The effects of the EU-Mexico Free Trade Agreement on trade flows

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By completing this bachelor thesis, one step towards our future careers are finalized. Choosing this topic was a natural choice for us given our interest in macroeconomics and international trade.

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Jesper Andersson and Linn Sundqvist

Abstract

This bachelor thesis examines the Free Trade Agreement (FTA) between Mexico and the countries that resembles the European Union (EU) prior to the expansion in 2004 (EU15). The purpose is to analyze the effects of the FTA between the trading parties and investigate whether the FTA has resulted in positive effects on export volumes. The model includes 16 countries and is estimated with panel data between the years 1997-2016. We apply a gravity model as econometric framework and perform two regressions, one with fixed effects and one with random effects. Our results suggest that export volumes have increased for Mexico and the EU. However, in contrast to previous estimates, our results show that the FTA have generated negative effects on trade creation between the trading parties.

Key words: International trade theory, Mexico and EU15, the Gravity model, Tariffs, Trade flows,

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1. Introduction

The definition of a free trade agreement (FTA) is according to the European Commission (2018) an agreement where countries are able to trade freely by removing or reducing customs tariffs in bilateral trade. Since the 18th century, recognized economists such as Smith (1776), Ricardo (1817), Heckscher (1919) and Ohlin (1933) have argued that free international trade has positive impacts for the trading parties. A majority of researchers support this argument and have contributed further by analyzing international trade flows through FTAs, regional trade agreements (RTAs) and preferential trade areas (PTAs) to capture the effects of free trade. Among those are Robinson and Theirfelder (2002) who argue that RTAs improves welfare and that trade creation greatly exceeds trade diversion. Carrère (2004) analyzes 130 countries and present findings suggesting that RTAs generate a positive significant increase in trade. One could therefore argue that it is surprising that, in this day and age, politicians, such as Donald Trump, manages to highlight tariffs as positive and that it is preferable to implement them. Nonetheless, trade protectionism is a political argument against free trade and governments possess the main responsibility to ensure that domestic markets remain competitive and their main tools are tariffs, quotas or export subsidies (Baumol and Blinder 2010; Abboushi 2010).

1.1 Purpose and Outline

The purpose of this study is to analyze the impact of the FTA between the European Union (EU) and Mexico by examining trade flows during the time period of 1997-2016. Mexico was the first Latin-American country to sign an FTA with EU and by doing so, they became increasingly more liberal towards international trade. Negotiations started during the 1990s, were signed in 1997, came into effect in 2000 for the part related to trade in goods and in 2001 for the part related to trade in services (European Commission, 2017). Various researchers (e.g. Peridy (2005), Baier and Bergstrand (2009) and Roberts (2004)), have analyzed trade flows and the effects of FTAs applying a gravity model as econometric framework. By guidance from prior studies, we aim to contribute with insights by analyzing the importance of free international trade. It is crucial to understand why researchers argue that free trade is beneficial for all parties. This is especially important in times when countries implement tariffs and trade wars are ongoing. At the time of writing, the chosen FTA in this study has been in force for roughly eighteen years which makes it an excellent setting for testing the importance of free trade.

1.2 Research Question

Has the implementation of the EU-Mexico FTA resulted in a positive impact on trade flows between Mexico and EU?

This thesis uses a panel dataset for 16 countries between the years 1997-2016. We apply a gravity model as econometric framework in order to capture the effect of the FTA between Mexico and the EU. We perform two regressions, one with fixed effects (FE) and another with random effects (RE). Our results suggest that Mexico's export volumes have increased towards the EU and likewise, EUs exports have increased to Mexico. Moreover, both regressions imply that the GDP of the respective trading parties have increased since the implementation of the agreement. However, our results do not imply positive effects of the FTA between Mexico and the EU.

1.3 Thesis Structure

The second section of this thesis presents an overview of the free trade agreement between the EU and Mexico which includes a short background of how the agreement was implemented followed by its main elements. The third section introduces a theoretical background in the field of international trade where we disentangle trade theories that are important to understand during our analysis of the agreement. Section four presents an overview of previous studies were researchers analyze the effects of free trade agreements using a gravity model-approach. Section five describes the research design of our thesis. By way of introduction, we present our methodology where we describe the gravity equation and further by a data-section where we explain how the data was collected and where it was retrieved. In section six we present the results of our thesis question followed by a discussion whereas in section seven we provide conclusions and limitations of the study.

2. The Free Trade Agreement between Mexico and the EU

In the 1980s, Mexico's trade policy changed from import substitutions to an export-oriented focus which developed over three phases. The third and final phase, aimed to build a wide network of FTAs between various countries (Table 1). The development of the reform in the first half of the 1980s sought to reduce import restrictions and import tariff levels. The integration deepened during the second half of that decade to further eliminate import restrictions and to reduce tariffs. In 1990, an even deeper trade integration was necessary since the focus on international trade changed to attract more foreign direct investments. When the North American Free Trade Agreement (NAFTA) was introduced in 1994, it marked the beginning of the third and final phase of Mexico's trade policy reform. NAFTA covered several areas e.g. tariffs and non-tariff barriers, liberalization of trade in services, investment flows, environmental- and labor clauses (European Commission, 2017). The areas that NAFTA covered, alongside with its commitment, contributed to a wider scope in Mexico's trade policy reform and thereby led to more agreements coming into force. Successful Mexican trade relations lead to negotiations with the EU, which were initiated in 1996.

Table 1. Trade Agreements signed by Mexico prior to the EU-Mexico FTA

Trade Agreements - countries and blocs	*Enforcement date*	*Type of Agreement*
NAFTA - Mexico, US, Canada	January 1st 1994	FTA - Goods and Services
Mexico - Costa Rica	January 1st 1995	FTA - Goods and Services
Mexico - Nicaragua	July 1st 1998	FTA - Goods and Services
Mexico - Chile	August 1st 1999	FTA - Goods and Services
Mexico - EU (EU15)	July 1st 2000 (goods) March 1st 2001 (services)	FTA - Goods and Services

(European Commission, 2017)

The starting point of the relationship between Mexico and the EU refers to a commitment that required negotiations involving three main goals; 1) strengthening the bilateral political dialogue 2) improving cooperation in economic, technical, scientific and cultural areas and 3) reciprocally liberalizing trade in goods and services within the framework of World Trade Organization (WTO) rules. These three pillars would eventually result in the FTA that came through in the year of 2000. Formal negotiations started in 1996 and in 1997, Mexico became the first Latin-American country to sign a "Global Agreement" with the EU. The agreement contained an Economic Partnership, Political Coordination and Cooperation Agreement and set up the basis for negotiations regarding the FTA. When the FTA was implemented later on, it

was one of the most comprehensive agreements ever signed by EU as it covered trade disciplines in a total of eleven markets. It also possessed unique features in its institutional framework, namely the structure of the joint council (main body governing the agreement). Traditionally, the joint council monitor supervises and administrate the implementation of agreements. However, in regard to the Mexico-EU agreement, it also had the primary negotiation responsibility (European Commission, 2017).

Tariff reductions were implemented swiftly and within eight years, all import tariffs on industrial products for both Mexico and EU were eliminated. As a result of tariff liberalization, Mexico's and EUs GDP is estimated to be 0.34 percent and 0.01 percent higher, respectively, since the implementation of the agreement. The asymmetric difference between Mexico and EU is a consequence of differences in importance for each other as trading partners (European Commission, 2017).

Figure 1 illustrates descriptive statistics of Mexico's exports (measured in billions of US dollars) to the EU15 countries between the years 1997 and 2016. Conversely, Figure 2 shows imports from the EU15 countries to Mexico.

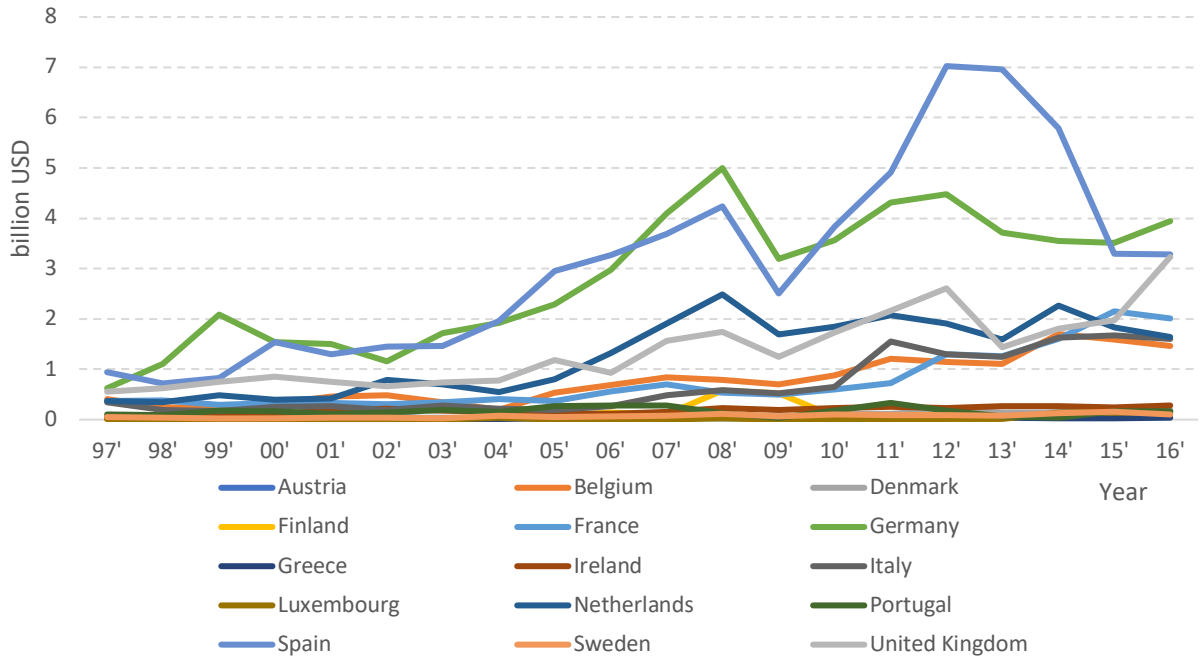

Figure 1. Export from Mexico to EU15 1997-2016, billion USD (WITS, 2018).

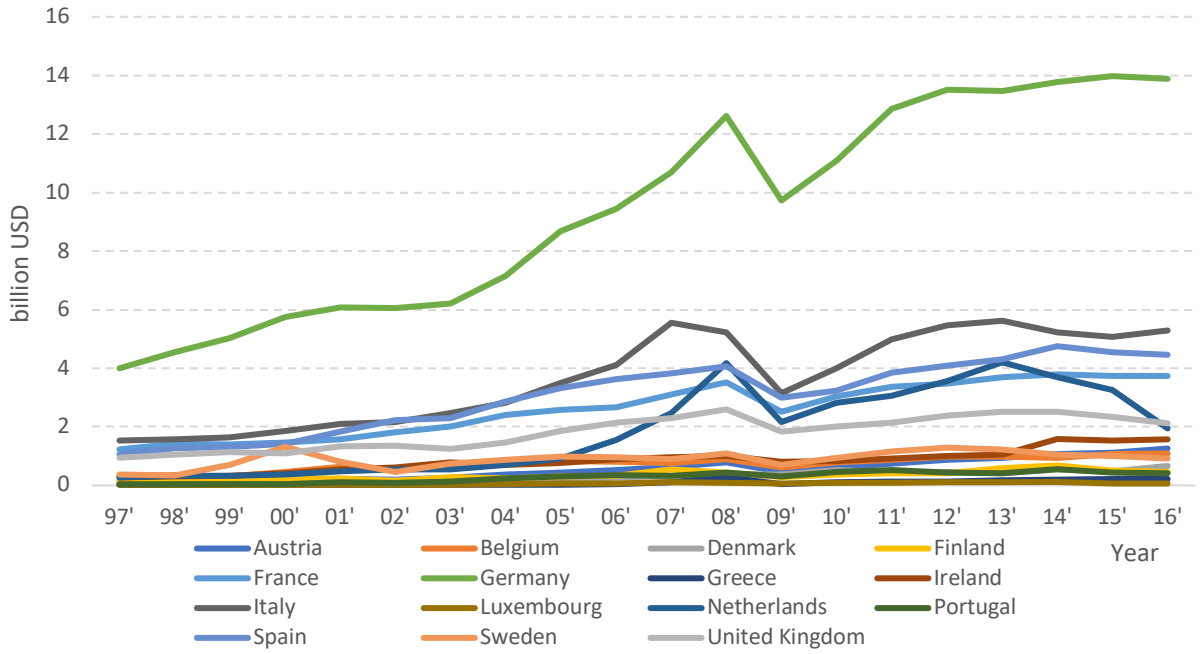

Figure 2. Imports from EU15 to Mexico 1997-2016, billion USD (WITS, 2018).

According to WTO, 81.3 percent of Mexico's overall world trade in goods and services are with countries that Mexico had active trade agreement with by 2011 (European Commission, 2017). In 2017, mechanical appliances and electrical equipment along with vehicles and aircrafts represented 48.5 percent of Mexico's total export to the EU, with a split of 25.3 percent and 23.2 percent, respectively. Moreover, EU's export to Mexico for the same categories of goods accounted for 51.4 percent (GlobalStat, 2018). Historically, it has been capital goods such as machinery and other mechanical parts that have stood for the largest share of Mexican exports, ranging between 18 and 34 percent of total exports between 1997 and 2016 (WITS, 2018).

As of today, Mexico has signed a total of twelve trade agreements with 42 countries. In April 2016, negotiations between Mexico and the EU commenced in order to replace the agreement from 2000. Mexico's trade policy and aim to liberalize its trade, makes their market one of the most open and competitive in the world (Export.gov, 2018).

3. Theoretical Background

The field of trade, and particularly the theory of absolute advantage, is greatly associated with the economist Adam Smith. He states that any absolute advantages are foregone in absence of trade (Smith, 1776). Thus, Smith (1776) stresses that countries shall produce the goods which they can produce most efficiently relative to other countries, i.e. they should export goods that the country more efficiently produces itself and conversely, import goods that can be produced more efficiently elsewhere. Since the paper of Smith (1776), economists have advocated that free trade is preferable as it prevents efficiency losses that are related to protectionism (Krugman, Obstfeld and Melitz, 2018). This chapter aims to narrate the development of the existing theoretical framework of trade through recognized theories which introduces comparative and non-comparative advantages. These are necessary to understand when analyzing trade flows between Mexico and the EU.

3.1 Ricardian Trade Theory

In the early 19th century, the economist David Ricardo developed The Ricardian Trade Theory and the concept of comparative advantage in international trade (Ricardo, 1817). In relation to Adam Smith's absolute advantage, a country is said to have a comparative advantage in producing a good if the opportunity cost of producing the product is lower in that particular country relative to another country. This occurs when one country's labor productivity is more efficient in producing a particular good, making that good an export-product (Ricardo, 1817; Krugman et al., 2018).

The Ricardian theory of international trade explains how a country's trade pattern (i.e. which products it imports and exports) is affected by its technological differences relative to another country. If one country holds an absolute advantage in producing two goods whilst another country has a comparative advantage of producing one of those goods, they will export the good which both will have a comparative advantage in (Feenstra and Taylor, 2017). Mexico and countries within the EU have consistently taken advantage in certain areas of trade, with the aim of enhancing this advantage through the FTA. Historically, a relatively large product share in the Mexican export market to Europe and Central Asia has been machinery and other various mechanical parts (together with raw materials and capital goods) (WITS, 2018). According to the Ricardian theory, one of the two categories mentioned should be chosen for either Mexico or the EU, whomever has a greater comparative advantage.

However, in the Ricardian theory, only the factor of labor is used. Throughout the years, economists have developed additional factors. For example, Heckscher (1919) and Ohlin (1933) developed a theory that includes both capital and labor to further create an understanding of why countries trade with each other (Feenstra and Taylor, 2017).

3.2 Heckscher-Ohlin Trade Theory

The Factor-Proportions theory, as the Heckscher-Ohlin theory also refers to, discusses countries differences in resources as the momentum for international trade. The theory describes the give-and-take between different countries and the global benefits that arise when each country export goods using factors of production that the country has an abundance in (Heckscher, 1919; Ohlin, 1933). Consequently, differences in resources is the only source of trade, which differentiates it from the Ricardian theory. The factor price is determined by the countries relative abundant factor; if a country has a higher ratio of an abundant factor opposed to another (e.g. land to labor), the comparative advantage lies in its land's intensive goods and vice versa (Krugman et al., 2018).

Assuming two economies, Home and Foreign, where each can produce two goods (e.g. food and cloth) using two inputs i.e. labor and land. According to the theory, the economies are assumed to have the same technology, meaning that labor and land yields the same output in either cloth or food. Assuming that Home is a labor abundant country and produces a higher ratio of cloth to food and Foreign is a land abundant country that produces a higher ratio of food to cloth. Free international trade will lead to point two whilst the absence of free trade would lead to point one or three (Figure 3) (Krugman et al., 2018).

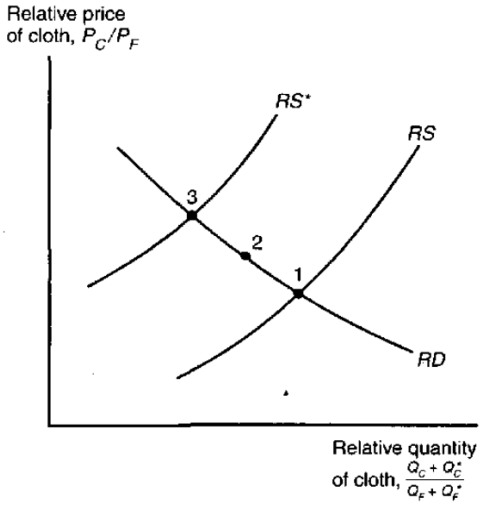

Figure 3. Convergence of prices, Source: Krugman and Obstfeld, 2003

Figure 3 illustrates the equilibrium of trade between countries that vary in their specialties and natural resources. Both Home and Foreign will export its abundant factor and import its scarce factor. Therefore, international trade leads to exchanging surplus factor services between countries (Markusen et. al., 1995). Free trade causes one single relative price of food and cloth to emerge on the world market when international competition is present and therefore generates benefits for all trading parties (Krugman et al., 2018).

3.3 New Trade Theory

"The more similar the demand structures of two countries, the more intensive, potentially, is the trade between these two countries." (Burenstam Linder, 1961 p.94).

In the Ricardian and Heckscher-Ohlin theories, there are stated explanations as of why countries trade certain goods with each other. Trade is considered to take place in a world which is characterized by perfect competition and where a country has a comparative advantage in producing a specific product because of differences in endowment (Feenstra and Taylor, 2017: Ahmed, 2012). Burenstam Linder (1961) developed a theory that differ from the neoclassical theories, known as the Linder Hypothesis. The Linder Hypothesis argues that countries with a larger domestic market for one good should also export that same good. Furthermore, countries that have similar per capita income could be used as a guideline for countries preferences, which in theory, also can be used when comparing similarities between trade partners (Burenstam Linder, 1961).

With inspiration from Burenstam Linder's theory, Krugman (1979) developed a theory of non-comparative advantage trade, that is based on i) increasing returns to scale ii) the possibility of product differentiation and iii) imperfect competition. Krugman further argued that earlier theories, e.g. Ricardo and Heckscher-Ohlin, fail to explain the actual patterns of trade between countries (Krugman, 1980). Krugman (1980) contributes with an explanation to the actual patterns of trade between countries that have similar endowments (e.g. in technology, wage, capital, labor). Countries will specialize in different products worldwide because of the monopolistic competition and the production of a good will consequently be located where the demand is the largest. This will generate increasing returns to scale and at the same time minimize transportation costs, which is two of the main elements in his contribution to international trade theory. Countries will be net exporters of products were the relative domestic demand is larger and hence, the specialization and variety of products for each country will increase the overall global welfare (Ahmed, 2012: Krugman, 1980).

Figure 4 illustrates a firm that specializes in a product due to the larger demand. Since customers want to be a part of a larger market where prices are lower for each good rather than a small market with higher prices, all will be better off in point two. (Krugman et al., 2018)

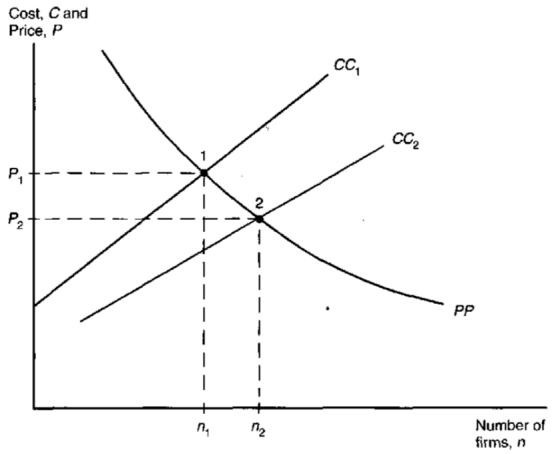

Figure 4. Increasing Returns to Scale, Source: Krugman and Obstfeld, 2003

3.4 Arguments against Free Trade

A central economic argument against free trade is that free trade threatens the domestic labor market due to cheap foreign labor (Baumol and Blinder, 2010). This argument is protectionist and trade protectionism is usually expressed through arguments concerning trade deficits, unemployment, infant industries and fair trade (Abboushi, 2010). Protectionism can be derived from the mercantilist view which argues that governments should promote exports and, conversely, view imports as harmful (Irwin, 1991). Nonetheless, mercantilist ignore the fact that it is impossible for every country to sell more relatively to what it buys since exports of one country is another country's imports. Another economic rationale is the infant-industry argument which describes how new industries are viewed as infants who needs room to grow without inference of international competition. If exposed to international competition too early, they may never develop and survive on their own (Baumol and Blinder 2010). According to Baldwin (1969), the infant-argument is the most theoretically valid exception to the case of free trade.

Non-economic arguments against free trade are justified solely by politics, for example maintaining national defense (Baumol and Blinder 2010). According to Thompson (1979) the national defense argument has mainly worked as an appeal to patriotic emotions and should therefore not be accepted as a sufficient economic argument. Furthermore, nations that assert that they must threaten with protectionism to make other countries drop their own protectionist acts, is also viewed as a non-economic argument (Baumol and Blinder 2010). According to

Baumol and Blinder (2010) this strategy may entail risks since the protectionist acts between two nations could increase rather than decrease.

Abboushi (2010) argue that the main element in trade protectionism is to protect a country's domestic producers against foreign producers in industries that may be vulnerable to volatile price changes. Governments have the main responsibility to look after its domestic markets and producers with import tariffs, quotas and/or subsidies. By raising the price of foreign products and reducing costs for the domestic producers, governments seek to boosts its domestic markets. In trade wars, countries cut imports that eventually will lead to lower exports as well. Consequently, countries are deprived of the gains that free trade brings (Baumol and Blinder, 2010). According to Kennan and Reizman (1984), relatively large countries tend to gain from trade wars as a consequence of manipulating terms to their advantage through tariffs. However, Kennan and Reizman (1984) further argue that methods like these introduces reprisals and that the post-reprisals equilibrium leaves all countries worse off compared to a free trade-situation.

4. Previous Research

Research on the topic is vast and economists have tested different analytical methods and theories. This thesis solely reviews studies performed with a gravity model as econometric framework when analyzing the effects of FTAs, PTAs and RTAs (Table 2).

Table 2. Previous Research on the effect of FTAs, PTAs and RTAs

Authors	*Objective*	*Dataset*	*Dependent variable*	*Independent variables*	*Estimation technique*	*Outcome*
Feenstra et al., (2001)	To differentiate amongst alternative theories of trade	Cross-sectional (1970, 1975,1980, 1985,1990)	Exports	GDP, distance(km), common borders, common language, remoteness. FTA	OLS	+
Fukao et al., (2003)	Analysis of trade effects under NAFTA	Panel data (1992–1998)	Imports	GDP per capita, tariffs, total commodity exports, country specific factors	OLS, fixed effects	+/-
Rose (2004)	Analysis of WTO/GATT	Panel data (1948-1999)	Bilateral trade	GDP, distance, common language, border, colonizer, currency, FTA	OLS, fixed effects, robust standard errors	+/-
Roberts (2004)	Analysis of the proposed China-Asean FTA	Cross-sectional (1996-2000)	Exports	GDP, GDP per capita, Distance, FTA	OLS	+/-
Carrère (2004)	Analysis of RTA on trade flows	Panel data (1962-1996)	Bilateral imports	GDP, GDP per capita, remoteness, FTAs and RTAs, infrastructure	Fixed effects, time fixed effects, ht-estimator, GLS	+
Peridy (2005)	Analysis of the AGADIR FTA effects	Panel data (1975-2001)	Exports	GDP, distance, common border, common language, FTA	OLS, fixed effects, two way fixed effects, random effects, differentiated estimates	+
Abedini and Peridy (2007)	Analysis of the GAFTA agreement effect	Panel data (1988-2005)	Exports	GDP, distance, common language, multilateral trade resistance, information costs, common border, FTA, participation (EU, NAFTA, GAFTA etc)	Fixed effects, random effects, HTM, ABB	+
Caporale, Rault and Sova (2009)	Bilateral trade effects of FTA	Panel data (1987-2005)	Bilateral trade	GDP, GDP per capita, distance, political stability, landlocked countries, FTA	OLS, Fixed effects, random effects, fixed effects vector decomposition	+
Chandran (2018)	Trade impact of the India-ASEAN FTA	Panel data (1991-2007)	Bilateral trade	GDP, GDP per capita, distance, ASEAN FTA, common border, common language, same colonizer	OLS, fixed effects, random effects,	+/-

According to Table 2, it is noticeable that researchers use similar variables and estimation techniques. Moreover, export or bilateral trade is commonly the dependent variable. The gravity model uses explanatory variables such as GDP, distance, FTA and country specific factors. It is also evident that panel data analysis is preferred over cross-sectional analysis.

Results, i.e. outcome according to Table 2, imply that implementation of trade agreements generally have a positive impact on trade flows between trading parties. However, Roberts (2004) investigates whether the proposed CHINA-ASEAN agreement will create trade diversion or trade creation for the involving countries. Presented results are ambiguous since they propose both positive and negative effects, making them difficult to interpret. Similarly, Fukao et al. (2003) examine whether NAFTA has resulted in trade diversion. Their results suggest that trade diversion has increased for some industries such as textiles, apparel and footwear products. Meanwhile, trade diversion has decreased for motor cars, vehicles and television receivers. Rose (2004) argue that observed results show little evidence that GATT/WTO membership has a positive impact on trade. Conversely, Abedini and Peridy (2007) present positive and significant results of GAFTA implying that trade creation has increased with 20 percent since its implementation. This is also true for Caporale, Rault and Sova (2009), Carrere (2004) and Chandaran (2018) presenting results indicating positive effects on trade flows.

5. Research Design

5.1 Methodology

In 1962, the economist Jan Tinbergen applied the gravity equation, which originally originates from the world of physics, to the field of economics to study patterns of trade. Since then, it has been widely used to study international trade and specifically trade flows (Martinez-Zarzoso, 2003). According to Anderson and Wincoop (2003) the gravity equation is one of the most empirically successful equations in economics due to the fact that it has the ability to capture bilateral trade flows to countries GDP, distance and other potential trade barriers. The standard gravity model estimates bilateral trade flows between countries and explains trade as a function of their GDP, populations and distance. The latter is a measure of proximity and can be measured in different terms, e.g. kilometers, religion or culture. Consequently, factors such as sharing land borders, colonial history or common language, are often included in the model. In-line with previous research, this thesis applies the gravity model as an econometric framework to investigate the impact of the current FTA on EU-Mexico trade flows. Thus, the results in this thesis are comparable with other studies covering the topic (Table 2).

We consider a null and one alternative hypothesis relating to the effect of FTA on export flows from Mexico to the EU:
H_0: There is no effect of the FTA on export flows from Mexico to the EU
H_1: There is a positive effect of the FTA on export flows from Mexico to the EU

5.1.1 The Gravity Model in International Trade

As previously mentioned, the gravity model originates from physics and, more specifically, from Newton's "Law of Universal Gravitation" which states that the attraction between two objects is given by:

$$F_{ij} = G\frac{M_i M_j}{D_{ij}^2} \tag{1}$$

Where notation is defined as follows,

- F_{ij} is the attractive force,
- M_i and M_j are the masses,
- D_{ij} is the distance between the two objects,
- G is a gravitational constant depending on the units of measurement for mass and force

According to Krugman et al., (2018) the model can be converted into economic terms and take on the following form:

$$T_{ij} = A\frac{Y_i Y_j}{D_{ij}^2} \tag{2}$$

Notation is then defined as follows,

- T_{ij} is the value of trade between country i and country j,
- Y_i and Y_j are the countries GDP respectively,
- D_{ij} is the distance between the countries i and j,
- A is a constant

The gravity model explains international trade as a log-linear function of distance and income between countries. It foresees that bilateral trade depends positively on income but is negatively impacted by distance (Shariat Ullah and Inaba, 2011). Moreover, the model expects larger economies to trade more with each other and is therefore positively affected by economic mass, i.e. GDP, whilst it is negatively affected by population. This is a result of the increase in the domestic market and the decrease in trade orientation that larger populations bring. When Tinbergen (1962) introduced the model, it became criticized due to its lack of robustness (Carporale, Rault and Sova, 2009). However, advancements in international trade theory provides justification in terms of increasing returns to scale, geography (as in transportation costs) and imperfect competition. Consequently, multiple studies, e.g. Anderson (1979), Bergstrand (1985), Helpman and Krugman (1985) and Bergstrand (1989) have contributed with additional theoretical justification.

Historically, a cross-sectional methodology has been applied when investigating impacts of FTAs (Egger, 2000). Nonetheless, the gravity model is continuously evolving and researchers such as Egger (2000) and Baltagi et al., (2003) present shortcomings of the cross-sectional methodology. Instead, they propose that panel data analysis should be applied since panel data has advantages such as allowing for both time- and country fixed effects for the exporters and importers. In the gravity model, potential sources of endogeneity bias fall under three categories: omitted variables, simultaneous causality and measurement errors (Caporale et al., 2009). Economists are not united when it comes to dealing with these potential endogeneity problems and therefore applying fixed effects models (FEM) or random effects models (REM). Egger (2000) presents advantages and disadvantages with both FEMs and REMs with the help of a Hausman test. Caporale et al., (2009) argues that FEMs allows for unobserved or misspecified factors that simultaneously explain trade volumes and lead to unbiased results. On

the other hand, there could also be unobservable time-invariant random variables that are difficult to compute which affects the explanatory variables and consequently trade volumes (Caporale et al., 2009). According to Stock and Watson (2015), FEMs allows to control for omitted variables when the omitted variables vary across entities (states or countries), but do not change over time. In this study, such variables could be cultural familiarities, for example language. Nevertheless, REMs may introduce bias; however, these models have the advantage of decreasing the variance of estimates of the coefficient of interest (Clark and Linzer, 2015).

This thesis will follow recent research, e.g. Caporale et al., (2009) and Chandran (2018) and apply panel data analysis with fixed effects (FE) and random effects (RE) followed by a Hausman test. The Hausman test can be described as a test that detects model misspecification and is usually performed when deciding between a REM or FEM. According to the test, the null hypothesis is that the preferred model is the REM versus the alternative hypothesis that the preferred model is the FEM. If the p-value is lower than 0.05, the null hypothesis can be rejected which is the same as rejecting the REM and indicating that FEM should be employed (Clark and Linzer, 2015). Moreover, we will control for factors that follow previous research e.g. Peridy (2005), Roberts (2004) and Chandran (2018) in order to isolate the effect of the FTA between Mexico and the EU.

The basic gravity model can be seen in equation (3) and is expressed in logarithms to specify a nonlinear regression function whilst simultaneously convert changes in variables into percentage changes (Stock and Watson 2015).

$$lnEX_{met} = \beta_0 + \beta_1 lnGDP_{mt} + \beta_2 lnGDP_{et} + \beta_3 lnGDPPC_{mt} + \beta_4 lnGDPPC_{et} + \beta_5 lnD_{me} + \varepsilon_{met} \quad (3)$$

where,

$lnEX_{met}$ is the value of export between country *m* to country *e*,

$lnGDP_{mt}$ and $lnGDP_{et}$ are the GDP of countries *m* and *e* respectively,

$lnGDPPC_{mt}$ and $lnGDPPC_{et}$ are GDP per capita of countries *m* and *e* respectively

lnD_{me} is the distance between the countries *m* and *e,*

ε_{met} is the error term,

We express all variables with a subscript *t* except distance since the distance measured in kilometers is constant over time.

Apart from the variables mentioned in equation (3), there are other factors that influences the cost of distance and they can be described as "cultural unfamiliarity" and refers to the lack of familiarity between the trading partners. In our extended model, we include familiarity variables as dummy variables. We expect countries that share the same language or share borders and colonial history to reduce the cultural distance and consequently increase bilateral trade between the parties. The extended model therefore takes the following form (equation (4)).

$$lnEX_{met} = \beta_0 + \beta_1 lnGDP_{mt} + \beta_2 lnGDP_{et} + \beta_3 lnGDPPC_{mt} + \beta_4 lnGDPPC_{et} + \beta_5 lnD_{me} + \beta_6 CL_{me} + \beta_7 C_{me} + \beta_8 LO_{me} + \varepsilon_{met} \quad (4)$$

where,

CL_{me} is a dummy variable that equals 1 if country *m* and country *e* share the same language, and zero otherwise,

C_{me} is a dummy variable that equals 1 if country *m* and *e* share colonial history, and zero otherwise,

LO_{me} is a dummy variable that equals 1 if country *m* and *e* are landlocked, and zero otherwise,

Moreover, we include one additional dummy variable in the gravity model in order to capture the trade effect of the EU-Mexico FTA. The variable takes the value of one if both countries belong to the EU-Mexico FTA and zero otherwise. The model that will be tested therefore becomes, the following (equation (5)).

$$lnEX_{met} = \beta_0 + \beta_1 lnGDP_{mt} + \beta_2 lnGDP_{et} + \beta_3 lnGDPPC_{mt} + \beta_4 lnGDPPC_{et} + \beta_5 lnD_{me} + \beta_6 CL_{me} + \beta_7 C_{me} + \beta_8 LO_{me} + \beta_9 FTA_{me} + \varepsilon_{met} \quad (5)$$

5.2 Data

Table 3 presents the countries used in this thesis. The database consists of panel data for 16 countries, namely the EU15 and Mexico, over the time period 1997-2016.

Table 3. Countries of Observation

Austria	Belgium	Denmark
Finland	France	Germany
Greece	Ireland	Italy
Luxembourg	Netherlands	Portugal
Spain	Sweden	United Kingdom
Mexico		

We choose these countries as they were members in the European Union prior to the accession of other membership candidates in 2004 (OECD, 2005). These countries are, in our view, most relevant to answer our thesis question since the EU-Mexico FTA came into force in 2000, hence having a direct relation with the above mentioned countries.

Data on export and import volumes are collected from World Integrated Trade Solutions (WITS) and generated an aggregated (i.e. total import and export) value for Belgium and Luxembourg. Data collected prior to 1999 only shows the combined trade statistics between the two countries due to the Belgium-Luxembourg Economic Union (BLEU)-treaty. In 1999 the European Community ruled against having the two nations sharing data on trade statistics, requiring them to split the information on international trade. To account for the missing values of the years of 1997 and 1998 for Belgium and Luxembourg, the export and import values for the years of 1999-2016 were added together. The aggregated value between 1999-2016 (e.g. Belgium 1999 import plus Luxembourg 1999 import, and so forth) was then divided by the import and export value for Belgium. This is the percentage in favor of Belgium import/export (since they have had the largest import/export volumes historically). Then, the average of the aforementioned percentage is calculated and multiplied with the Belgium-Luxembourg import and export for the missing trade data. The outcome is a fair split of the sum of export and import and holds in a historical perspective if the information still had been collected as a combined entity between the both countries.

Table 4. presents the included variables and where they are collected along with their expected outcome.

Table 4. Variables included in the regression, source and expected outcome

Variable	*Description*	*Source*	*Expected outcome*
$lnEX_{me}$	Dependent variable Export value from country m to country e	WITS	+
$lnGDP_m$	GDP of country m	The World Bank	+
$lnGDP_e$	GDP of country e	The World Bank	+
$lnGDPPC_m$	GDP per capita of country m	The World Bank	+
$lnGDPPC_e$	GDP per capita of country e	The World Bank	+
lnD_{me}	Bilateral Distance in km from country m to country e	CEPII	-
(d)CL_{me}	Dummy variable common language	CEPII	+
(d)C_{me}	Dummy variable sharing colonial history	CEPII	+
(d)LO_{me}	Dummy variable, landlocked	CEPII	-
(d)FTA_{me}	FTA dummy for the included countries	European Commission	+

The dependent variable, export value ($lnEX_{me}$), consists of the export data, i.e. the export value in current US dollars from Mexico to the EU. The expected outcome of export flows, with the included variables, is to be positive.

The independent variables constitutes GDP ($lnGDP_{me}$) which is measured in current US dollars and bilateral distance (lnD_{me}), measured in km. The GDP variable has a positive expected effect on export flows since countries with larger GDP also are stated to have a larger amount of trade. Hence, GDP will be a contributing factor towards higher export (Krugman et al., 2018; Shariat Ullah and Inaba, 2011). Bilateral distance measured between each trading country's capital centers, is expected to have a negative impact on export flows since distance increases transportation or time costs. Thus, since the capitals in the EU are located relatively close to each other, the outcome is expected to be similar amongst the different countries.

Moreover, GDP per capita ($lnGDPPC_{me}$) is one additional independent variable. GDP per capita is measured through a country's GDP divided by its midyear population. GDP per capita can be observed as an indicator for changes in a country's living standard since it also indicates the purchasing power for an exporting or importing country (Sohn, 2005). A country with a larger population tends to increase its domestic market and therefore decreases trade orientation. However, two countries could have different populations and similar GDP but have differences in their economic development (Bergstrand, 1985). Therefore, GDP per capita is expected to have a positive effect on exports.

The FTA dummy ((d) FTA_{me}) is an explanatory variable. It is taken into account to control for exports from Mexico to the EU. This binary variable is expected to have a positive impact on export volumes since the purpose of the FTA is to reduce tariffs and trade barriers. The dummy variable is taken into account from January 1st, 2000 despite that the agreement came into force July 1st, 2000. Thereby, the FTA dummy will have an impact first noticeable after 2001.

Lastly, the common language dummy variable ((d) CL_{me}) is expected to have a positive impact since sharing common languages facilitates entrance into a trade-partnership. This also applies for sharing colonial history ((d) C_{me}). The variable indicates that one country has governed another country for an extended period of time and therefore contributed to the current state of the other country's institutions. Countries that have similar institutional structures tend to engage in trade more often than others. The landlocked country dummy ((d) LO_{me}) variable has been included since trade could be limited as a result of a lack of coastline for certain European countries. If a European country is surrounded only by land and other countries, the expected outcome on Mexican export is negative (Mayer and Zignago, 2011).

6. Empirical Results and Analysis

According to the gravity model, the variables common language and colonial history are expected to have a positive impact on export flows from Mexico. Figure 5 presents total exports from Mexico to EU15 and it is evident that exports to Spain and Germany is significantly higher relative the other countries. Mexico and Spain share colonial history and language which somewhat could explain the higher export volumes (Figure 5). This assumption is also in accordance with Burenstam-Linder's theory, i.e. countries that are similar tend to trade more with each other.

Furthermore, as can be observed in Figure 5, Mexico's import value from Germany is far greater in comparison to other countries, aside from Spain. Mexico, Germany and Spain share the same top exports, being machinery (mainly vehicles (cars)), mechanical parts and electrical equipment (WITS 2018b; WITS 2018c). By importing and exporting products within the same category, Mexico, Spain and Germany foster product differentiation and thereby, meeting the public need for variety in products. In addition, global spread of operations assists the car producers to achieve increasing returns to scale, which is in line with Krugman (1979). Traditional trade theory of comparative advantages can also help to explain this phenomenon. Product differentiation allows each country to specialize in products in which they have a comparative advantage (Ricardo, 1817; Heckscher, 1919; Ohlin, 1933). E.g. Mexico will import cars that are costly to produce domestically; conversely, cars that are cheaper to produce domestically will be cars that Mexico export.

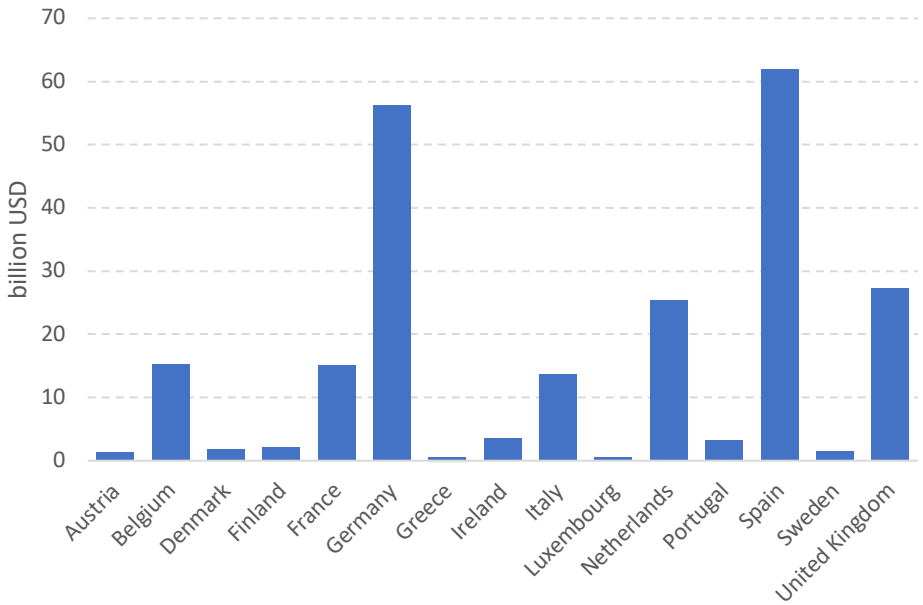

Figure 5. Total Export volumes per country between 1997-2016 from Mexico to EU15, billion USD, Source: WITS, 2018

Table 4 presents descriptive statistics for the total dataset, thus 16 countries with one exporting country and 15 importing countries. The statistics include mean values, standard deviations, minimum and maximum values and number of observations. Statistics are provided for the variables export flows, GDP for the trading parties, GDP per capita for the trading parties, distance between the countries and the FTA-dummy variable. All values are in logarithmic form.

Table 4. Summary of descriptive statistics

Variable	*Mean*	*Standard Deviation*	*Minimum*	*Maximum*	*Observations*
EX_{me}	12.27	1.80	7.04	15.76	300
GDP_{m}	27.51	0.28	26.93	27.90	300
GDP_{e}	26.87	1.21	23.70	28.98	300
$GDPPC_{m}$	8.99	0.20	8.54	9.26	300
$GDPPC_{e}$	10.46	0.45	9.35	11.68	300
$Dist_{me}$	9.15	0.06	9.04	9.33	300
FTA_{me}	0.80	0.40	0	1	300

As seen in Table 4, the study includes 300 observations. GDP and GDP per capita for Mexico is shown to be relatively equal over the years. GDP for Mexico has a mean value of 27.51, where the minimum is 26.93 and maximum is 27.90, and with a standard deviation of 0.28. The GDP for the EU has a mean value of 26.87 and a standard deviation of 1.21 due to the various countries within the EU. GDP per capita for EU has a mean value of 10.46 and has a standard deviation of 0.45. These values differentiate more for the EU relative to Mexico as the minimum and maximum values of GDP per capita change between the different countries and years within the EU. As expected, the distance from each EU capital to Mexico is similar displaying a mean value of 9.15 and has a standard deviation of 0.06. The FTA dummy variable has a mean value of 0.80 indicating that the FTA between Mexico and EU have been in force the majority of the time period that has been examined (since 1 indicates that the FTA is in force).

Table 5 presents results from two different regressions, (1) and (2). In order to test the robustness in our estimation technique we apply one with fixed effects (FE) whilst the other one is performed with random effects (RE).

Table 5. Gravity model estimates

	(1) ***Fixed Effects***	***(2)*** ***Random Effects***
Variables	EX_{me}	EX_{me}
GDP_m	3.758** (1.316)	4.470*** (1.365)
GDP_e	3.512 (2.240)	1.069*** (0.120)
$GDPPC_m$	-3.022* (1.466)	-3.848** (1.532)
$GDPPC_e$	-3.387 (2.519)	-0.735*** (0.279)
$Dist_{me}$	0.00 (0.00)	-9.112*** (1.324)
CL_{me}	0.00 (0.00)	1.000*** (0.272)
C_{me}	0.00 (0.00)	0.00 (0.00)
LO_{me}	0.00 (0.00)	0.0524 (0.383)
EUMexicoFTA	-0.184 (0.106)	-0.195* (0.111)
Constant	-122.7*** (31.43)	-13.65 (20.23)
Observations	300	300
R-squared	0.533	0,525
Number of countries	15	15

Standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*

Regression (1), using FE, shows positive results for the exporter's (Mexico) GDP at a 5% significance level, in line with our expectations. The result implies that a 1% change in GDP is expected to yield an increase of 3.78% in export flows, ceteris paribus. There is also a positive relationship between GDP and export volumes for the importing countries (EU), however, not statistically significant. Hence, the assumption that larger economies trade more relative to smaller economies, appears to hold. GDP per capita did not present positive effects on export flows, which contradicts our expectations. Nonetheless, according to the gravity model, population influences trade negatively, which partly could explain the negative relationship between exports and GDP per capita. The variables distance, colonial history, common language and landlocked are time-invariant variables; thus, they are dropped due to the FE estimator.

Regression (2), using RE, indicates positive results for the exporter's (Mexico) GDP at a 1% significance level. Hence, a 1% change in GDP is expected to yield a 4.47% increase in export flows. Furthermore, GDP for the importing countries (EU) display a positive result at a 1% significance level, implying that 1% change in GDP increases export volumes with 1.096%. GDP per capita shows a negative relationship for both Mexico and the EU. When Mexico's GDP per capita increases with 1%, its export volume is expected to decrease with 3.84% whereas for the EU, export flows are expected to decrease with 0.73% if GDP per capita increases with 1%. The distance between Mexico and the EU influence export flows negatively, which is in accordance with expectation. This is reinforced by our results indicating significance at a 1% level. If the distance is altered with 1%, export flows are expected to decrease with 9.11% between the participating countries. Cultural familiarity, such as sharing the same language, has a positive effect on export flows. This is confirmed by the results which are significant at a 1% level. The variable landlocked shows a mildly positive relationship with export flows, contradicting our expectations.

The FTA-variable between Mexico and the EU presents a negative effect with application of both FEM and REM. However, in the REM the result is significant at the 10% level implying that trade creation decreases with 0.195% if both countries are covered by the agreement. This is somewhat surprising and suggests that the FTA has a negative effect on trade between Mexico and the European countries. The observed R-squared is high, i.e. indicating high explanatory power for both models. It increases slightly in the FEM (from 0.525 to 0.533), indicating an increased explanatory power of the model relative to the REM.

In order to determine whether the FEM or REM is the most suitable in our thesis, we perform a Hausman test as seen in Table 6.

Table 6. Hausman test

Coefficient	***Fixed***	***Random***	***Difference***	***Variance***
GDP_m	3.75846	4.470179	-0.7117186	0.3626441
GDP_e	3.511517	1.068678	2.442838	1.123167
$GDPPC_m$	-3.022033	-3.848474	0.826441	0.387181
$GDPPC_e$	-3.386895	-.7352245	-2.651671	1.192202
FTA_{me}	-0.1835755	-0.1947115	0.011136	0.00

P-value = 0.3296

Our results present a p-value of 0.33, hence we cannot reject the null hypothesis of zero correlation between our regressors and the unique errors. This implies that the REM is preferred over FEM. However, the REM assumes that there is no correlation between the individual effects and some explanatory variables, implying that the REM is only consistent if this assumption holds. In our model, we cannot rule out that other factors might affect trade flows between the trading parties. For example, Mexico's largest and most influential neighbor, the United States, plays an important role for Mexico's economy. We have not taken the effect of these relations into account in this thesis. Therefore, we conclude that the FEM is the most appropriate model to answer our thesis question.

7. Conclusions and Limitations

In this empirical study, we evaluate the current FTA between the EU and Mexico using a gravity model approach. We perform two regressions using FE and RE followed by a Hausman test in order to answer our research question. Our results indicate that the FTA between Mexico and the EU had a negative effect on Mexico's export flows between the years of 1997 and 2016. Our results contradict the findings of Carrère (2004), Peridy (2005), Abedini and Peridy (2007), Caporale et al., (2009) but are more in line with Rose (2004) as he present findings indicating inconclusive results of a GTO/WTO membership. This paper also shares similarities with Fukao et al., (2003) as they find that trade diversion has increased for some industries since the implementation of NAFTA. We conclude that our estimation techniques are more in line with the papers of Rose (2004) and Fukao et al., (2003) relative to Carrère (2004), Peridy (2005), Abedini and Peridy (2007), Caporale et al., (2009) who apply more advanced estimation techniques. Furthermore, there are likely to be factors that influence Mexico's trade flows that are not included in this particular study. A possible factor that is not accounted for is the existence of other trading partners that are closer in geographical distance to Mexico, e.g. the United States. According to the papers of Shariat Ullah and Inaba (2011), Rose (2004) and Roberts (2004), close distance and sharing borders are suggested to increase trade between countries. Mexico and the United States share borders and are a part of NAFTA, suggesting a good trade relation between the parties and thereby possibly increased trade flows. Consequently, our results are likely to be affected by NAFTA.

In our results, the REM finds that there is statistical significance between the GDP of each country, the bilateral distance in kilometers and the export flows, all of which are important variables in the gravity model. Mexico's GDP has increased since the trade liberalization began in the 90s and may partially be influenced by their trade with the EU. The FEM also generates a positive significant result between Mexico's GDP and export flows as well as positive results for EU's GDP and Mexico's export flows. The FTA between the EU and Mexico does not, as previously mentioned, show any significance towards an increase in export flows from Mexico. Important to take into consideration is the width of the agreement, as it covers more than just trade relations. Both enhancements in the political dialogue and various other co-operations are in the scope of improvement.

Finally, we conclude that even though the results imply a negative effect from the FTA, exports and imports for Mexico have improved on an aggregate level. As seen in Figure 1 and 2, the

numbers have increased just slightly over the last twenty years, ignoring the economic crisis in 2008 that occurred worldwide. Furthermore, approximately 80 percent of Mexico's trade is with countries they have signed trade agreements with (European Commission, 2017). If FTAs where to be eliminated, Mexico's trade would most likely decrease. Moreover, Mexico and EU are in full agreement on a new, much broader and modernized agreement, indicating that the agreement that came into effect in 2000 was successful. The new agreement will take on and include the impact of corruption in the private and public sector. Analyzing trade flows given that corruption is accounted for (particularly for Mexico) has the potential to increase the accuracy of the results and is therefore an interesting topic for future research.

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Appendix A.

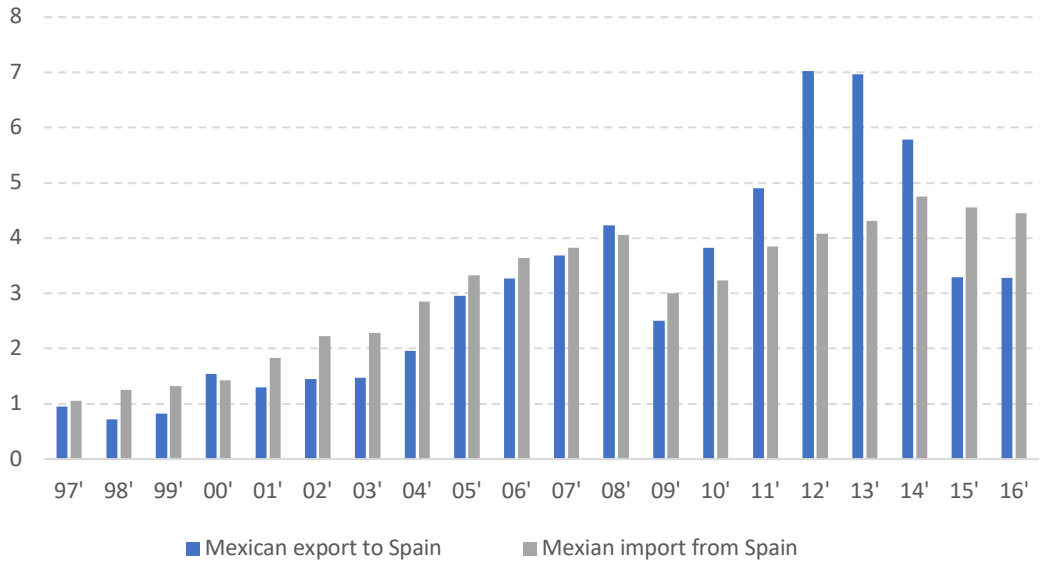

Figure 6. Export and import flows between Mexico and Spain 1997-2016, billion USD, Source: WITS, 2018