU, Peru and Colombia I mentioned that in contrast to Colombia, Peru has managed to establish a substantial trade surplus with the EU and I planned to find out if the FTA had an impact on that. Unfortunately due to the statistically insignificant results, I could not find out if the individual trade creation effect on Peru has been larger than for Colombia, potentially explaining the better recent developments in trade flows.

8. Conclusion & Discussion

This thesis has studied the trade effects of the FTA between the EU and the Andean Community using a micro-founded gravity model with aggregated and disaggregated trade data.

Leaving out the country Ecuador that joined the agreement in 2016, my results clearly show that the FTA has resulted in overall trade creation effects. The positive outcome only 6 years after the enforcement of the FTA leads an overall positive medium-term evaluation of the trade deal and hopefully contributes to a reinforced economic integration between the two trade blocs. The trade creation may not seem substantial at first sight. However, apart from the relatively short time span, we also need to consider the transition periods, which are still in place and reduce the potentials for gains in trade. Furthermore, at least Colombia and Peru had enjoyed preferential tariff rates before the agreement took action under the GSP and GSP+ clause. Taking into consideration these two factors, the statistical significant trade creation effects are even more remarkable.

At the disaggregated level, when only the manufacturing- and the agricultural sectors are considered, trade creation effects were found to be higher than for the whole economy. My results show that despite higher presiding barriers to trade, particularly in the agricultural sector, the FTA has generated trade creation effects for the member states.

Based on current provisions, the FTA will take full effect by 2030. By then tariffs for industrial and fishery products will be entirely removed, while tariff concessions in the agricultural sector range between 70-80%. The members of the agreement should ensure the gradual liberalisation in the sectors in order to generate new possibilities for trade gains for all parties concerned.

My attempt to capture the impact of the FTA on the trade flows of each individual member did not result in statistical significant results. A potential reason is the low overall share of the trade volume in terms of total trade flows considered in the dataset. With possible higher trade flows in the future

and a resulting higher importance on a worldwide basis, future research may find a statistically significant impact for each member. Even though the hypothesis that the trade creation effects for Peru and Colombia are greater than for the EU could not be confirmed, it is still likely that benefits for the smaller economies have been greater than for the larger one. Multiple academic contributions, like the ex-ante assessment of the FTA by Francois et al (2012), confirmed this hypothesis in the past and emphasised the advantages of the access to a larger market. Furthermore, there have been publications about additional benefits for the lower developed members which for example include technology transfer, democratisation processes and sustainability measures.

Speaking about the overall impact of the FTA, it is obvious that for the EU, the trade deal with the Andean Community does not have a top priority. There are other regional FTA's like the one with Mexico, or Mercosur[6], that enjoy a higher importance just because of substantially higher overall bilateral trade volumes. Therefore a deepened economic integration between the trade blocs in the future is possible, but other trade deals may enjoy a political priority in Brussels. Nonetheless, the FTA with the Andean Community has also been used by the EU to improve general relations with the Latin American region. Hence, while the individual impact of the FTA is comparatively low, evaluating it in conjunction with the FTA's with Central America, Mercosur Mexico and Chile, the actual value of the agreement and political importance at the EU level, might be higher than estimated at first sight.

Due to the relatively early evaluation of the FTA, there are still a lot of additional perspectives that could be taken into consideration, but go beyond the scope of this thesis. For example the issue of trade diversion effects. Potentially external factors have contributed to the statistically insignificant results. Further working on the specifications of the aggregated- and disaggregated gravity models

[6] currently under negotiation

may improve the significance and permit future interpretation of these effects. Furthermore, the transition periods that are still in place until 2030, could be evaluated at a more detailed level. There are different transition periods in place and they are assigned to particular product categories. Future research could pursue a detailed econometric analysis about the effects of the agreement on different product categories, which unfortunately is beyond the scope of this thesis.

As mentioned earlier, it is likely that the overall trade gains are larger for Peru and Colombia than for the EU. However, both countries have benefited from substantial tariff concessions under the GSP and GSP+ regime since the 1990. While the FTA has granted additional concessions to Peru and Colombia, the EU has also gained additional tariff concessions from the trade deal. Future research could do a more detailed analysis with a separate evaluation of the effect of the GSP clauses and the FTA.

Another area, which can be highly interesting for future research is the issue of NTB. Being a non-monetary measure, these trade barriers are harder to estimate. Still, also in the case of the Andean Community and the EU, NTB's are likely to be significant. As indicated in the evaluation report from 2017 from the European Commission, EU countries have for example raised concerns that Peru may use technical specifications to exclude EU firms from access to procurements markets. Furthermore, the country has so far impeded the import of pharmaceuticals and medical devices from the EU (European Commission, 2017, p. 7). These are just two examples of NTB's and there are likely to be many more.

Lastly, the importance of Foreign Direct Investment is an issue of high importance, especially when it comes to asymmetric FTA's. Since business sectors of lower industrialised countries often suffer from a lack of financial resources, one reason why these countries engage in FTA's is to increase their inward FDI flows. Already in the first three years of the agreement, the FDI flows from the EU

to Colombia increased by 4% and for Peru by 15%. Analysing the role of the FTA regarding the FDI flows is therefore another interesting field for future research.

The issue of technological transfer from North to South is also a potential area. Grossman & Helpman (1991) first brought this discussion to the academic debate and multiple additional contributions have been developed since then. The structure of the exports from the EU to Peru and Colombia, with top export products being machineries, transport equipment and motor vehicles, might suggest a technology transfer and future research could come up with new interesting perspectives on that issue.

This thesis shall therefore be seen as a start for additional future academic contributions on the FTA. It clearly contributes to existing literature, because it has studied trade creation and trade diversion effects for the aggregated level, individual economic sectors, as well as individual member countries of the trade deal. To the best of my knowledge, this thesis represents the first ex-post micro-founded gravity model applied to the FTA and even if not all results were statistically significant, it has provided benchmarks for future academic research.

Asymmetric FTA's have been discussed controversially in the past and while there have been agreements with negative economic consequences, this FTA so far had an overall positive impact on the member countries. Ensuring a gradual liberalisation and fulfilment of agreed provisions will be crucial in order to maintain the beneficial development. I therefore also hope that the positive results found by this econometric assessment will contribute to an overall improved image of asymmetric FTA's.

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10. List of Appendices:

11. Appendices

Appendix A:

Table 1: Breusch & Pagan LM test for random effects - 1st specification

	Var	sd = sqrt(Var)
ln_impo~s	18.90024	4.34744
e	2.302073	1.517258
u	4.430976	2.104988

Test: Var(u) = 0 chibar2(01) = 9.9e+05 Prob > chibar2 = 0.0000

Appendix B:

Table 2: Hausmann Test - 1st specification:

	fixed	random	difference	S.E.
ln_gdp_e	0.4323551	1.073582	-0.6412267	0.00997
ln_gdp_i	0.8803118	0.9982381	-0.1179263	0.010709
FTAone	0.0113054	0.1455838	-0.1342784	0.0025138
FTAboth	0.1323842	0.282394	-0.1500099	0.0015281

fixed = consistent under Ho and Ha; obtained from xtreg ; random = inconsistent under Ha, efficient under Ho; obtained from xtreg ;Test: Ho: difference in coefficients not systematic ; chi2(24) = (b-B)'[(V_b-V_B)^(-1)](b-B)= 3714.85

Prob>chi2 = 0.0000 (V_b-V_B is not positive definite)

Appendix C:

Table 3: Breusch Pagan LM Test for Random effects - 2nd specification

	Var	sd = sqrt(Var)
ln_impo~s	18.9772	4.3563
e	2.2529	1.5010
u	4.6257	2.1507

Test: Var(u) = 0 chibar2(01) = 1.0e+06 Prob > chibar2 = 0.0000

Appendix D:

Table 4: Hausman test - 2nd specification:

	fixed	random	difference	S.E.
ln_gdp_e	0.3603	1.0887	-0.7284	0.0100
ln_gdp_i	0.9582	0.8970	0.0612	0.1053
FTAone	0.0953	0.2234	-0.1281	0.0024
FTAboth	0.1462	0.2969	-0.1508	0

fixed = consistent under Ho and Ha; obtained from xtreg ; random = inconsistent under Ha, efficient under Ho; obtained from xtreg ;Test: Ho: difference in coefficients not systematic ; chi2(24) = (b-B)'[(V_b-V_B)^(-1)](b-B)= 22762.00 Prob>chi2 = 0.0000 (V_b-V_B is not positive definite)

Appendix E:

Table 5: Breusch Pagan LM Test for Random effects - 3rd specification

	Var	sd = sqrt(Var)
ln_impo~s	14.1063	3.7558
e	2.1759	1.4751
u	5,8358	2.4157

Test: Var(u) = 0 chibar2(01) = 9.8e+05 Prob > chibar2 = 0.0000

Appendix F:

Table 6: 3rd Hausman test - 3rd specification:

	fixed	random	difference	S.E.
ln_gdp_e	0.1606	0.7251	-0.5645	0.0108
ln_gdp_i	0.0194	0.8318	-0.0124	0.0110
FTAone	-0.2080	0.09004	-0.1108	0.0028
FTAboth	0.3229	0.4447	-0.1217	0.0013

fixed = consistent under Ho and Ha; obtained from xtreg ; random = inconsistent under Ha, efficient under Ho; obtained from xtreg ;Test: Ho: difference in coefficients not systematic ; chi2(24) = (b-B)'[(V_b-V_B)^(-1)](b-B)= 1434.46

Prob>chi2 = 0.0000 (V_b-V_B is not positive definite)

Appendix G:

Table 7: Breusch Pagan LM Test for Random effects - 4th specification

	Var	sd = sqrt(Var)
ln_impo~s	18.9002	4.3474
e	2.3022	1.5173
u	4.4267	2.1040

Test: Var(u) = 0 chibar2(01) = 9.8e+05 Prob > chibar2 = 0.0000

Appendix H:

Table 8: Hausman test - 4th specification

	fixed	random	difference	S.E.
ln_gdp_e	0.4253	1.0681	-0.6428	0.0979
ln_gdp_i	0.8728	0.9923	-0.1195	0.1054
FTACOL	0.0067	-0.0120	0.0187	0.0240
FTAPER	0.0802	0.0212	0.0590	0.0240
COLother	0.2253	-0.2390	0.4643	0.0961
PERother	0.3930	-0.01076	0.5006	0.0980

fixed = consistent under Ho and Ha; obtained from xtreg ; random = inconsistent under Ha, efficient under Ho; obtained from xtreg ;Test: Ho: difference in coefficients not systematic ; chi2(24) = (b-B)'[(V_b-V_B)^(-1)](b-B)= 2816.09 Prob>chi2 = 0.0000 (V_b-V_B is not positive definite)

Appendix I:

Table 9:Breusch Pagan LM Test for Random effects - 5th specification

	Var	sd = sqrt(Var)
ln_impo~s	18.9002	4.3474
e	2.3021	1.5173
u	4.4210	2.1026

Test: Var(u) = 0 chibar2(01) = 9.9e+05 Prob > chibar2 = 0.0000

Appendix J:

Table 10: Hausman test - 5th specification

	fixed	random	difference	S.E.
ln_gdp_e	0.4290	1.0686	-0.6396	0.0098
ln_gdp_i	0.8743	0.9925	-0.1182	0.1054
FTAEU	-0.5106	0.0447	-0.0957	.
EUother	-0.0533	-0.0119	-0.0414	0.0045

fixed = consistent under Ho and Ha; obtained from xtreg ; random = inconsistent under Ha, efficient under Ho; obtained from xtreg ;Test: Ho: difference in coefficients not systematic ; chi2(24) = (b-B)'[(V_b-V_B)^(-1)](b-B)= 3318.07 Prob>chi2 = 0.0000 (V_b-V_B is not positive definite

Appendix K:

Table 11: Summary variables fixed effect regressions

	1) 1st specification, fixed effects X_{ijt}	2) 1st specification without zero trade flows X_{ijt}	3) 2nd specification, fixed effects X_{ijt}	4) 2nd specification, without zero trade flows X_{ijt}	5) 3rd specification, fixed effects X_{ijt}	6) 3rd specification, without zero trade flows X_{ijt}	7) 4th specification, fixed effects X_{ijt}	8) 4th specification, without zero trade flows X_{ijt}	9) 5th specification, fixed effects X_{ijt}	10) 5th specification, without zero trade flows X_{ijt}
ln_gdp_e	0.4323 *** (0.0111)	0.2182 *** (0.01159)	0.3603 *** (0.0113)	0.1283 *** (0.0070)	0.1606 *** (0.1257)	0.0777 *** (0.0090)	0.4253 *** (0.0110)	0.1942 *** (0.0114)	0.4290 *** (0.0111)	0.4290 *** (0.0111)
ln_gdp_i	0.8803 *** (0.0119)	0.7651 *** (0.0116)	0.9582 *** (0.0118)	0.2063 *** (0.0070)	0.8194 *** (0.1269)	0.4590 *** (0.0090)	0.8728 *** (0.0117)	0.7414 *** (0.0114)	0.8743 *** (0.0117)	0.8743 *** (0.0117)
$FTAone_{ijt}$	0.0113 (0.0120)	0.1907 *** (0.0144)	0.0953 *** (0.0124)	0.1163 *** (0.0087)	-0.2080 (0.1338)	0.1926 *** (0.0112)	-	-	-	-
$FTAboth_{ijt}$	0.1324 *** (0.0279)	0.0565 *** (0.0399)	0.1461 *** (0.0286)	0.1660 *** (0.2407)	0.3229 *** (0.2824)	0.4509 *** (0.0309)	-	-	-	-
$FTACOL_{ijt}$	-	-	-	-	-	-	0.0067 (0.1168)	0.0802 (0.1694)	-	-
$FTAPER_{ijt}$	-	-	-	-	-	-	0.0801 (0.1170)	0.3266 ** (0.1694)	-	-
$COLother_{ijt}$	-	-	-	-	-	-	0.2253 * (0.1325)	0.5628 *** (0.1925)	-	-
$PERother_{ijt}$	-	-	-	-	-	-	0.3930 *** (0.1345)	0.5024 *** (0.1925)	-	-
$FTAEU_{ijt}$	-	-	-	-	-	-	-	-	-0.0511 (0.0793)	0.0380 (0.1147)
$EUother_{ijt}$	-	-	-	-	-	-	-	-	-0.0534 *** (0.0131)	-0.1001 *** (0.0156)
constant	- 24.6416 *** (0.3969)		-25.5529 *** (0.3992)	-6.1722 *** (0.2323)	-17.5595 *** (0.3992)	-10.0110 *** (0.2980)	- 24.3041 *** (0.3846)	-19.1869 *** (0.3760)	- 24.4097 *** (0.3859)	-19.2832 *** (0.3764)
Observations	406,108	677,615	378,003	675,615	316,695	675,615	406,108	675,615	406,108	675,615
R-squared	0.4418	0.4156	0.3081	0.2716	0.2279	0.2973	0.4379	0.4016	0.4393	0.4007
F-test	33.78	28.14	36.85	90.05	37.46	48.52	34.01	28.61	33.92	27.89