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Observing the Effects of CAFTA on Trade using the Gravity Model

Master thesis

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Abstract

This thesis aims to analyse the effects of the Central America Free Trade Agreement on trade using the gravity model. The principal actors of interest are the United States of America and Central American countries combined with Dominican Republic as the other regional actor. Panel data was used with 153 countries for the period of 1995-2015. The model was specified using the dummy approach and estimated with OLS and PPML estimators to obtain results on effects of trade policy variables on exports. Estimates show mixed results but the general effect of CAFTA on exports is positive and significant. This trade creation effect makes CAFTA an important trade agreement for economic relations between member countries.

Abstrakt

This thesis aims to analyse the effects of the Central America Free Trade Agreement on trade using the gravity model. The principal actors of interest are the United States of America and Central American countries combined with Dominican Republic as the other regional actor. Panel data was used with 153 countries for the period of 1995-2015. The model was specified using the dummy approach and estimated with OLS and PPML estimators to obtain results on effects of trade policy variables on exports. Estimates show mixed results but the general effect of CAFTA on exports is positive and significant. This trade creation effect makes CAFTA an important trade agreement for economic relations between member countries.

Klíčová slova

Gravity model, CAFTA, FTAs, US trade, Central America

Keywords

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Declaration of Authorship

1. The author hereby declares that he compiled this thesis independently, using only the listed resources and literature.

2. The author hereby declares that all the sources and literature used have been properly cited.

3. The author hereby declares that the thesis has not been used to obtain a different or the same degree.

Prague 30.12.2017. **Jan Škreb** _____

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Acronyms

CA-DR	Central America and Dominican Republic
CAFTA	Central America Free Trade Agreement
CBI	Caribbean Basin Initiative
FDI	Foreign direct investment
FTA	Free trade agreement
MRT	Multilateral Resistance Terms
NAFTA	North American Free Trade Agreement
OLS	Ordinary least squares
PPML	Pseudo-Poisson Maximum Likelihood
PTA	Preferential trade agreement
RTA	Regional trade agreement
WTO	World Trade Organization

Institute of Political Studies

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Proposed Topic:

Observing the Effects of CAFTA on Trade Using the Gravity Model of Trade

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Topic Characteristics / Research Question(s):
My thesis will focus on analyzing trade between US and countries in Central America. The main purpose is to define the effects of the Central America Free Trade Agreement on trade in this area. I will use the gravity model of trade to assess the impact of this free trade agreement on trade levels in the region. In these times of foreign trade policy uncertainty due to president Donald Trump and trade competition from China, it is relevant to analyze trade agreements and their usefulness for the US.

Working hypotheses:

1. Hypothesis #1: CAFTA has a significant and positive impact trade
2. Hypothesis #2: Membership in CAFTA increases exports of the US to the Central America region.
3. Hypothesis #3: Membership in CAFTA increases exports of the Central America region the US.

4. Methodology:

I will use the gravity model of trade to analyze the effect of a trade agreement on trade levels. Specifically, I will interpret the sensitivity of exports from US to Central America to the FTA dummy, and vice versa. I plan on using panel data in the period from 1995-2015 to have more explanatory potential. The variables I will be using are standard for this kind of analysis. My dependent variable will be exports. The independent variables will be GDPs of exporter and partner, distance, FTA dummy, various country-specific variables (such as common language, common land border, etc.) I will specify the model using the dummy method proposed my Baldwin and Taglioni (2006) and consequently, will estimate the model using PPML and OLS techniques in order to be

able to compare the results from both. I will account for the endogeneity of the FTA variable using the Baier & Bergstrand (2007) method.

Outline:

1. Introduction
2. Literature review and theoretical background
3. Methodology
4. Empirical results
5. Discussion
6. Conclusion
7. References

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1. Introduction

The Central America Free Trade Agreement (CAFTA) was established in 2006 as a free trade agreement between the United States of America (US), the Dominican Republic and five Central American countries: Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua (CA-DR). CAFTA is the first trade agreement between the US and a group of developing countries and therefore presents an interesting case for analysis. The official purpose of trade agreements is to increase trade between its members, but impact of trade agreements goes beyond international exchange and affects political spheres as well. That is one of the reasons why research of trade agreements is an essential part of exploring international dynamics. However, the starting point of investigation of the effects of trade policy is, naturally, exploring its effects on trade. Keeping this in mind, it is surprising that research literature on CAFTA is very limited. Therefore, this thesis is an attempt to shed more light on this subject.

Given that CAFTA is primarily a trade instrument, the choice of method to analyze it is the gravity model of trade. Motivated by the lack of research as well as changing political landscapes in the US, this paper tries to give answers to the economic benefits of this trade agreement. Since the goal of trade liberalization policies is to increase trade between members, this research is guided by three hypotheses expecting positive impacts of the trade agreement: the first one is that CAFTA increases exports of its members, the second one is that CAFTA increases exports of the US to the CA-DR region and the third one is that CAFTA increases exports of the CA-DR region to the US. The hypotheses are tested by running regressions on a panel data set of 153 countries over 21 years. The model includes a variety of standard gravity model variables as well as CAFTA-specific variables. The theoretical foundations of the gravity model are accounted for using two sets of dummies following methodology presented by Baldwin and Taglioni (2006), namely country-pair and time dummies. The estimation techniques applied are ordinary least squares estimator and pseudo-Poisson maximum likelihood estimator. Endogeneity of trade policy variables is accounted for using country-pair effects following advice of Baier and Bergstrand

(2007). Finally, trade creation and trade diversion effect are explored using a pair of dummy variables in line with methods proposed by Yang and Martinez-Zarzoso (2014).

The thesis is structured as follows. The second chapter consists of an overview of the region encompassed in the trade agreement and it includes a short description of relations between the US and CA-DR region as well as their trade dynamics. This chapter continues with a brief outline of the main provisions of CAFTA. The third chapter starts with a summary of the most relevant empirical research literature that deals with CAFTA. It continues with an introduction of the gravity model and presents the most pertinent literature covering the effects of trade agreements on trade using this model. Chapter four includes a description of data set used for the analysis. Further it describes the specific methods used to obtain estimates using theory from relevant gravity model literature. Chapter five presents results from the regressions and provides interpretations of them. A brief discussion on results and the importance of this kind of research is the main subject of the sixth chapter. Finally, conclusions are presented in the seventh chapter.

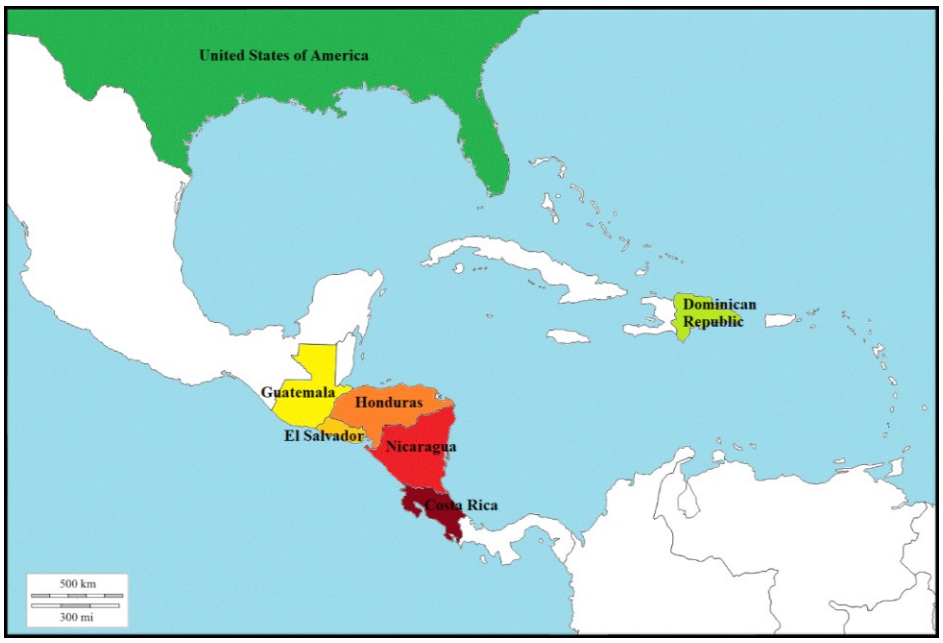
2. CAFTA and its Members

This chapter introduces the members of CAFTA, especially the Central American region. Further, economic relations between the US and Central America are explored and finally a brief overview of the main aspects of CAFTA are presented in order to provide a contextual basis for empirical research.

2.1 Regional Overview

Central America is arguably one of the regions that is least analyzed in economic and political research. Nevertheless, it holds an important role in the dynamics of the Western Hemisphere. Therefore, countries analyzed in this research are all signatories of CAFTA and include United States of America, Dominican Republic, and five Central American countries: Costa Rica, El Salvador, Honduras, Guatemala, and Nicaragua. The following is a map of CAFTA member countries that highlights the unique position of Central American countries.

Figure 1. Map of CAFTA members



Source: Own map (using template from (D-Maps, n.d.))

The five Central American countries have an important geostrategic location as a bridge between the two Americas and between the Atlantic and Pacific Ocean. This unique location is characterized by all countries having substantial access to sea and all countries except E Salvador have access to both oceans. Another aspect that is observable from the map, and important for further research in trade costs, is that the US, as well as the Dominican Republic, share no border with any other member country.

In terms of regions, Central American countries belong to the Latin America region while Dominican Republic belongs to Caribbean countries. All CA-DR countries belong to the Caribbean Basin region but are not part of the South American region. The United States on the other hand represents the biggest economy in the Western Hemisphere.

The countries of Central America have often been grouped together because of their many similarities. However, the Dominican Republic also entered into this trade agreement in the later stages. Thus, it is important to highlight the similarities between CA-DR countries, which are that:

- Their official primary language is Spanish,
- They share a common colonial history under Spanish rule,
- They are all predominantly Christian nations,
- Their territories, GDP and population sizes are smaller than most Latin American countries,
- They are particularly vulnerable to external shocks and extreme natural events,
- They are open to international trade and,
- They have structural current account deficits (Beteta & Moreno-Brid, 2014).

As we can see, the CA-DR countries are very similar across a wide range of criteria. It is important to note that Mexico is excluded from this grouping because of significantly different size and relationship to the US as well as its exclusion from most definitions

of Central America. Further, two other Central American countries, Belize and Panama, are not included in this research since they are not members of CAFTA.

Therefore, to provide an additional overview of countries that are analyzed in this paper and give the reader a chance to familiarize with this region, the next table is presented with basic information and indexes. The information presented here is to highlight the similarities of the CA-DR countries as well as the differences between them and the US.

Table 1. Basic information on CAFTA member countries for 2016

2016	*Total area (km^2)*	*Population*	*GDP (PPP, billions $)*	*GDP per capita (PPP, $)*	*Gini index (2014)*	*HDI*
United States	9 833 517	323 995 528	18 560	57 300	45 *(2007)*	0,920
Costa Rica	51 100	4 872 543	79,26	16 100	48,5	0,776
Dominican Republic	48 670	10 606 865	161,90	15 900	47,1 *(2013)*	0,722
El Salvador	21 041	6 156 670	54,79	8 900	38	0,680
Guatemala	108 889	15 189 958	131,80	7 900	53	0,640
Honduras	112 090	8 893 259	43,19	5 300	47,1	0,625
Nicaragua	130 370	5 966 798	33,55	5 300	47,1	0,645

Note: Sources for the first five categories in the table are taken from CIA Factbook for comparison purposes (Central Intelligence Agency, 2017). HDI indexes are taken from the official UNDP page (United Nations Development Programme, 2017).

As we can observe from the table, the United States is unsurprisingly by far the biggest country in all aspects presented. Concerning variations among the CA-DR countries, we can see that the populations and GDP values vary from large countries of Guatemala and Dominican Republic to smaller countries like Nicaragua and El Salvador. Costa Rica and Dominican Republic on the other hand have higher living standards and life

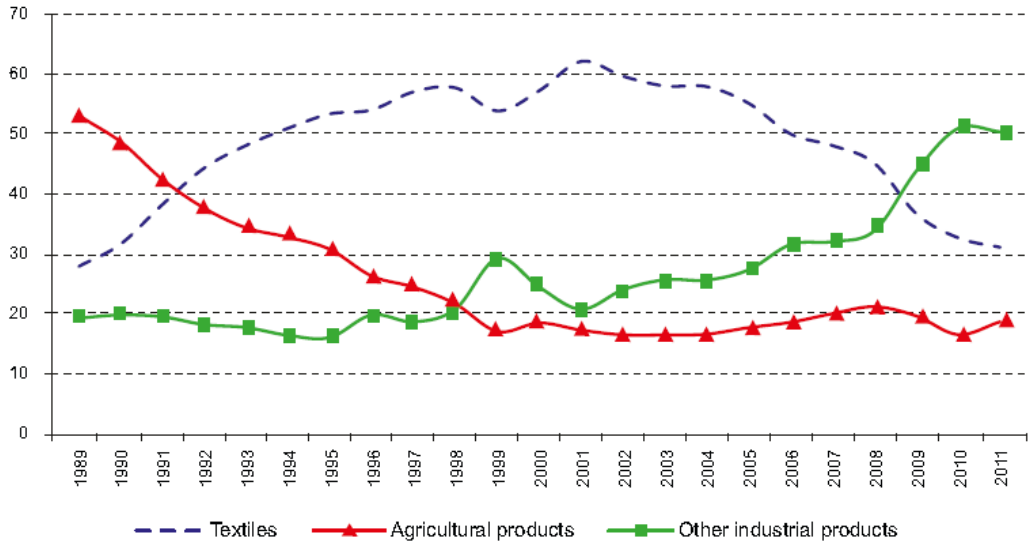
quality. Nevertheless, the countries in the CA-DR region are similar enough to be grouped as one party in the trade agreement, with United States being the second party.

2.2 CA-DR and US Relations

The CA-DR region has not achieved the growth rates or gained the attention of the economic world as much as the South East Asian countries have. Nevertheless, the period from 1950s-1980s was characterized by vigorous growth in this region, mostly driven by increases in agricultural exports and industrialization. This period was also marked by increasing trade integration in the region. In 1961 El Salvador, Guatemala, Honduras and Nicaragua created the Central American Common Market which became the second largest export market for Central America after the US. Costa Rica joined this common market one year later. Intra-regional trade was increasing until 1980s when civilian conflicts, both intra-state and inter-state, reduced economic interactions between countries. Another unfavorable factor was the international debt crisis which decreased trade flows. However, there was renewed vitality in the region in the 1990s which lasted until 2008 and the Global Financial Crisis. Nevertheless, the average growth rate from 1990 - 2011 was 4,6% per year. On the other hand, countries in the region maintained trade deficits for the entire time during this period, since imports grew on average 10,3% per year (Beteta & Moreno-Brid, 2014).

The economic relationship between CA-DR and the US is characterized by relatively stable trade relations. In 1990, main exports of CA-DR to the US consisted of bananas (19%), coffee (14%), clothing (10%), beef (5%) and sugar (4%). However, the main strategy of the CA-DR countries to boost exports in the 1980s and 1990s was to attract foreign direct investment. Trade was enhanced by the US passing the Caribbean Basin Initiative (CBI) in 1984, which opened the door of the US market for CA-DR products. The CBI eliminated or substantially lowered tariffs on US imports from CA-DR. However, it also shifted the export basket of the CA-DR countries towards substantially more maquila-based textiles. This can clearly be seen in the following graph, which highlights the structure of exports from CA-DR to the US (Beteta & Moreno-Brid, 2014). However, in time the structure of exports became more balanced.

Figure 2. Central American Common Market: main exports to the United States, 1989-2011 (Percentages of total exports)



Source: (Beteta & Moreno-Brid, 2014)

It is important to note that the CBI did not give preferential access of US goods to the CA-DR. Consequently, CA-DR depends on trade liberalization for its exports. This led to the situation that only 12% of exports from the region are not covered by a trade agreement. And these preferential arrangements also shape the export structure, with 80% of exports to the US being industrial goods (textiles) and 90% of exports to the EU being agricultural products in 2011. In essence, the CA-DR region mainly exports low value-added goods (Beteta & Moreno-Brid, 2014). Accordingly, the next section explores trade between US and CA-DR in more detail.

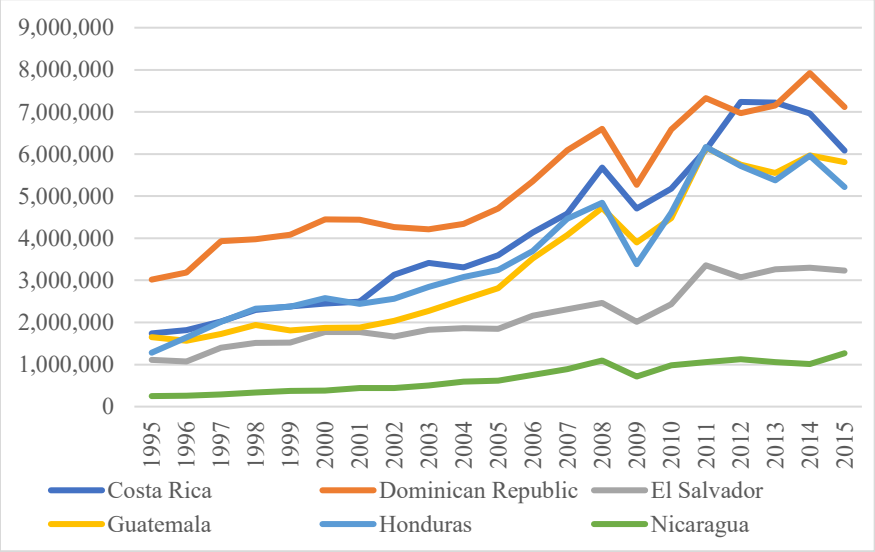
2.3 Trade between CAFTA Member Countries

The official aim of CAFTA is to increase trade among member countries. Therefore, I will present a brief overview of trade patterns among these countries in the period from 2005-2015, in order to provide better context for subsequent empirical research.

Since 2005, merchandise trade between the US and CA-DR has increased by 70% and CA-DR countries have become the 13th largest trading partner for US, larger than India, Australia and Italy. Exporters from the US to the region have enjoyed a large increase in trade. Since 2005, US goods exports to CA-DR increased by 84% and US exports of manufactured goods to the region increased by 79%. Exports of manufactured goods that increased the most are: medical equipment, aircrafts and parts, iron and steel, power generating machinery and clocks and watches. The rise in exports of agricultural products has been even more dramatic, with the biggest categories being: food manufactures, corn, wheat and oats, meat, dairy products, alcoholic beverages and fruits. Estimates say that US exports to CA-DR support around 175 000 jobs in the US. Surprisingly, this trade development changed the US trade balance with the region from a deficit into a surplus of $2.7 billion in 2014. Another interesting fact is that the number of companies that export to CA-DR has risen by 7 000 to a total of 20 000, 90% of which are small and medium sized businesses (Murphy & Busch, 2015).

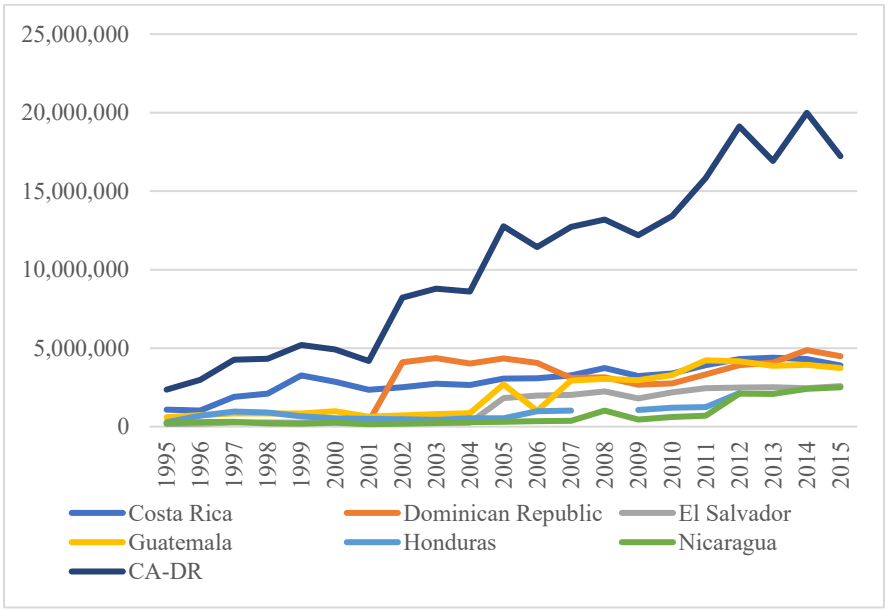
Exporters from CA-DR to the US have also enjoyed significantly more trade since 2005, even though their access to US markets was significantly improved due to CBI which was implemented 21 years before. US merchandise imports from CA-DR have risen by 57% since 2005. Exports from CA-DR have risen in some labor-intensive products groups such as computers and electronics as well as wiring sets for cars. Agricultural exporters from CA-DR have focused on exporting products that they have a competitive advantage in producing, such as bananas, pineapples, cucumbers and melons. On the other hand, exporters of apparel from the region have not enjoyed such an increase in trade, perhaps due to competition from Asia. Nonetheless, one of the greatest benefits of these improved economic relations for CA-DR is the increase in flow of foreign direct investment (FDI) to the region. Inflows of FDI to CA-DR have more than doubled between 2004-2014. Of these flows, 66% are in the service sector and the rest are mostly in the manufacturing industry (Murphy & Busch, 2015). Therefore, in this period, trade between the US and CA-DR has flourished in both directions. This is also visible in the following figures:

Figure 3. US Exports to CA-DR 1995-2015 in US$ thousands



Source: WITS (World Bank, n.d.)

Figure 4. CA-DR Exports to US (1995-2015) in US$ thousands



Source: WITS (World Bank, n.d.)

As we can see, in the observed period trade has increased in both directions. What is interesting to note is the dip is US exports during the global financial crisis in 2008 and

2009. Further, US exports increased tremendously to all countries in the region except for Nicaragua and El Salvador where the increase has been much milder. Decrease in exports during the global financial crisis occurred for the CA-DR region as well, but it not so clearly visible in the graph due to the inclusions of aggregated exports for the whole region. Since the main topic of this thesis is exploring trade between US and CA-DR as a region, figure 4 shows the increase of regional exports to the US, which is represented by the uppermost line on the graph.

Regarding the current state of trade relations (for 2015), the CA-DR area is a significant trading partner to the US as a whole. However, if taken individually, the CA-DR countries account between 0,22-0,47% of exports of US (except Nicaragua which accounts for only 0,08%). On the other hand, the US is by far the biggest export market for all CA-DR countries, with export partner shares between 35-53%. All other trading partners do not even come close (World Bank, n.d.). The US has a trade surplus with all CA-DR countries except Nicaragua, with which it has a large trade deficit. With other countries in the region it has a large trade surplus except with Honduras where the difference between imports and exports is not as substantial.

Looking at bilateral trade across product groups, US exports to CA-DR are relatively balanced. This means that exports from the top five product groups usually total around 72% of all exports (exceptions being Dominican Republic and Guatemala where export groups are even more balanced) and there are no major differences among these product groups since there is not one category that has a much larger share than the rest. Overall, the biggest export groups for US to CA-DR are machinery and electrical and fuel.

The situation is quite different for CA-DR exports to the US, except for Dominican Republic and Honduras which have a relatively balanced export portfolio, with first five product groups totaling around 78% of all exports. Around 72% of exports from Costa Rica are composed of only two categories: vegetable and vegetable products (in this case it is mostly fruits) and miscellaneous goods (manufactured goods). For El Salvador the situation is even more extreme with textiles accounting for 77% of all

exports. For Guatemala, the first two product groups (vegetables and textiles) account for 71% of trade. Finally, for Nicaragua textiles account for 54% of total exports and first three groups total 78% of all exports. For more detailed information on trade structures, see appendix 1. Overall, the biggest export groups for CA-DR countries to US are food groups and textiles, with machinery and electrical being in the third place (World Bank, n.d.).

To conclude, trade between the US and CA-DR countries has grown in the recent decade and the structure of current trade shows a pattern of more value-added goods being exported by the US and more food products and textiles being exported by CA-DR. In the next section, I will introduce the Dominican Republic-Central America Free Trade Agreement, which is an integral part of this region's economic and political relations.

2.4 Regional Trade Agreements and CAFTA

The proliferation of trade agreements in the last two decades has been quite impressive. The number of bilateral trade agreements has significantly increased from 50 in 1992 to a whopping 290 trade agreements in 2010. But not all trade agreements are the same. Influential economist, Jacob Viner, classified trade agreements into five types, according to intensity of trade liberalization:

1) Preferential trade agreements (PTA) – member countries unilaterally lower inter-member tariffs,
2) Free trade agreement (FTA) – member countries eliminate all inter-member tariffs,
3) Customs union – member countries decide on common external tariffs,
4) Common market – member countries allow free movement of labor and capital,
5) Economic and monetary union – member countries coordinate monetary and fiscal policy and share a currency (Acharyya & Kar, 2014).

On the other hand, regional trade agreements (RTA), as defined by the World Trade Organization (WTO) are reciprocal trade agreements between two or more partners and can be either FTAs or customs unions (World Trade Organization, n.d.). The term RTA is used to emphasize the geographical aspect of trade integration and is vaguer on the level of intensity of integration. CAFTA is officially an FTA, but the term RTA applies as well in this case. Further, there are various reasons other than increase in trade, of why countries enter into trade agreements in the first place.

Dur et al. (2014) present several of the most important political economy reasons why countries sign into trade agreements, such as:

- competition among trading nations,
- different industry and market characteristics,
- the role of democratization of trade agreements,
- distribution of power and alliances,
- use on international trade institutions as instruments to lock-in specific policies,
- bureaucratic interests,
- electoral concerns and
- attracting foreign direct investments.

On the other hand, Chandran (2017) argues that the magnitude of impact of RTAs is not uniform, but that they are still booming due to the slow processes of trade liberalization and integration under the WTO. The author argues that this flourishing of RTAs creates a complicated global system of intertwined trade agreements that are difficult to research. Nevertheless, study of RTAs is important for understanding global trade dynamics and one of these agreements that deserves more attention is CAFTA.

The negotiations for the Central America Free Trade Agreement between the US and Central American countries started in January 2003. The negotiations ended rather quickly, in December 2003, for all countries except Costa Rica who reached an agreement with the US in January 2004. The agreement was signed in May 2004 (Organization of American States, n.d.). Dominican Republic joined in August of 2004

and the agreement name was altered to include this change. The agreement entered into force in January 2006 for all signatories except Dominican Republic, for which it entered into force in 2007 and for Costa Rica in 2009, due to domestic issues (US Customs and Border Protection, 2015). From the start, CAFTA had an ambitious array of objectives that go further than traditional trade policies.

Thus, the main objectives of CAFTA are to:

- expand and diversify trade,
- eliminate trade barriers,
- promote fair competition,
- increase investment opportunities,
- protect and enforce intellectual property rights and,
- establish a framework for further trade integration in the Americas (Stenzel, 2008).

In order to better understand the nature of the agreement and its possible effects on trade, the following is an overview of main provisions of CAFTA. Firstly, due to CAFTA, tariffs on US exports of consumer and industrial goods to CA-DR have been completely eliminated by 2015 and tariffs on nearly all US agricultural exports to the region will be phased-out by 2020. Since trade in agricultural products is a sensitive issue for CA-DR countries, this additional provision provides a smoother trade liberalization process. CAFTA also includes provisions that oblige parties to apply the disciplines for sanitary and phytosanitary measures according to the WTO Agreement. The provisions of CAFTA dealing with market access of goods consolidate current CBI access of both US and CA-DR exporters. A large majority of tariffs for manufactured goods were completely eliminated upon CAFTA's entry into force. Regarding the rules of origin, CAFTA takes a more flexible approach than other important US FTAs. Since the textile industry is an important aspect of trade between US and CA-DR, regulations in this sector are more detailed and conditions are still more restrictive than for other sectors. However, CA-DR textile exporters enjoy the

best market access conditions in this sector than any other US trading partner (Jaramillo, Lederman, Bussolo, Gould, & Mason, 2006).

Important provisions under CAFTA are concerned with trade in services, since this kind of trade did not receive significant attention under CBI. This part of the FTA is mostly dealing with transparency in regulatory processes. A separate chapter is concerned only with regulation of financial services. CAFTA also requires stricter implementation of intellectual property rights. When it comes to labor and environmental provisions, CAFTA commits all members to enforce current domestic laws and regulations. Specifically, it bans relaxation of labor and environmental regulations in order to increase trade. These provisions do not require much legislative change, but mostly require better enforcement of current laws. This is especially important for labor rights laws in the textile industry in CA-DR. The agreement also includes provisions for non-discriminatory access of foreign firms to public contracts.

Furthermore, CAFTA includes obligations to improve customs operations, especially for CA-DR countries since these issues have posed significant barriers to trade. The agreement includes rules of origin that are easier to administer and provisions for more transparency and better sharing of information to combat trans-shipment in illegal goods. CAFTA also includes monetary penalties for members that do not comply with the provisions and other dispute settlement mechanisms to facilitate a deeper impact of the agreement (Jaramillo, Lederman, Bussolo, Gould, & Mason, 2006). Finally, it is important to note that even though the main research interest of this thesis is in exploring US and CA-DR relations, CAFTA is an agreement that also affects trade between CA-DR countries themselves.

As we can see, CAFTA includes a wide range of provisions whose official aim is to facilitate not only more volume of trade but also better quality of trade between member countries. The literature in the following sub-chapter 3.1 tries to answer whether this trade agreement did in fact bring change.

3. Literature Review

The following sections present a review of literature that has been used for this thesis. Firstly, I review the available literature that examines the effect of CAFTA on various aspects of society in the CA-DR region. Then, I shortly present the methodological evolution of the gravity model. Finally, I present an overview of empirical literature using the gravity model to analyze trade agreements.

3.1 Review of Literature on CAFTA

Since effects of CAFTA have not been meaningfully explored, the following is a mixture of papers that use different methodologies as well as a mixture of academic journals and papers of less scientific rigor. It is worthy to note that some research papers written in Spanish might have been missed due to language constraints. The following table briefly presents main papers that analyze the effect of CAFTA.

Table 2. Overview of literature on effects of CAFTA

Authors and year	Topic	Results	Approach
Abrahamson (2007)	Impact of CAFTA on social citizenship	CAFTA brings social policies back on political agenda.	Descriptive policy analysis
Bussolo & Niimi (2009)	Effect of CAFTA on poverty levels in Nicaragua	Small effect on poverty levels.	GE models to simulate trade reform scenarios and estimate price effects and how price changes effect income changes
Calderon & Poggio (2010)	Effect of trade promotion on levels of growth	Trade openness stimulates growth.	GMM
Condo et al. (2005)	Negotiation process of CAFTA	Opposition to CAFTA as part of anti-globalization movement and pro-business groups in favor of FTA.	Qualitative analysis using IPE approach
Delgadillo (2013)	Effect of CAFTA on exports of Nicaragua	CAFTA accounts for 69% increase of Nicaraguan exports.	Gravity model of trade

Filipski et al. (2011)	Impact of CAFTA on rural incomes in Dominican Republic	Negative impact of low agriculture prices on rural household incomes.	CGE model
Francois et al. (2008)	Effects of CAFTA on welfare	Positive effects due to increase in capital stock and FDIs.	CGE model
Gordillo et al. (2010)	Effect of CAFTA on intra-regional trade	Growth in trade due to CAFTA.	Gravity model of trade
Granados & Cornejo (2006)	Convergence of various RTAs into CAFTA	Convergence ineffective if forced by politics. Competition between MERCOSUR and CAFTA can be damaging to trade.	Qualitative trade policy analysis
Jansen et al. (2007)	Effect of CAFTA on growth prospects	CAFTA will create new opportunities for low skilled labor, especially in maquila industry.	CGE model.
Jaramillo et al. (2006)	Ex-ante analysis of welfare gains of CAFTA	Relative gains across households. Positive effect on FDI.	Large variety of methods of macroeconomic analysis
Kose & Rebucci (2005)	Ex-ante analysis of CAFTA on macroeconomic fluctuations	Expected growth in productivity, specialization in economic output and boost in FDI.	Dynamic stochastic general equilibrium model and descriptive macroeconomic analysis
Morley (2006)	Trade liberalization under CAFTA	Necessary to supplement FTA with policies for disadvantaged groups.	Qualitative trade policy analysis
Sandoval et al. (2015)	Effect of CAFTA on trade of El Salvador	Statistically insignificant and negative result of CAFTA.	Gravity model of trade
Spilker et al. (2017)	Effects of CAFTA in Costa Rica on firm level	No benefit of CAFTA in aggregate level trade. Small firms reap more benefits.	Poisson regression models

Yeboah et al. (2007)	Effect of CAFTA on trade between US and CA-DR	Positive effect on trade.	Gravity model of trade

Source: Author's table

Taking this into account, the only paper that does relatively similar research to the one of this thesis is Yeboah et al. (2007). However, it has not been published in a peer-reviewed journal. Additionally, the choice of methods as well as choice of data used in this paper is different from this thesis. Nevertheless, Yeboah et al. (2007) use the gravity model to analyze trade between US and CA-DR. They use only trade in agricultural products and estimate the equation with the random effects model. Their results show that all countries except Costa Rica are trade creators. Overall, the results show that CAFTA has a positive effect on trade between the US and CA-DR region (Yeboah, Shaik , Allen, & Ofori-Boadu, 2007).

Noteworthy papers that deserve more attention include Jansen et al. (2007), who argue that CAFTA will improve growth prospects of the region by creating new opportunities for unskilled labor whereas skilled labor will experience rising wages. The authors also identify three key aspects of growth for the region in the context of the trade agreement. First, they suggest moving already employed resources to more productive sectors. Secondly, they observe a need for a change in the structure of demand toward more demand of previously unemployed unskilled labor. Thirdly, they say there needs to be an increase in capital formation to increase the overall supply of capital.

On the other hand, François et al. (2008) argue that the most welfare-improving mechanism of CAFTA is in fact the increase in FDI and capital stock. They also see the importance of the agreement on the textile industry since this sector is important for the CA-DR region, but is experiencing increasing competition from China. Like many other papers dealing with this topic, they conclude that the agreement needs to be supplemented with complementary policies in infrastructure and competitiveness in order to improve potential gains from trade liberalization (Francois, Rivera, & Rojas-Romagosa, 2008).

Jaramillo et al. (2006) present the most comprehensive ex-ante analysis of CAFTA. They argue that the agreement is expected to promote greater levels of investment by providing more certainty, economic reforms and transparent regulation. Their research shows that a vast majority of the CA-DR population will experience welfare gains, except for a small share of the rural population. The authors argue that previous trade agreements in the area increased export volumes, but did not reduce poverty or transform economies. They further suggest that gains from the agreement depend on the capacity of the economy to change its productive structure. They identify two key factors in this change: infrastructure that affects trade costs (such as freight or insurance) and the regulatory environment. Additionally, they identify the potential effects of CAFTA, on FDIs as positive, on corruption they find no direct significant effects and on innovation they find mixed effects.

Then they turn to the phasing-out of tariffs arguing that it is best to have a quick trade liberalization process that lowers or eliminates tariffs in a short time span and that is additionally supplemented with targeted support for sensitive groups. This support can include decoupled transfers, technical assistance or public goods programs. Then the authors turn to the macroeconomic effects of CAFTA and identify two main effects. First, the potential revenue losses due to removal of import taxes will have negative fiscal effects. They propose for El Salvador and Guatemala to significantly increase tax revenue, for Costa Rica to improve efficiency and allocation of public expenditures and attract private investment and for Honduras and Nicaragua to do all three things. Another macro effect is the effect of the trade agreement on the pattern of business cycle synchronization. However, since there is little intra-industry trade between the countries, gains from this synchronization are expected to be low in the beginning (Jaramillo, Lederman, Bussolo, Gould, & Mason, 2006).

Calderon and Poggio (2010) look at effects of trade promotion due to CAFTA on growth in CA-DR countries. Their results show a robust causal link from trade to growth. They say that trade openness stimulates growth but that lack of structural reforms in CA-DR hinder growth levels from being higher. Therefore, they conclude

that CAFTA can be welfare enhancing, if it is complemented by appropriate reforms in education, infrastructure and institutional quality (Calderon & Poggio, 2010).

Spilker et. al (2017) on the other hand observe the effects of CAFTA on the firm level. First, they state that there has not been enough research on the effect of FTAs on developing economies. They analyze the effect on CAFTA on trade in Costa Rica. Their results show that CAFTA had no effect on both the extensive and the intensive margin. However, disaggregating trade on the extensive margin, the mineral products industry as well as footwear and headgear have profited from CAFTA. On the intensive margin, the effect on trade flows has been negative on all product groups except for wood and wood products. Finally, surprisingly their results show that the benefits of trade liberalization were mostly felt by smaller firms.

Filipski et al. (2011) analyze the impact of CAFTA on rural incomes and welfare in the Dominican Republic. Their results show that the impact of tariff elimination reduces agricultural prices which negatively effects all rural households, not only agricultural ones. The authors conclude by saying that post-CAFTA adjustment policies are needed to reduce welfare losses on the society. These include increasing agricultural productivity gains and expanding competitive exports.

In conclusion, the reviewed papers look at the impact of CAFTA on various aspects of a countries' economy and society. Many papers reach similar conclusions, such as that the FTA will improve trade levels, that rural farmers will be negatively affected, and that the FTA needs to be complemented with other policies to reap the full benefits and avoid the negative impacts of trade liberalization. The literature presented helps put CAFTA into context and show the importance of studying this trade agreement.

3.2 Evolution of the Gravity Model

The gravity model of trade was formulated in 1962 by economist Jan Tinbergen. He was inspired by the idea of Isaac Newton's law of gravity which states that two objects attract each other with a force that is directly proportional to their masses and inversely proportional to their distance. Analogously, in economics and trade this would mean

that two countries will trade more the bigger their economic mass is and will trade less the bigger the distance is between them. This simple approach led to development of the intuitive gravity model that is best represented by this simple expression:

$$logX_{ij} = c + b_1 logY_i + b_2 logY_j + b_3 log\tau_{ij} + \varepsilon_{ij} \quad (1)$$

In this equation, X represents exports from countries i to j, c represents the regression constant, Ys represent GDPs of countries i and j, τ represents trade costs (in this case only distance), ε represents the error term and finally b represents coefficients (Shepherd, 2013).

This simplified method led researchers to use it as a tool in empirical research in international trade. However, the model was criticized for not having a solid theoretical basis, which encouraged researchers to focus on various methodological issues. The most important contribution was arguably by Anderson and Van Wincoop (2003), who emphasized the importance of approximating multilateral resistance terms (MRTs) and adding them to the basic gravity equation. MRTs essentially account for the fact that exports from one country to another depend on trade costs across all export markets and that imports of one country by another one depend on trade costs across all possible suppliers. Adding these terms and some other explanatory variables makes up the standard theoretically-founded gravity equation as it is used today:

$$logX_{ij} = c + b_1 logY_i + b_2 logY_j + (1-\sigma) log\tau_{ij} + b_3 log\Pi_i + b_4 logP_j + \varepsilon_{ij} \quad (2)$$

In this equation: X represents exports from i to j, Ys represent GDPs of countries i and j, $(1-\sigma)$ represents elasticity of substitution, τ represents trade costs presented below, Π and P represent the MRTs, ε represents the error term and finally b represent coefficients (Bacchetta, et al., 2012).

Furthermore, trade costs are an essential part of explaining international trade and years of research using the gravity model have shown that some bilateral characteristics of

country pairs have a high influence on trade. This is presented in the following expression:

$$\log \tau_{ij} = b_1 logdist_{ij} + b_2 contig + b_3 comlang\_off + b_4 colony + b_5 comcol \qquad (3)$$

In this equation: trade costs are again represented by τ, *dist* represents the geographical distance between two countries, *b* represents coefficients and the following are dummy variables: *contig* equals unity if countries share a land border, *comlang* equals unity if countries share a common official language, *colony* equals unity if there was ever a colonial relationship between the two countries and *comcol* equals unity if countries ever had a common colonizer in the past (Shepherd, 2013).

In conclusion, the gravity model of trade has evolved to be a useful tool in empirical analysis of international trade. It has been extensively used to analyze the effect of trade agreements on bilateral trade and therefore is an appropriate method to use in the analysis of CAFTA in this thesis. That is why, the following section provides a literature review of research using the gravity model to explore trade liberalization.

3.3 Empirical Literature using the Gravity Model for Trade Agreement Estimates

It is appropriate to begin this section with an overview of the paper by Cardamone (2007), who reviewed 115 research papers that evaluate the impact of trade agreements on trade using the gravity model. The author presents three main conclusions from her survey. First, all the reviewed papers, except two of them, use a dummy variable to proxy the trade agreements. Second, the results of the impact of trade agreements on trade flows vary wildly, on scales of both significant/insignificant and positive/negative. The author attributes this to the heterogenous choices of periods, country groups and variables. Third, the estimation methods that are used also vary with the author claiming that all reviewed papers ignore at least one estimation issue that can lead to biased results.

The papers reviewed by Cardamone (2007) use as a dependent variable either total trade (averaged) or only imports/exports. In terms of choices of independent variables, the most common choices are GDP as a proxy for national income, distance as a proxy for trade costs, country-pair variables for common language and land borders as well as for islands, landlocked countries, and colonial ties. Variables such as remoteness, country's area size, GDP per capita, and dummies for common currency are also common, but less frequently used than the aforementioned standard gravity model variables. In terms of estimation methods employed, most papers use ordinary least squares method (OLS) with fixed effects even though other methods are used as well, such as random effects and estimating nonlinear specifications of the gravity model (Cardamone, 2007).

A majority of research on RTAs focuses on either very specific case studies analyzing the effects on only one country or one product group, or they focus on general effects of RTAs using a broad sample in order to provide wide-ranging conclusions on trade liberalization. However, using a similar approach to this thesis, the following table presents noteworthy papers that describe effects of one or more RTAs separately.

Table 3. Overview of literature on effects of trade agreements using the gravity model

Authors and year	Trade agreement	Results
Buigut (2012)	East African Community Customs Union	Kenya, Uganda, and Rwanda have significant increase in intra EAC exports. Kenya and Tanzania have significant increase in their intra EAC imports.
Carillo-Tudela & A Li (2004)	Andean Community PTAs and Mercosur	No analyzed FTA has a big impact on intra-regional trade.
Elliot (2007)	CARICOM	Mixed results for exports.

Endoh (1999)	1) European Economic Community, 2) Latin American Free Trade Association, 3) Council of Mutual Economic Assistance	1) positive trade creation effect & negative trade diversion effect, 2) negative both trade creation & diversion effects, 3) positive both trade creation and diversion effects.
Fath-Allah (2015)	Variety of RTAs in the Arab region	Positive effect on trade creation. Positive effect of being member of multiple agreements.
Peridy (2004)	Various RTAs between non-European Mediterranean countries and EU	They all have a significant and positive effect on trade.
Tang (2005)	1) North Atlantic Free Trade Agreement, 2) Australia – New Zealand Closer Economic Relations, 3) Association of Southeast Asian Nations	All three trade agreements have increased trade between members.
Yang & Martinez-Zarzoso (2014)	ASEAN – China Free Trade Area	Substantial and significant trade creation.
Zidi & Dhifallah (2013)	Tunisia – EU trade agreement	No trade creation. No trade diversion of imports, but there is trade diversion of exports.

Source: Author's table

As we can see, the results from the papers in the previous table show that the effects of RTAs can vary, but are mostly positive for trade creation. When it come to more general conclusions on effects of RTAs, the following papers are presented which introduce some interesting methodological approaches or conclusions.

Martinez-Zarzoso and Nowak-Lehman (2003) analyze trade between two big trade blocs: the European Union and Mercosur. They use novel variables for that time, such

as infrastructure endowments, per capita income differences and exchange rates. A second novelty is that they analyze trade between two trade blocs, not countries. Their results show that if the population of the exporting country rises, somewhat surprisingly the impact is negative, possibly due to absorption effects. On the other hand, if the population of the importing country rises the effect on trade flows is positive, because larger countries tend to import more. They also show that better infrastructure of the exporting country increases trade. Finally, they conclude that belonging to either of the trade blocs increases the member countries' trade. However, interestingly, Kurihara (2011) demonstrates that RTAs promote international trade more in OECD countries than in non-OECD countries.

Vicard (2011), on the other hand, comes to different conclusions in his research on RTAs. He shows that the effectiveness of an RTA increasing trade between two countries depends on the economic characteristics of these two countries, but also on the characteristics of all other members of the RTA. Specifically, trade between two countries will be increased by the implementation of the RTA, if the two countries have large and symmetric GDPs and other RTA member countries have small and asymmetrical GDPs. Finally, the author claims that RTAs made between countries on the North/North, South/South and North/South axis have similar effects on trade.

Lee et al. (2004) analyze the effects of proliferation of RTAs on global trade. Their primary result shows that RTAs increase intra-bloc trade. Further, they explain the recent growth in number of RTAs by stating that the net-gains from joining existing RTAs are less than net-gains from creating a new RTA with other non-members. However, more interestingly, they use two dummies to evaluate the effect of belonging to more than one regional trade agreement. They use a "RTA-SingleOverlap" dummy, which is unity, if both countries belong to the same RTA and either one of the countries belongs to only one more RTA with other countries.Further, they use a "RTA-GroupOverlap" dummy which is unity, if both countries belong to multiple RTAs. The results show that belonging to more than one RTA is counterproductive. The authors therefore argue that the current expansion of RTAs may not lead to global free trade.

Carrere (2004) uses the gravity model to assess effects of several RTAs while paying special attention on correct specification of trade creation and diversion methods. The results on the seven RTAs that are covered show that RTAs did in fact increase intra-regional trade and also introduced trade diversion effects with the rest of the world, both in terms of imports from and exports to the rest of the world. Complementary research is done by Urata and Okabe (2007) who use the gravity equation with FTA dummies on aggregate data. Their results indicate that FTAs bring trade creation, while trade diversion effects are small. However, they also use disaggregated data and show that FTAs have different effects for different products groups.

On the other hand, Egger et al. (2011) estimate the effects of PTAs on trade by using non-linear econometric techniques and specifically accounting for zero trade flows and trade policy endogeneity. An interesting addition to their model is the inclusion of political variables that might affect bilateral trade, such as autocracy of the regime, durability of the regime and political competition in the country. The authors show that taking into account endogeneity of PTAs increases the impact on trade, compared to calculations that take PTAs as exogenous. They also point out that taking into account zero trade flows significantly changes results.

Similarly, Lederman and Ozden (2007) analyze trade agreements of the US. They argue that it is important to control for geostrategic and political interests, since they play a significant role in determining the probability that a country will gain preferential access to the US market. They use different transportation cost variables as well as the instrumental variable to account for endogeneity of PTAs mentioned above. The instrumental variable they use is a function of various geostrategic interests of the US. Their results confirm their hypothesis that preferential access to US markets is highly influenced by non-economic factors.

In conclusion, it is apparent from the research done on the effect of trade agreements on international trade using the gravity model that trade agreements often have a positive effect on trade flows.

4. Data and Methodology

The next section presents an overview of the data that is used in the empirical analysis as well as the methods used to obtain results.

4.1 Data

I use a panel dataset to examine the effect of CAFTA on trade. Specifically, I utilize a strongly balanced panel dataset of 153 exporters and partners. Some of the countries were dropped from the sample due to an extremely limited amount of trade observations. Keeping in mind possible selection bias, the dropped countries were distributed quite randomly and had no importance for the trade relationships I examine. A full list of countries that are included in the dataset is available in Appendix 3. The time period is from 1995-2015, since it provides enough observations from before and after the trade agreement entering into force. Given the stated information, the total number of observations is 488 376. However, there are 178 765 missing trade observations, which is around 36%.

Since I decided to use a balanced dataset and created all possible country pair combinations, the amount of missing values is normal and expected since small countries (such as the small island nations in the Pacific) do not trade with a lot of partners and since trade flows are not always recorded. Keeping that in mind, I left these observations as missing and allowed them to be dropped from the regressions.

The following table presents the standard variables in the dataset and their respective sources:

Table 4. List of standard gravity model variables used in the model

Variable name	Description	Source
tradevalue	Aggregate exports in current USD	UNCOMTRADE (by the Grant Agency of the Czech Republic, grant no. GACR 402/16-02392S)

gdp_exporter/gdp_partner	GDPs of countries in current USD	World Bank WDI (n.d.)
dist	Distance between capital cities of two countries in kilometers	CEPII (n.d.)
contig	Dummy if countries share a common land border	CEPII (n.d.)
comlang_off	Dummy if countries share a common official language	CEPII (n.d.)
colony	Dummy if countries shared a colonial past	CEPII (n.d.)
comcol	Dummy if countries shared a colonizer	CEPII (n.d.)
landlockedex/landlockedpar	Dummies if exporter/partner does not have access to sea	CEPII (n.d.)
rta	Dummy is 1 if there is a regional trade agreement between country pair	International Economics Data and Programs (de Sousa, 2014)

Source: Author's table

4.2 Methodology

The following is an overview of the methodological aspects of gravity modelling used in this research. Therefore, it is fitting to start with Baldwin and Taglioni (2006) who identify three important mistakes that are commonly made in empirical research using the gravity model. The first one (gold medal) is not taking into account the microeconomic foundations of the theoretical gravity model by failing to approximate multilateral resistance terms. This mistake leads to biased results, because these omitted variables are correlated with trade cost terms. The second mistake (silver medal) is wrongly averaging bilateral trade flows. Since the theoretically based gravity model proposes using one direction trade, averaging exports and imports leads to

overestimation. The reason lies in the difference between taking the average of logs and logs of average. The third mistake (bronze medal) is inappropriately deflating trade values. Since there are global trends in inflation rates, deflating nominal trade values by the US aggregate price index can cause biased estimates due to spurious correlations. Even though these three mistakes are common, there are solutions for them as will be discussed in subsequent pages.

Another important issue arises when using the gravity model to analyze the effects of FTAs on trade and this is endogeneity of the trade policy variable. This issue is most notably addressed by Baier and Bergstrand (2007). They present three main sources of endogeneity bias of right-hand side variables' coefficient estimates: omitted variables, simultaneity and measurement error bias. The authors then provide a selection of panel methodologies to solve for endogeneity. The first argument they make is that using panel data is more appropriate for dealing with endogeneity than cross-section data. The second solution they provide is using fixed effects. Namely, they use country-pair effects to account for distance, common border and language and they use country-time effects to account for GDP and MRTs. The authors stress that country-pair effects deal with endogeneity by absorbing the unobservable links between endogenous trade policy variables and the error term. Thirdly, the authors introduce lagged effects of the implemented FTA on trade. This is motivated by the fact that full effects of FTAs come into economic effect later than they actually legally enter into force. This is due to phase-in effects which in this context means that tariffs are often gradually removed. Finally, the authors conclude that best estimates for the effects of FTAs on trade are obtained by using the theoretical gravity model, using panel data, and using country-pair effects. Larch et al. (2016) follow this argument and also recommend using country-pair dummies to account for FTA endogeneity.

When analyzing effects of FTAs on trade, it is also useful to look at how they affect intra-member trade versus trade with non-members. Jacob Viner first described the effects of trade liberalization in this context using the terms trade creation and trade diversion. In a hypothetical situation, countries A and B are members of a trade

agreement and country C is not. In this case trade creation means formation of new trade between countries A and B that did not occur prior to the FTA. On the other hand, trade diversion means replacing trade between country A and country C with trade between country A and country B (Magee, 2008). This simplified description provides the basic logic of these occurrences, which can be measured in the gravity model context.

A simple methodology to observe these effects is presented by Yang and Martinez-Zarzoso (2014). What is important to note is that the approach the authors take to measure trade creation and trade diversion is slightly different that the basic description from above. Namely, they propose creating three dummy variables. The first one equals unity if both countries are members of the FTA. A positive and statistically significant coefficient indicates pure trade creation. The second dummy equals unity if exporter is member of FTA and partner is not. A positive and statistically significant coefficient indicates export creation and a negative and statistically significant coefficient indicates export diversion. Finally, a third dummy equals unity if exporter is not a member of the FTA and partner is a member of the FTA. A positive and statistically significant coefficient indicates import creation while a negative and statistically significant coefficient indicates import diversion. Depending on the relative sizes of the coefficients, one can observe the effects of FTAs on member countries.

The main topic of this paper is the effects of CAFTA on exports. Therefore, I create the following dummy variables in order to measure the effect by interpreting the coefficients of these variables:

Table 5. List of CAFTA-specific variables

cafta	Dummy is 1 if trade is between members of CAFTA
cadr_cafta	Dummy is 1 when a CA-DR country is exporter and US is partner

usa_cafta	Dummy is 1 when USA is exporter and a CA-DR country is partner
cafta_exp	Dummy is 1 if exporter is CAFTA member and partner is not
cafta_imp	Dummy is 1 if exporter is not CAFTA member and partner is a CAFTA member

The different times of CAFTA's entry into force for different countries is taken into account. This is because CAFTA entered into force in 2006, except for Dominican Republic and Costa Rica, for which it entered into force in 2007 and 2009.

Keeping the choice of model as well as choice of variables in mind, the following is an expression of the foundational equation for empirical analysis of CAFTA:

$$\begin{aligned} logtradevalue = {} & \beta_1\, logGDP\_exporter + \beta_2\, logGDP\_partner + \beta_3\, logdist + \\ & \beta_4 contig + \beta_5 comlang\_off + \beta_6 colony + \beta_7 comcol + \beta_8 landlocked_i + \\ & \beta_9 landlocked_j + \beta_{10} rta + \beta_{11} cafta + \beta_{12} cafta\_exp + \beta_{13} cafta\_imp + \\ & \beta_{14} usa\_cafta + \beta_{15} cadr\_cafta + \beta_{16} D + \varepsilon_{ij} \end{aligned} \tag{4}$$

Note that β represents coefficients of variables explained above and D represents a set of dummy variables included to approximate MRTs. The model expressed here will be referred in subsequent pages as the main model. It stands in comparison to an alternative model presented after.

A correlation matrix was calculated in order to show the relationships between variables used in the main model. There is not a significantly high correlation between any of the variables which means all of them can be included in the model. For the correlation matrix, see Appendix 4.

The dependent variable is the trade value which is, in this case, exports. Independent variables GDPs and distance are included as a Newtonian foundation for the logics of

the gravity model. The expected signs for GDPs are positive, since basic trade theory says that the higher the GDP of a country, the more it will trade with others. The expected sign for distance is negative, since gravity model theory says that the bigger the distance between countries, the less trade they will have,as distance is a proxy for trade costs. Country-pair specific variable such as common border or common language are included as a standard set of gravity model variables, which have shown to have a big impact on bilateral trade. They are expected to have positive signs since cultural and historical similarities facilitate more trade due to lower trade costs. However, variables that represent whether a country is landlocked or not should have a negative sign, since trade theory says that countries that have access to sea will trade more, considering the advantages of maritime transport (Bacchetta, et al., 2012).

Trade policy variables are included with the understanding that a simple dummy method might not be adequate to fully capture the effects of RTAs. Nevertheless, the *rta* variable is included in order to control for effects of other RTAs on trade. The variable *cafta* is included to measure the effect of being a member CAFTA on trade. It is also used to measure trade creation. A positive sign is expected for this variable. Further, variables *cafta_exp* and *cafta_imp* are included following the methodology of Yang and Martinez-Zarzoso (2014)in order to measure trade creation or trade diversion of both exports and imports. Based on previous research, a positive sign for both variables is expected.

Most importantly, variables *cadr_cafta* and *usa_cafta* are used to measure the effect of being a member of CAFTA on exports of both the US and CA-DR region. Historical relations between these two actors have been close, and they already had trade liberalization policies between them prior to CAFTA. Therefore, the expected signs of *cadr_cafta* and *usa_cafta* variables are positive.

The expected results from the analysis leads to the research hypotheses as follows:

1) CAFTA increases exports of its members.
2) CAFTA increases exports from the US to the CA-DR region.
3) CAFTA increases exports from the CA-DR region to the US.

The first hypothesis will be tested with the *cafta* variable, the second hypothesis will be tested with the *usa_cafta* variable and the third hypothesis will be tested primarily with the *cadr_cafta* variable.

What is left tp further present is the specification and estimation techniques used to obtain results, which will be used to test the hypotheses.

One of the main issues in specifying a gravity model is how to include MRTs. Since MRTs are unobservable and cannot be measured like standard variables, they have to be approximated and one of the ways of approximating them (and taking care of the gold and bronze medal mistakes) is using dummy variables. It is important to note that there are other ways of approximating MRTs, such as using Taylor-series expansion as proposed by Baier and Bergstrand (2009) or constructing artificial variables as proposed by Anderson and Van Wincoop (2003). However, given the high prevalence of using the dummy approach in gravity model literature as well as the suitability of this method for analysis of trade policy variables, these alternative methods were not implemented.

That being said, Baldwin and Taglioni propose a method for panel data by creating a set of dummies to control for MRTs. They use:

- country dummies which are equal to unity whenever an exporter/partner appears in the data,
- time dummies which are equal to unity for every specific year,
- country-pair dummies which are unity every time trade is between a specific country pair and,

- country-time dummies which are unity whenever an exporter/partner appears in the data in a given year (Baldwin & Taglioni, 2006).

There are various approaches to using the above-mentioned method. Baldwin and Taglioni use various combinations of dummies: country-pair and time, country and time, time only, country-time and country-time and country-pair.

Using only country dummies is not enough to take into account unobservable effects, especially in a longer time period as in this analysis. Baldwin and Taglioni (2006) also state that country-pair dummies are superior to simple country ones. Therefore, country-pair dummies are more appropriate for this research. More specifically, the reason country-pair effects are important is because they deal with unobserved country-pair characteristics that affect trade. Even though standard gravity model variables such as dummies for common language or common colonizer capture some of the cultural and historical ties between countries, they cannot capture all of the effects. Essentially, country-pair dummies capture the effects of any kind of country-pair characteristic on trade, that is constant in time (Magee, 2008). Another important reason for including country-pair dummies is that they do not only account for MRTs, but also help to solve endogeneity of trade policy variables and, thus, are essential for this analysis.

The inclusion of dummies to account for the time dimension is also necessary. Simple time dummies are chosen in order to deflate nominal variables and take care for global trends. Inclusion of this set of dummies is almost universal across gravity model research (Baldwin & Taglioni, 2006).

To summarize, the main specification methods will include country-pair dummies, and time dummies. It is important to note that this approach is very prominent in gravity model literature (Baltagi, Egger , & Pfaffermayr, 2014; Gomez-Herrera, 2013).

The next step is estimating the equations. The two most common choices presented in gravity model literature exploring the effects of FTAs on trade are OLS and Pseudo-Poisson Maximum Likelihood estimator (PPML). There are other options such as the Hausman-Taylor estimator or the Heckman Sample Selection estimator, but they are

out of the scope of this paper. The first estimation method chosen is theOLS estimator which shows the connection between trade and the dependent variables by minimizing the sum of squared errors to provide a sort of lines of best fit. It has three important conditions under which it is statistically useful. First, the orthogonality assumption states that errors must have mean zero and cannot be correlated with any of the explanatory variables. Second, the homoscedasticity assumption states that errors must be independently drawn from a normal distribution with a given variance. Thirdly, the full rank assumption states that none of the explanatory variables can be a linear combination of other explanatory variables (Shepherd, 2013).

However, when using OLS it is important to decide which kind of estimation is performed regarding the presence of fixed or random effects. There is a simple way, presented by Park (2010), of deciding which estimation method to use. First, the F-test (Wald test) should be conducted in order to check for presence of fixed effects. Then a Breusch-Pagan Lagrange Multiplier test should be performed to check for presence of random effects. If the first test finds fixed effects and the second one finds random effects, a Hausman test should be performed in order to decide between the two. The difference between fixed and random effects is that fixed effects allow for correlation between the individual effect and the regressors, whereas random effects restricts the correlation to be zero. Further, random effects assumes that the unobserved component is distributed randomly, while fixed effects does not (Gomez-Herrera, 2013).

The choice between using fixed or random effects estimators was made using methodology presented above. The F test showed presence of fixed effects and the Breusch-Pagan Lagrange Multiplier test showed presence of random effects. When the Hausman test was performed, the chi squared value was negative. Even though this result could point to using fixed effects (Stata, 2011, p. 713), another test was performed while the output of the Hausman test is available in the Appendix 4. The alternative test is the test of overidentifying restriction performed using the -xtoverid- command in Stata. The results show presence of fixed effects. Therefore, the first estimations were performed using OLS fixed effects.

Test of Overidentifying Restriction: Fixed Effects versus Random Effects

Test of overidentifying restrictions: fixed vs random effects
Cross-section time-series model: xtreg re
Sargan-Hansen statistic 5140.074 Chi-sq (28) P-value = 0.0000

OLS was the most common estimator in gravity model research of FTAs until the advent of PPML. Santos Silva and Teneyro (2006) developed the PPML method which estimates the equation in a multiplicative form. They present results using OLS and PPML for comparison and they show that estimations based on the log-linearized versions of the gravity equation produce larger effects than using the PPML technique. The authors argue that this is due to the fact that, unlike OLS, PPML produced unbiased estimates in the presence of heteroskedasticity. A second advantage of PPML is that it can handle zeros trade flows. The dependent variable, which is usually trade value, is not in logarithm form in PPML, while in OLS the trade value is in logs. Therefore, OLS cannot handle zero trade flows, since the log of zero is not defined (Santos Silva & Tenreyro, 2006). Additional advantages of PPML are that, like OLS, it is relatively easy to implement, and the interpretation of coefficients is exactly the same as in OLS. Therefore, since PPML provides unbiased estimates in the presence of heteroskedasticity and it is appropriate for estimating policy impacts, it is chosen as the second estimator in this thesis (Shepherd, 2013). Importantly, the PPML models use fixed effects estimation as random effects are not appropriate in the PPML context (Santos Silva J. , 2017).

Therefore, all of the following models include country-pair fixed effects and are estimated with OLS and PPML. It is important to note that using country-pair fixed effects will not prevent the estimation of bilateral trade policies such as the effect of CAFTA on trade, since this variable is time-varying (Larch, Wanner, Yotov, & Zylkin, 2017). Since CAFTA entered into force in 2006 for most countries, the time span of analysis starts from 1995 to give enough observation before the trade policy was implemented. This enables the regression to give coefficients on effects of CAFTA

since there is enough variation within the country pairs and it not collinear with country-pair fixed effects.

Given the theory presented above, the following two equations express the main regressions used to obtain estimates of the effect of CAFTA on trade. All the regressions were performed using Stata 12 SE.

$$\begin{aligned} logtradevalue = {} & \beta_1\, logGDP\_exporter + \beta_2\, logGDP\_partner + \beta_3\, logdist + \\ & \beta_4 contig + \beta_5 comlang\_off + \beta_6 colony + \beta_7 comcol + \beta_8 landlocked_i + \\ & \beta_9 landlocked_j + \beta_{10} rta + \beta_{11} cafta + \beta_{12} cafta\_exp + \beta_{13} cafta\_imp + \\ & \beta_{14} usa\_cafta + \beta_{15} cadr\_cafta + \beta_{16} CP + \beta_{17} T + \varepsilon_{ij} \end{aligned} \tag{5}$$

This expression is the same as the equation 4, except that sets of dummy variables are defined as: CP which represents a set of country-pair dummies and T which represents a set of time dummies. This model is estimated using OLS.

$$\begin{aligned} tradevalue = {} & \beta_1\, logGDP\_exporter + \beta_2\, logGDP\_partner + \beta_3\, logdist + \\ & \beta_4 contig + \beta_5 comlang\_off + \beta_6 colony + \beta_7 comcol + \beta_8 landlocked_i + \\ & \beta_9 landlocked_j + \beta_{10} rta + \beta_{11} cafta + \beta_{12} cafta\_exp + \beta_{13} cafta\_imp + \\ & \beta_{14} usa\_cafta + \beta_{15} cadr\_cafta + \beta_{16} CP + \beta_{17} T + \varepsilon_{ij} \end{aligned} \tag{6}$$

This expression is the same as the equation 5, except for the dependent variable which is not in logs. The reason is because this model is estimated using PPML.

Further, the -robust- option in Stata was used in regressions to produce standard errors that are robust to arbitrary patterns of heteroskedasticity. Another option that was used in regressions is the -cluster- option which allows for correlation of the error terms within defined groups. In this case, clustering was done on the basis of country pairs as proposed by Shepherd (2013). Therefore, what is still left to present is the results of the estimations and subsequent interpretations.

5. Empirical results

The following chapter first presents results from the main model and then continues with results from an alternative model with different CAFTA variables.

5.1 Results from main model

This sub-chapter presents results obtained from regressions using the data and methodology that was described in the previous chapter. It is important to note in the beginning that since in both regressions country-pair fixed effects were used, none of the coefficients of the country-pair specific variables could be estimated. The general issue with the fixed effects model is that the variables that do not vary over time in each country are perfectly collinear with fixed effects and will be omitted. Therefore, variables that do not vary within the country-pair in time are collinear with the fixed effects dummies and are omitted. However, since the omitted variables are not the variables of interest for this research, their exclusion does not pose any problem.

Firstly, the coefficients of the GDP variables are around 0.6. The interpretation of these results goes as follows: the coefficient of GDP of exporter in the second regression is 0.667 which means that a one percent increase in GDP will increase trade between countries by around 0.67%, since the coefficients of continuous variables are interpreted as simple elasticities (Larch, Monteiro, Piermartini, & Yotov, 2016). Results for GDPs in both models are positive and statistically significant, as expected.

Table 6. Regression output of main model using regional CA-DR variable

	(1) OLS	(2) PPML
lgdp_exporter	0.610***	0.667***
	(0.0237)	(0.0291)
lgdp_partner	0.710***	0.611***
	(0.0207)	(0.0304)
rta	0.0727***	0.0607*
	(0.0209)	(0.0364)
cafta	0.322***	0.484***
	(0.0927)	(0.146)
cafta_exp	0.148***	-0.0756
	(0.0445)	(0.0519)
cafta_imp	-0.258***	-0.154**
	(0.0428)	(0.0662)
usa_cafta	-0.366***	-0.399***
	(0.107)	(0.140)
cadr_cafta	-0.574***	-0.748***
	(0.130)	(0.126)
Constant	-17.36***	-
	(0.745)	
Observations	307,778	306,705

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Regarding the *rta* variable, the coefficients are relatively low, but positive and significant. However, the interpretation of the effects of indicator variables, such as this one, is less straightforward. Coefficients of these variables need to be converted into elasticities using the simple expression: $\left[e^{\widehat{\beta}} - 1\right] x\ 100$. Hence, the interpretation of this RTA variable with a coefficient of 0.06, as in the second regression, is that being in a RTA increases trade by 6.18%. This effect is rather small, and a higher magnitude was expected. However, this variable is not the main variable of interest and is included as a control variable for trade agreements.

More important is the overall CAFTA variable, which is positive and significant in both regressions. For the model estimated with OLS, the coefficient shows that being in CAFTA, increases trade between members by 38%, which is much lower that the

model estimated by PPML, where the effect of CAFTA is a 62.25% increase in exports. However, both results are positive and substantial and, therefore, corroborate the first hypothesis that CAFTA does in fact increase trade between its members.

Since overall trade creation effects of CAFTA have been established, it is useful to look at trade creation or trade diversion on the export and import level. For interpretation of these variables, the approach of Yang and Martinez-Zarzoso (2014) is applied. The following table helps with easier interpretation:

Table 7. Interpretation of trade creation and trade diversion effects

	Export effects		Import effects	
	cafta_exp>0	*cafta_exp*<0	*cafta_imp*>0	*cafta_imp*<0
cafta>0	Pure trade creation of exports	If *cafta*>*cafta_exp* = trade creation & export diversion. If *cafta_exp*>*cafta* = export diversion	Pure trade creation of imports	If *cafta*>*cafta_imp* = trade creation & import diversion. If *cafta_imp*>*cafta* = import diversion
cafta<0	Expansion of extra-bloc exports	Export diversion & contraction of intra-bloc exports	Expansion of extra-bloc imports	Import diversion & contraction of intra-bloc imports

Source: (Yang & Martinez-Zarzoso, 2014)

The effect of CAFTA on export diversion or creation is established only using the model estimated with OLS since the one with PPML provides statistically insignificant results of the *cafta_exp* variable. Therefore, according to the first regression, CAFTA has the effect of pure trade creation of exports. This shows that new trade was created between members that did not exist prior to the FTA and was not a substitute of trade with other non-member partners. However, when it comes to effects on imports, the results from both regressions show import diversion. This means that lower-cost

imports from non-member countries are replaced by higher-cost imports from member countries.

When we observe the effects of CAFTA on exports of US to other CAFTA members, the results are rather surprising. In both regressions, the results are negative and highly statistically significant. The magnitude is very high, specifically in the model estimated with PPML, which shows a 49% decrease in US exports to members due to CAFTA. This result might indicate a negative impact of CAFTA on exports of certain product groups, which makes the aggregate effect of CAFTA negative. Further research using disaggregate data would be beneficial, however, this is out of the scope of this paper. The results force a disproval of the second hypothesis because these results do not show that CAFTA increases US exports to CA-DR, but rather the opposite effect.

When it comes to the impact of CAFTA on exports from CA-DR to the US, the results are even more surprising. In both regressions, the effect of CAFTA are highly statistically significant and negative. For example, in the model estimated with PPML, the coefficient shows a 111% decrease in exports of CA-DR to the US owing to CAFTA. This again might be due to a highly negative impact of CAFTA on exports of specific products from the region. Another reason might be that, since the CBI already significantly reduced tariffs on CA-DR exports to the US, the effect of CAFTA might be net negative due to effects of slow or inefficient consolidation of regulation, which can act as a significant trade barrier. Further, the effects of CAFTA might be highly negative for only some countries of the CA-DR region and positive for others. This is explored in the next sub-chapter. Nevertheless, the third hypothesis is also disproved, since there is no evidence of CAFTA increasing exports from CA-DR to the US, but quite the opposite.

In conclusion, the presented results point to a general trade creation effect of CAFTA, but to a negative impact on exports of the two main actors in this paper, the US and CA-DR region. This situation is rather unintuitive.

Therefore, additional regressions were run using lagged variables. Specifically, three variables: *cafta*, *usa_cafta* and *cadr_cafta* were all lagged by one and two years, following the methodology of Baier and Bergstrand (2007). However, the results were statistically insignificant for the most part. And when the effects were significant, they did not substantially differ from the results of estimated models that do not include the lags. Nevertheless, the output of this model is available in Appendix 5.

5.2 Results from model with individual CA-DR variables

The estimations from the main model have shown some surprising results, especially when it comes to the effects of CAFTA on exports of the US and the CA-DR region. That is why, it might be beneficial to look at the effect of CAFTA on exports of CA-DR countries individually.

Therefore, instead of the *cadr_cafta* variable, six new variables are included in the model that account for effects of CAFTA on exports to the US of each country of the CA-DR region. The newly added variables are presented in the following table:

Table 8. List of individual CA-DR country variables

Variable name	Variable explanation
cri_cafta	Dummy variable is 1 if Costa Rica is exporter and USA is partner
dom_cafta	Dummy variable is 1 if Dominican Republic is exporter and USA is partner
gtm_cafta	Dummy variable is 1 if Guatemala is exporter and USA is partner
hnd_cafta	Dummy variable is 1 if Honduras is exporter and USA is partner
nic_cafta	Dummy variable is 1 if Nicaragua is exporter and USA is partner

slv_cafta	Dummy variable is 1 if El Salvador is exporter and USA is partner

Therefore, the regression that were run are expressed by the following two equations:

$$logtradevalue = \beta_1\, logGDP\_exporter + \beta_2\, logGDP\_partner + \beta_3\, logdist + \beta_4 contig + \beta_5 comlang\_off + \beta_6 colony + \beta_7 comcol + \beta_8 landlocked_i + \beta_9 landlocked_j + \beta_{10} rta + \beta_{11} cafta + \beta_{12} cafta\_exp + \beta_{13} cafta\_imp + \beta_{14} usa\_cafta + \beta_{15} cri\_cafta + \beta_{16} dom\_cafta + \beta_{17} gtm\_cafta + \beta_{18} hnd\_cafta + \beta_{19} nic\_cafta + \beta_{20} slv\_cafta + \beta_{21} CP + \beta_{22} T + \varepsilon_{ij} \quad (7)$$

$$tradevalue = \beta_1\, logGDP\_exporter + \beta_2\, logGDP\_partner + \beta_3\, logdist + \beta_4 contig + \beta_5 comlang\_off + \beta_6 colony + \beta_7 comcol + \beta_8 landlocked_i + \beta_9 landlocked_j + \beta_{10} rta + \beta_{11} cafta + \beta_{12} cafta\_exp + \beta_{13} cafta\_imp + \beta_{14} usa\_cafta + \beta_{15} cri\_cafta + \beta_{16} dom\_cafta + \beta_{17} gtm\_cafta + \beta_{18} hnd\_cafta + \beta_{19} nic\_cafta + \beta_{20} slv\_cafta + \beta_{21} CP + \beta_{22} T + \varepsilon_{ij} \quad (8)$$

As in the previous model, both regressions could not estimate the coefficients of country-pair specific variables. When it comes to GDP variables and the RTA variable, the results are practically identical to the main models. However, the CAFTA variable shows the same signs and significance, but a different magnitude. In the model with individual CA-DR country variables, the overall effect of CAFTA is lower in both regressions. The coefficients of around 0.2 shows a 22% increase of trade between members due to CAFTA. Therefore, the results from this model also corroborate the first hypothesis that CAFTA has a positive impact on trade of its members.

The situation with trade diversion and creation variables is the same as in previous regressions. and also shows overall trade creation and import diversion.

Table 9. Regression output of model with individual CA-DR country variables

	(1) OLS	(2) PPML
lgdp_exporter	0.610***	0.668***
	(0.0237)	(0.0291)
lgdp_partner	0.710***	0.611***
	(0.0207)	(0.0304)
rta	0.0721***	0.0595
	(0.0209)	(0.0364)
cafta	0.265***	0.213**
	(0.0885)	(0.0962)
cafta_exp	0.148***	-0.0756
	(0.0445)	(0.0519)
cafta_imp	-0.259***	-0.154**
	(0.0428)	(0.0662)
usa_cafta	-0.307***	-0.127
	(0.104)	(0.0935)
cri_cafta	-0.659***	-0.439***
	(0.0706)	(0.0667)
dom_cafta	-0.358***	-0.520***
	(0.0702)	(0.0655)
gtm_cafta	0.249***	0.403***
	(0.0695)	(0.0632)
hnd_cafta	-0.193***	0.00227
	(0.0701)	(0.0649)
nic_cafta	0.508***	0.953***
	(0.0701)	(0.0649)
slv_cafta	1.193***	1.128***
	(0.0703)	(0.0653)
Constant	-17.37***	-
	(0.745)	
Observations	307,778	306,705

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

When it comes to impacts of CAFTA on exports of US to other members the result of the first regression is similar to the result from the main model, but the second regression gives a statistically insignificant result. However, the result in the first regression again forces a disproval of the second hypothesis.

Regarding the effect of CAFTA on exports of CA-DR countries to the US taken individually, the results vary across countries. For Costa Rica and Dominican Republic, the effect is highly significant and strongly negative. Since these two countries have by far the highest GDP per capita and the first and third highest GDP compared to other countries in the CA-DR region, this negative effect could possibly be explained by different trade structures due to higher standard of living and larger size of economy. Both of these countries also have a higher share of miscellaneous goods in their exports to the US and neither of these countries have a high share of textile exports, unlike the rest of the CA-DR. On the other hand, for Guatemala, Nicaragua and El Salvador the impact of CAFTA is significant and positive. All three of these countries are relatively smaller and have a high share of textiles in their exports to the US. However, in order to provide more answers, again, analysis using disaggregate data could be useful. Finally, for Honduras in the first regression, the effect of CAFTA is significant and negative and, in the second regression, the effect is insignificant. Interestingly, similar to Costa Rica and Dominican Republic, Honduras also does not have a high share of textiles in its' exports to the US.

In conclusion, the impact of CAFTA on exports is negative or insignificant for the US and Honduras, strongly negative for Costa Rica and Dominican Republic and positive for El Salvador, Guatemala, and Nicaragua. These mixed results mean the second and third hypothesis cannot be corroborated using these models.

6. Discussion

The official aim of FTAs is to increase and improve trade and there is a vast collection of empirical research literature that has explored whether this in fact happens or not. A large share of papers finds a positive effect of trade agreements on trade, but the conclusions are far from unanimous. Nevertheless, given the specific region and trade agreement that was analyzed in this paper, research started with the hypotheses that CAFTA does increase trade of its members.

Three hypotheses were presented. The first one was that CAFTA increases exports of member countries. The second one was that CAFTA increases exports from the US to the CA-DR region. The third one was that CAFTA increases exports in the opposite direction, from the CA-DR region to the US. Following empirical analysis, the first hypothesis wasconfirmed, but the other two could not be corroborated. The reasons for negative effects of CAFTA on US and CA-DR exports might lie in a number of issues. Firstly, even though this paper uses a well-approved method, there might be more appropriate methodology that could be used for this case, such as approximating MRTs using Taylor-series expansion as proposed by Baier and Bergstrand (2009) or by using different estimators. A different approach might capture more effects of this FTA. Secondly, maybe the effect of CAFTA on exports is in fact negative and the research methodology is appropriate. A possible reason might be that CA-DR region and the US have asymmetric economies and political systems and thus trade policy consolidation might prove a significant trade cost in the short run. However, since the agreement has been in force in most countries for 11 years already, this is unlikely to explain the full negative effect of the FTA. Therefore, disaggregating data might show some answers of why the effect of CAFTA is negative on exports of these two actors. Maybe one product group was affected very negatively, and thus aggregate data also shows this sign. Finally, another reason for the negative effect of CAFTA might also be due to the used data. Since the dependent variable in the models is value of exports of goods, some significant international flows such as trade in services and FDI flows are not included. Given that some ex-ante analysis of CAFTA predicted that majority of gains

will be in exactly these areas, omitting them might show a negative sign on trade in goods, but in reality, the net effect of CAFTA could be positive on international exchange. However, since the topic of this paper is analyzing the impact of CAFTA on only exports, further research could focus on using different dependent variables.

Keeping that in mind, when variables for individual CA-DR countries were included instead of the regional variable, the results changed. They showed that the impact of CAFTA on exports is negative or insignificant for the US and Honduras, strongly negative for Costa Rica and Dominican Republic and positive for El Salvador, Guatemala, and Nicaragua. Therefore, future research could focus on using more detailed methods, such as different types of trade as well as different model specifications, to capture a fuller range of effects of FTAs.

However, the importance of studying trade agreement goes beyond pure economic impacts. Trade agreements can have significant effects on international relations. According to Dieter (2014) geopolitics is a major factor in international trade and countries have started to pursue RTAs not only for trade liberalization motives, but also for geopolitical reasons. Rosen (2004) goes into more detail, arguing on the case of US trade agreements with Israel and Jordan, that when the US signs trade agreements with small countries, its foreign policy goals are more important than economic ones. Rosen sees this as a strong indication that, for the US, some FTAs are foreign policy tools and not used exclusively for trade liberalization. Finally, Flores Macias and Kreps (2013) argue that increased trade produces convergence in foreign policy. They follow ideas of Keohane and Nye, when they argue that weaker states want to prevent conflict with stronger states that they trade with in order to not disturb trade relations. Therefore, they accommodate stronger states on foreign policy issues, since they have less bargaining power due to trade dependency.

Keeping that in mind, it is important to acknowledge that the US certainly has interest in keeping influence in the CA-DR region. Lowenthal (2010) identifies that military security and political solidarity with the region are not as important now as they were in previous decades. But he maintains that economic advantages of the region are still

important, especially when it comes to significant investment opportunities. The author also argues that the importance of CA-DR to US also lies in necessary cooperation between the two regions to solve environmental problems, issues with narcotics and organized crime, and food security. Nevertheless, the US is not the only super-power that is interested in the region.

Chinese president Xi Jinping declared in 2015 an ambitious goal for trade in Latin America and Caribbean region. The aim is to increase trade volume to $500 billion and direct investment to $250 billion until 2019 (Dollar, 2017). This is a clear indication of increased Chinese interest in the region. In line with this argument, Piconne (2016) reasons that China wants to reform the international order so that it reflects its economic weight. He posits that if Chinese influence in Latin America increases, this will inevitably reduce the influence of the US in the region. This argument is supported by research from Flores Macias and Kreps (2013), who show that countries trading heavily with China will more likely side with it on some foreign policy issues. Since China, unlike the US and European nations, has no historical animosities with countries in the region, the pure link between trade and foreign policy can more easily be emphasized. This also provides China with the opportunity to focus on investing in the region without dealing with various foreign relations issues connected to a complicated past.

Therefore, since the US has interests in the CA-DR region which might be threatened by Chinese penetration into this market, an FTA between the US and CA-DR can serve non-trade-related goals and be of great foreign policy importance for the US. However, despite this importance of trade agreements, president of the US Donald Trump has brought the existence of US trade agreements into question. He has been very vocal about his disapproval of the North Atlantic Free Trade Agreement (NAFTA) and the possibility that the US might drop out of it (Helmore, 2017). This is puzzling, not only considering the aforementioned foreign policy implications, but also since the economic effects of NAFTA have been very positive for the US, according to trade research (Cardamone, 2007). When it comes to CAFTA, there are reports that president Trump has vowed, during this presidential campaign, to drop out of this trade

agreement as well (Wilkinson & Hennigan , 2016). This information, albeit circumstantial, is consistent with the foreign policy approach of the current US president.

In conclusion, the non-trade importance of CAFTA is arguably quite significant. And the fact that its future is not secure makes research on this topic even more relevant. Furthermore, research could focus on a multidisciplinary approach to analyze a wide range of effects of FTAs and CAFTA in particular, since trade agreements are tools of both international trade and international relations.

7. Conclusion

International trade is an important aspect of global dynamics and trade agreements present a crucial aspect of integration and liberalization of trade flows across the world. CAFTA is one of those important trade agreements. Since empirical literature on CAFTA is very limited, a goal of this paper was to contribute to the research base with a better understanding of the trade effects of this FTA. Therefore, the gravity model was deemed most appropriate for this subject matter. Panel data was used that consisted of 153 exporter and partner countries over a period of 21 years. Theoretical foundations of the model were accounted for using country-pair and time fixed effects and the estimations were done using OLS and PPML. Results from regressions showed that CAFTA increased trade of its members. However, when the effects were analyzed for exports of the US and the CA-DR region separately, the results showed a negative impact of this FTA on exports of these two main actors. Further, when the effects of the trade agreement were disaggregated on individual exports of CA-DR countries, the results were mixed. Therefore, the effect of CAFTA cannot be confirmed with precision. However, the research does show a positive tendency of effects of CAFTA on trade. Results have also shown that this trade agreement produces overall trade creation and import diversion effects.

A relatively straight-forward approach was taken in this thesis, with a clear wish to observe the changes of aggregate exports of goods due to CAFTA. However, further research could focus on disaggregate exports as well as FDI flows and trade in services. Nevertheless, the results from this thesis can provide some arguments that CAFTA increases trade between its members. Since economic theory assumes that increased trade can produce welfare gains for domestic populations, CAFTA can be seen as a trade policy instrument with a positive impact on wellbeing of populations, especially those of poorer countries of the CA-DR region. On the other hand, given the relatively small economic significance of the CA-DR region on overall trade of the US, the trade agreement can provide some non-economic benefits to the US, mostly in increasing its influence in the region. However, future studies using alternative quantitative and

qualitative approaches can offer some new explanations on the effects of this FTA. Given the ever-changing economic and political landscapes in the world, understanding the effects of major trade agreements can not only explain trade relations but also provide a basis for further study of international economic and political relations.

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Appendices

Appendix 1.

The following tables 1.-6. are constructed using World Bank's database World Integrated Trade Solution (WITS). The data is for 2015, except for Honduras and Nicaragua exports for which last available data is from 2014. All trade amounts are represented in $US thousands and shares represent percentage of a product group in total exports. Product group classification is on a sectoral basis, broadly based on the Harmonized System (World Bank, n.d.).

Table 1. Trade structure between US and Costa Rica

		Top Product Groups				
		1	2	3	4	5
US exports to Costa Rica		*Machinery and Electrical*	*Fuels*	*Miscellaneous*	*Plastic or Rubber*	*Vegetable Products*
	Amount	1 453 089	1 334 003	1 055 805	502 826	357 919
	Share (%)	23,63	21,69	17,17	8,18	5,82
Costa Rica exports to US		*Miscellaneous*	*Vegetable Products*	*Machinery and Electrical*	*Plastic or Rubber*	*Food Products*
	Amount	1 621 759	1 163 483	324 375	248 046	189 315
	Share (%)	41,54	29,80	8,31	6,35	4,85

Table 2. Trade structure between US and Dominican Republic

		Top Product Groups				
		1	2	3	4	5
US exports to Dominican Republic		*Machinery and Electrical*	*Fuels*	*Miscellaneous*	*Textiles and Clothing*	*Food Products*
	Amount	1 156 539	1 120 954	798 213	629 031	585 465
	Share (%)	16,21	15,71	11,19	8,82	8,21
Dominican Republic exports to US		*Food Products*	*Miscellaneous*	*Textiles and Clothing*	*Machinery and Electrical*	*Stone and Glass*
	Amount	933 084	920 713	659 047	579 020	459 488
	Share (%)	20,76	20,48	14,66	12,88	10,22

Table 3. Trade structure between US and El Salvador

		Top Product Groups				
		1	2	3	4	5
US exports to El Salvador		*Miscellaneous*	*Fuel*	*Textiles and Clothing*	*Machinery and Electrical*	*Vegetable Products*
	Amount	613 955	568 217	537 638	449 513	215 555
	Share (%)	18,91	17,50	16,56	13,85	6,64
El Salvador exports to US		*Textiles and Clothing*	*Machinery and Electrical*	*Food Products*	*Vegetable Products*	*Stone and Glass*
	Amount	1 979 016	202 795	135 461	98 364	32 768
	Share (%)	76,69	7,86	5,25	3,81	1,27

Table 4. Trade structure between US and Guatemala

		Top Product Groups				
		1	2	3	4	5
US exports to Guatemala		*Fuels*	*Machinery and Electrical*	*Miscellaneous*	*Vegetable Products*	*Textiles and Clothing*
	Amount	1 585 827	860 546	696 658	464 432	378 423
	Share (%)	27,04	14,68	11,88	7,92	6,45
Guatemala exports to US		*Vegetable Products*	*Textiles and Clothing*	*Minerals*	*Food Products*	*Fuels*
	Amount	1 417 918	1 238 082	393 791	271 385	117 113
	Share (%)	37,96	33,15	8,13	7,27	3,14

Table 5. Trade structure between US and Honduras

		Top Product Groups				
		1	2	3	4	5
US exports to Honduras		*Textiles and Clothing*	*Fuels*	*Machinery and Electrical*	*Miscellaneous*	*Vegetable Products*
	Amount	1 529 288	1 138 060	687 714	530 321	265 484
	Share (%)	29,19	21,73	13,32	10,12	5,07
Honduras exports to US		*Machinery and Electrical*	*Vegetable Products*	*Animal and Animal Products*	*Stone and Glass*	*Wood and Wood Products*
	Amount	565 785	483 361	189 457	181 594	180 270
	Share (%)	28,20	24,09	9,44	9,05	8,98

Table 6. Trade structure between US and Nicaragua

		Top Product Groups				
		1	2	3	4	5
US exports to Nicaragua		*Machinery and Electrical*	*Textiles and Clothing*	*Miscellaneous*	*Food Products*	*Vegetable Products*
	Amount	267 818	247 596	215 177	94 988	87 485
	Share (%)	21,31	19,71	17,12	7,56	6,96
Nicaragua exports to US		*Textiles and Clothing*	*Animal and Animal Products*	*Vegetable Products*	*Stone and Glass*	*Food Products*
	Amount	1 289 225	351 853	259 132	195 554	191 631
	Share (%)	53,59	14,63	10,77	8,17	7,97

Source: (World Bank, n.d.)

Appendix 2.

List of countries:

Albania
Algeria
Andorra
Argentina
Armenia
Australia
Austria
Bahamas
Bahrain
Bangladesh
Barbados
Belarus
Belgium
Belize
Benin
Bolivia
Bosnia and Herzegovina
Botswana
Brazil
Brunei
Bulgaria
Burkina Faso
Cambodia
Cameroon
Canada
Cape Verde
Chile
China
Colombia
Costa Rica
Cote d'Ivoire
Croatia
Cuba
Cyprus
Czech Republic
Denmark
Djibouti
Dominica
Dominican Republic
Ecuador
Egypt
El Salvador
Eritrea
Estonia
Ethiopia
Finland
France
Gabon
Gambia
Georgia
Germany
Ghana
Greece
Grenada
Guatemala
Guinea
Guinea-Bissau
Guyana
Honduras
Hong Kong
Hungary
Iceland
India
Indonesia
Iran
Ireland
Israel
Italy
Jamaica
Japan
Jordan
Kazakhstan
Kenya
Kuwait
Latvia
Lebanon
Lithuania
Luxembourg
Macau
Macedonia
Madagascar
Malawi
Malaysia
Maldives
Mali
Malta
Mauritania
Mauritius
Mexico
Morocco
Mozambique
Namibia
Nepal
Netherlands
New Zealand
Nicaragua
Niger
Nigeria
Norway
Oman
Pakistan
Palau
Palestine
Panama
Papua New Guinea
Paraguay
Peru
Philippines
Poland
Portugal
Qatar
Romania
Russia
Rwanda
Saint Lucia
Saint Vincent and the Grenadines
Samoa
Saudi Arabia
Senegal
Seychelles
Sierra Leone
Singapore
Slovak Republic
Slovenia
South Africa
South Korea
Spain
Sri Lanka
Sudan
Suriname
Swaziland
Sweden
Switzerland
Syria
Tanzania
Thailand
Togo
Tonga
Trinidad and Tobago
Tunisia
Turkey
Turkmenistan
Uganda
Ukraine
United Arab Emirates
United Kingdom
United States
Uruguay
Venezuela
Vietnam
Yemen
Zambia
Zimbabwe

Appendix 3.

Table 1. Correlation matrix for main model

	ltradevalue	lgdp_exporter	lgdp_partner	ldist	contig	comlang_off	colony	comcol	landlockedex	landlockedpar	rta	cafta	cafta_exp	cafta_imp	cadr_cafta	usa_cafta
ltradevalue	1															
lgdp_exporter	0.5529	1														
lgdp_partner	0.3969	-0.1281	1													
ldist	-0.2354	0.101	0.0318	1												
contig	0.1749	-0.0086	0.0178	-0.3796	1											
comlang_off	0.0086	-0.1191	-0.1037	-0.1423	0.1352	1										
colony	0.1369	0.0693	0.0619	-0.049	0.093	0.1745	1									
comcol	-0.0966	-0.1884	-0.1625	-0.1205	0.0752	0.3412	-0.0436	1								
landlockedex	-0.1081	-0.1849	0.0353	-0.0748	0.0427	0.0139	-0.023	-0.0007	1							
landlockedpar	-0.0972	0.0488	-0.1488	-0.0698	0.0414	0.0085	-0.0215	-0.0015	0.002	1						
rta	0.2553	0.0207	0.076	-0.5264	0.2285	0.1168	0.0393	0.0515	0.0251	0.0166	1					
cafta	0.0375	0.0004	0.0053	-0.0644	0.046	0.0508	-0.0047	-0.0107	-0.0138	-0.0137	0.0749	1				
cafta_exp	-0.0052	0.0318	0.0371	0.0457	-0.0061	0.0236	-0.0049	-0.0479	-0.0618	-0.0065	-0.0031	0.2228	1			
cafta_imp	0.0205	0.0283	0.0475	0.0492	-0.005	0.022	-0.0046	-0.0467	-0.006	-0.0599	0.0023	0.2286	0.0304	1		
cadr_cafta	0.0248	-0.0127	0.0442	-0.0104	-0.0029	-0.0076	-0.0025	-0.0056	-0.0072	-0.0071	0.0173	0.2844	0.0622	0.0639	1	
usa_cafta	0.0231	0.0355	-0.0037	-0.0082	-0.0022	-0.0058	-0.0019	-0.0042	-0.0054	-0.0054	0.0292	0.3959	0.0882	0.0905	-0.0002	1

Appendix 4.

Table 1. Hausman Test output

	---- Coefficients ----			
	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
lgdp_exporter	.6095977	1.161604	-.5520066	.0098461
lgdp_partner	.7100968	.8300423	-.1199455	.009731
rta	.072739	.1904685	-.1177295	.0028803
cafta	.3223256	.3193663	.0029593	.0073425
cafta_exp	.1484633	.1915442	-.0430809	.0044363
cafta_imp	-.2584837	-.2074715	-.0510122	.0039628
usa_cafta	-.3658397	-.2583731	-.1074666	.0144474
cadr_cafta	-.5742586	-.1932479	-.3810108	.1893007

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(27) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= -958.23 chi2<0 ==> model fitted on these data fails to meet the asymptotic assumptions of the Hausman test; see suest for a generalized test

Appendix 5.

Table 1. Regression output of model with lagged variables

	(1) OLS	(2) PPML
lgdp_exporter	0.610***	0.667***
	(0.0237)	(0.0291)
lgdp_partner	0.710***	0.611***
	(0.0207)	(0.0304)
rta	0.0728***	0.0606*
	(0.0209)	(0.0364)
cafta	0.0915	0.267
	(0.111)	(0.176)
L1cafta	0.273***	0.164
	(0.0930)	(0.117)
L2cafta	-0.0103	0.0889
	(0.0569)	(0.0741)
cafta_exp	0.148***	-0.0756
	(0.0445)	(0.0519)
cafta_imp	-0.258***	-0.154**
	(0.0428)	(0.0662)
usa_cafta	-0.0598	-0.202
	(0.117)	(0.169)
L1usa_cafta	-0.272***	-0.154
	(0.0987)	(0.123)
L2usa_cafta	-0.0875	-0.0757
	(0.0652)	(0.0790)
cadr_cafta	-0.589***	-0.575***
	(0.184)	(0.194)
L1cadr_cafta	0.105	-0.142
	(0.186)	(0.133)
L2cadr_cafta	-0.102	-0.0590
	(0.189)	(0.104)
Constant	-17.36***	-
	(0.745)	
Observations	307,778	306,705

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1