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International Trade analysis of lifting Cuba’s Trade Embargo: New dynamics in the Caribbean Container Services

By

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Abstract

After the announcement of the US department of state about the re-establishment of US and Cuba diplomatic relations this year and looking at the US policy makers reducing trade barriers, the world has the eyes on the Caribbean, waiting for something to happen. The trade embargo against Cuba is formed by several acts and resolutions established by the US government after Fidel Castro took power, early 1960’s. It constitutes a trade restriction that disables any non-US company to make deals with Cuba. It is clear that the International Trade picture through the Caribbean is somewhat biased due to Embargo. A repeal of the Embargo will dramatically change maritime container transit through the Container Shipping lines. In this research, the analysis has been focused on the potential trade creation and trade diversion effect of lifting The Cuban Democracy Act, representing Cuba’s trade Embargo, within the Caribbean container services and how this can be translated into benefits for the shipping lines. This study aims to measure the impact of lifting the Cuban Democracy Act against Cuba on maritime container trade and how this can be translated in potential benefits for shipping lines in the Caribbean. The gravity model has been used to capture the real effect that the Embargo has in Cuba’s containerized trade and its trade partners. It has been estimated sanctions coefficient by using the PPML estimator, proven that sanctions dramatically reduce trade flows from and to Cuba, not only from and to the US, but also to other Cuba’s trade partners. Then, it has been gathered the fixed effects of sanctions in order to estimate the relevant effect in volume and direction of trade. The GSIM model served to prove that an extraordinary increase in bilateral trade output between Cuba and the US will occur. Then, it was proven that changes in trade patterns containerized flows will happen after lifting sanctions. China, Spain and Mexico are the countries that will reduce trade the most with Cuba, leaving the US capture the largest trade volumes. It was found a substantial bilateral trade increase between the US and Cuba. In addition, it was found that Dominican Republic, Trinidad and Tobago and Jamaica will exhibit the largest changes in trade routes with regards to the Caribbean. Accordingly, decisions about freight rate, ship types and service capacity can be taken. Further, Barbados and The Bahamas will experience changes in trade direction, but in a lower scale. Therefore, the clear picture given by the findings, can lead to better containership fleet utilization by re-allocating current fleet and improving scheduling. With the results, it is also acknowledgeable that freight rates along the Caribbean region might improve due to the increase in trade, which adding it up to the improvements in operational optimization, it can be translated in to benefits for the shipping lines trading in the Caribbean. Apprehensible we can expect that, after sanctions are lifted, the world will see new changes and dynamics in the Caribbean container services.
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List of Abbreviations

AEDP - Antiterrorism and effective Death Penalty Act
AVE – Ad Valorem Equivalent
CDA – Cuban Democracy Act
CGE – Computable General Equilibrium
CIA – Central Intelligence Agency
CMEA – Council for Mutual Economic Assistance
EEA - European Economic Area
EFTA – European Free Trade Area
EU – European Union
FEU – Forty-foot Equivalent Unit
GDP – Gross Domestic Product
GTAP – Global Trade Analysis Project
MAOTRI - Market Access Overall Trade Restrictiveness Index
NTB – Non-Tariff Barriers
OLS – Ordinary Least Square
PPML – Poisson Pseudo Maximum Likelihood
ROW – Rest of World
RQ – Main Research Question
SITC – Standard International Trade Classification
SQ – Sub Research Question
TCE – Trade Cost Equivalent
TEU – Twenty-foot Equivalent Unit
TSR& EEA - Trade sanctions reform and Export Enhancement Act
UN – United Nations
US – United States of America
USD – United States Dollar
USSR – Union of Soviet Socialist Republics
WITS – World Integrated Trade Solution
WTO – World Trade Organization
1. Introduction

The current trade Embargo from US authorities into Cuban territory restricts any US citizen, governmental institution or company that have any relation with Cuba or Cuban nationals. The restriction reduces the potential trade that Cuban economy could establish between US and US Territories. The distortions caused by the Embargo changes the dynamics in the Caribbean container lines. For instance, services between Puerto Rico and US virgins cannot be performed due to these Non-Tariff Barriers, which are typically an inefficient mechanism to achieve political objectives.

On the year 1992, the Cuban Democracy Act (CDA) was issued, whose main sections established restrictions for motor vessels that have called Cuban port, to forbid calling American ports. From that moment on, major US trade partner such as Japan, Israel, Germany, UK, The Bahamas, Barbados, Dominican Republic and Norway were forced to apply trade restrictions against Cuba's seaborne trade. Instead, other countries like Mexico, Trinidad and Tobago, Venezuela and so forth, have been capturing part of the diverted trade from other countries to Cuba (TIES, 2013).

After some discussions, President Obama announces easing regulations for trading with Cuba, which were not dropped completely, but entitles to think that more is on the way (UST, 2015). The Cuban economy has a relevant potential in the Caribbean. Cuba is the largest Caribbean island, the most populated and the second island in terms of GDP (CIA, 2016). Just like China after the liberalization, Cuba might become a milestone opportunity to accelerate the economic growth in the Caribbean. Together with the expansion of the Panama Canal, Cuban international opportunities can be extremely profitable to the entire shipping lines trading in the Caribbean, more over if is considered as a gateway for EU and US liner services.

New international investments are taking place in Mariel Container Terminal, few kilometres away from Havana (Labrut, 2015). The feeder service logistics, feeder hubs and freight rates in the Caribbean might have an outstanding turn, changing all current trend on cargo allocation. In terms of international trade, it might have a significant impact in trade flows and in the welfare of the Caribbean economy.

This research enables the opportunity to study potential outcomes solely in terms of trade creation and trade diversion of lifting the Trade Embargo against Cuba. In addition, it tries to explain how the outcome can be translated into future opportunities for the container shipping lines when cargo volume increases and when changes actual direction. As mentioned in an article in the journal Trade Winds on 2015, “Better US-Cuba relations generate hope of more future trade links" for the maritime industry (Stamford, 2015).

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1 Calling a port is a shipping term used to indicate that the port is on schedule for loading/discharging operations (Stopford, 2009).
1.1.  **Problem Statement**

The trade Embargo against Cuba is formed by several acts and resolutions established by US policy makers after Fidel Castro took power, early 1960’s. The Cuban Democracy Act is a specific international sanction that was established by the US congress in 1992 against the Cuban Government. It consists in a trade Embargo that disables any non-US company to make deals with Cuba. The Sanction also applies to non-US companies that trade with Cuba and the US. Meaning that, this sanction has the same jurisdiction also among US trade partners.

There are countries, such as Germany, Norway and other partner previously mentioned that are following the act, limiting their trade with Cuba or penalizing companies that encounter trade with Cuba. Also Puerto Rico, the Virgin Islands, The Bahamas and the Leeward Island have significantly decreased trade with Cuba due to economic sanctions imposed by the US policy makers. Nevertheless, countries like Venezuela, China and even some countries of the European Union (EU) have still some trade ties with the Caribbean country. In the case of the EU, however, some companies were banned to trade with the US because they were having trade relationship with Cuba. Countries with similar size, economic development and cultural boundaries, such as Dominican Republic and Jamaica are having 8 to 10 times the amount that Cuba has of container traffic per year.

We clearly see that the International Trade picture through the Caribbean is somewhat biased on the Cuban Democracy Act in place since 1992. Not having similar trade restriction in nowadays container transit in the Caribbean might change the way Container Shipping lines look at the region. We estimate the impact of lifting this Act in today’s container services in the Caribbean.

1.2.  **Research Question (RQ)**

What would be the impact of lifting the Cuban Democracy Act against Cuba on maritime container trade and how can this be translated in potential benefits for shipping lines in the Caribbean?

Cuban Democracy Act is one of the major trade barriers that disables US and other countries to trade freely with Cuba, as mentioned above. With this RQ we focus our scope on the effect of lifting this act into potential changes in trade flows. As a result of changes in trade flows, we can estimate the benefits for shipping lines to acknowledge trade direction and trade creation from the repeal of this trade barrier.
1.3. **Sub Research Questions (SQ)**

1. **What is the current geopolitical and trade situation and which are the implications of the Cuban Democracy Act against Cuba on the Container Services?**

   This question helps to describe the regulatory situation imposed against Cuba and settles the bases and starting point of the research and for the literature review. The initial situation drives us to determine the possible outcomes that the lifting of the embargo may lead to. In addition, it helps us to evaluate the theoretical background describing the impact of sanctions in trade developments.

2. **What is the trade creation effect of lifting Cuban Democracy Act on actual container trade flows in the Caribbean?**

   With regards to this question, we try to estimate the changes in volume, or so-called output, that can be obtain after the lifting of the Cuban Democracy Act. After lifting or easing trade restrictions, trade tends to increase to where was previously restricted (Van Marrewijk, 2012).

3. **What is the trade diversion effect of lifting Cuban Democracy Act on actual container trade flows in the Caribbean?**

   After the repeal of a trade barrier between countries, trade tends to divert from the initial situation. Now that trade has become much easier between 2 countries, the trade from other countries that were less restricted in the initial situation now may become more restricted compared with the new scenario without sanctions. In the new scenario where the trade restriction is lifted, new trade lanes and traffic may arise, changing completely the trade in the Caribbean (Van Marrewijk, 2012).

4. **How changes in trade flows can be translated into potential benefits for the shipping lines?**

   This question allows drawing conclusions and recommendations related to changes in trade flows of containers in the Caribbean. Knowing the direction and the new volumes of container traffic, shipping lines are able to perform strategic planning regarding number of ships required in the Caribbean and operational scheduling. In addition, container-shipping companies are able to estimate, with the changes in supply and demand for container, how freight rates per container will fluctuate in the Caribbean services. Also in term of fleet composition trade in the region and the allocation of hubs if drastic changes occur (Stopford, 2009).
1.4. **Research Objectives**

The research tries to measure the potential impacts of a lifting Cuba’s Embargo into the international trade flows of containerized cargo in the Caribbean. By reducing trade barriers such as the Cuban Democracy Act, we focus on the effect that such reduction will have in the movement of cargo and in the increase on trade between Cuba and Cuba’s trade partners.

As first glance, we look at describing the current geopolitical and economic situation between Cuba and US; in order to achieve a framework on our initial scenario where sanctions are in place. In addition, we state a theoretical assessment on how changing sanctions have affected trade and what might be the result of lifting sanctions.

In a later stage, we have as an objective to estimate the effect of sanctions on trade, to later estimate the container trade creation effect of lifting sanctions. Using the methodological approach, we measure the impact on changes in volume traded between Cuba and its trade partners after the lifting in accordance with the theoretical approach. Meaning, we will establish a scenario of which sanctions were never imposed. Additionally, our objective is to estimate the changes in container trade direction after the lifting of the sanctions, which will all come together with our methodology.

Lastly, we aim to assess the output obtained from changes in trade flows and translated into recommendations for shipping lines to analyse the changes that might occur in freight rates due to the increase in trade, for example. Also with regards on fleet composition trading in the Caribbean, due to an increase in trade. Diversion effect may lead to re-evaluating routing and schedules of shipping lines.

**Main Objectives Summary:**

- **RQ:** Measure the potential Impact of lifting Trade Embargo on container trade flows along the Caribbean region.
- **SQ1:** Describe Cuba’s Initial Situation with Embargo in place, which builds a framework for expectations on potential changes in trade flows.
- **SQ2:** Measure Trade creation effect of lifting Trade Embargo through the methodological approach.
- **SQ3:** Measure Trade Diversion effect of lifting Trade Embargo through the methodological approach.
- **SQ4:** Assess results obtained from the methodological approach and translate does results in recommendations to shipping lines based on changes in trade flows.

1.5. **Thesis Structure and Design**

Starts by drafting the introduction that’s highlights the main features to be consider from the main research question as it can be seen in figure 1. Then, it follows a general introduction about the current geopolitical situation in Cuba and how the situation links to the theoretical background and the possible future situation. Furthermore, we assess
debates on sanctions effect on trade and suitable models that previous researches have used in similar studies. Using the outcome of the literature overview and review we construct a methodology that can answer sub-research question 1 and 2. The gravity model captures the fixed effect that sanctions has on trade. Then, the fixed effect of the sanctions is used as input for the Global Simulation Model (GSIM) to calculate the trade diversion and trade creation effect. Changes in volumes links to freight rate changes and changes in direction links to fleet capacity utilization and scheduling. Lastly, we analyse the results in order to give draft conclusions and some possible recommendations to the container shipping lines.

Figure 1 – Thesis structure and approach
Source: Author.
2. **Current Economic and Geopolitical background between Cuba and US**

Assessing trade flows and future scenarios of lifting sanctions is a complex task. In order to understand the relationship and possible outcome of a potential lifting it is relevant to be aware of the history between Cuba and the US, whose links started more than 100 years ago, been both countries part of the same State. Furthermore, it is relevant to evaluate the significance of the Embargo, implications and effect into trade between Cuba and the rest of the world.

In this chapter we start looking at the history before and after the Embargo, which give us an idea of the present and possible future situation between Cuba and the US. We also state the history of the embargo, together with the performance of the Cuban economy. Thereafter, it is mentioned the relevant statues in place and significance of the Cuban Democracy Act. Lastly, it is explained the actual situation in terms of politics and the performance of Cuba’s container trade to give the reader an idea of how trade could change after lifting the sanctions.

### 2.1. The years before the revolution

#### 2.1.1. Political situation

The relationship between Cuba and the United States of America (US) started after 1898 when the US declares war to Spain, which later defeats and claims Cuba as part of US territory. Thereafter, Cuba and the US established an intense diplomatic political and commercial relationship. In 1902 Cuba gets independency, but with still some US political intervention. Subsequently, Cuban president Jose Miguel Gomez takes office after hazy elections helped by the US in 1909, officially ending with the occupation (BBC, 2012).


According to Johnson (1964), in 1959 the US investments in Cuba were the second largest in any Latin American country. Excluding Venezuela, the investment per capita were 3 times larger than the rest of the Latin American countries all combined. In 1959, the US direct investment per capita were USD 143, whereas the rest of Latin American countries (excluding Venezuela) were USD 39 per capita. At that time, there was no doubt US and Cuba were linked together by economic and political ties.

As from 1960 the rough debates between US and Cuba started to grow tremendously. Castro’s attitude and political tendency drove political stability to worsen. Cuba’s government empowered labour unions to strike against the capitalist “aggressor” (Johnson, 1964). That same year, President Dwight Eisenhower established Import quotas for sugar producers in Cuba and imposes hard sanctions against the Cuban government after Castro’s nationalizes all American banks and businesses running in
Cuba at that time (CFR, 2016). The year 1960 was registered as the first attempt from the US government to pressure political change in Cuba.

The cold war enhanced the concern around Cuba. The iron curtain\(^2\) was no longer far in the east. Since 1960, the CIA was training a group of Cuban Exiles in US territory to prepare a disembark in the Cuban coast. In 1961, president John F. Kennedy launched the secret invasion at Bay of Pigs in the South side of the island. The invasion was “disbanded” by Castro’s army, raising hostility between US and Cuba’s head of states (JFK Library, 2016).

2.1.2. Trade relation

When US annexed Cuba in 1898, tariffs were dropped by 52% between them in order to boost trade and economic growth (Copeland, Jolly, & Thompson, 2011). Since then, trade relations between both countries have been particularly volatile through history. According to Johnson (1964), the US direct investment in Cuba for manufacturing products grew from USD 45 million in 1929 to USD 111 million in 1959. Investments in trade also grew almost 200% from 1929 to 1959.

Between the years 1951-1953 it was estimated that 59% of total value of Cuba’s exports were purchased by the US and 79% of total value of imports were purchased by Cuba from the US. As it can be seen in figure 2 and 3, the trade relationship between the US and Cuba was significant.

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\(^2\) The Iron Curtain refers to the notional limits of the Soviet Bloc till the end of the cold war.
Looking through history it is evident that the vicinity and ties between US and Cuba has been significantly important. In the following section it is discussed relevant developments between Cuba and the US during the Embargo.

### 2.2. The Embargo

On February 7th 1962, Kennedys governmental body announces a full Embargo on Cuba in order to distress Fidel’s new government. Together with worldwide conflicts of the cold war between US and the Union of Soviet Socialist Republics (USSR), tensions started to rise dramatically (CFR, 2016).

By the end of 1962, US spies discovered a mission of USSR that was placing missiles into Cuban territory, which threaten US sovereign territory. The so called “Cuban Missile Crisis” caused a blockade on Cuba’s coasts by the US naval forces for thirteen days. Negotiations took place and the USSR retreated with the conditions of US withdrawing military bases in Turkey and Italy. By 8th July 1963 The Cuban Assets Control Regulation (CAFR) was imposed in order to complete the total Embargo into Cuba (CFR, 2016).

The embargo consists in a federal regulation and several statutes issued by different institutions inside the US federal government. The statutes concerning Cuba’s sanctions are handled by the US Department of Treasury, which publishes the sanctions and any further developments of US regulations (UST, US Department of Treasury, 2015).
The basis of the Embargo is essentially ruled by the Federal Regulation, which is the Cuban Assets Control Regulations (CAFR). The CAFR was imposed on 8th July 1963 and is considered the main regulation that enables Cuba to trade with the US. The objective of the embargo is to forbid any person subjected to US jurisdiction to make transactions with Cuba’s government or Cuban people (UST, 2016).

US and Cuba’s relation worsen later on. In 1966 US congress issues the Cuban Adjustment Act, which gives the opportunity for Cubans that come to the US to apply for citizenship a year after arrival. This immigration act together with the significant drop of the Cuban economy (figure 4) caused a massive flow of Cubans immigrating to the US in the following years. The mass migration generated a bizarre relationship between US and Cuba (CFR, 2016).

![Figure 4 – Cuba's Historical GDP and GDP per capita growth 1971 - 2013](source: Author through World DataBank (2016)).

Fidel’s government propaganda against US politics in the Island harvested a strong disapproval of US culture and related businesses. Whilst, a significant number of successful Cuban’s businesses resided in the US. Up to 1.1 million Cubans were estimated to resided in the US in 2013, from which 77% of total immigrants settled in Florida (figure 5) and 25% of total immigrants where working on managerial position or where having businesses. Nowadays, the Cuban population in the US raises up to 2.2 million inhabitants, which suggests a strong cultural relationship (Rusin, Zong, & Batalova, 2015).
After the migration crisis that started in the seventies, the situation between US and Cuba came to a stagnated state and trade was distorted, but continue to quietly on go year by year, till the nineties, when a new waves of political actions and issuing of new statutes started to take place.

2.3. Relevant statutes and The Cuban Democracy Act

In order to put pressure to the unstable Fidel socialist politics in the nineties, George H.W. Bush approved in 1991 further trade restrictions between US and Cuba. But this time he added something different, when approved by the congress in 1992, the Cuban Democracy Act (CDA) “encourage countries that conduct trade with Cuba to restrict their trade and credit relations with Cuba in manner consistent with this act” (Torricelli, 1992).

For the first time, the issue between Cuba and US now became multilateral. The prohibitions stated that vessels calling Cuban ports were no longer allowed to call US ports. US business subsidiaries were no longer allowed to make transactions with Cuba, even if the subsidiaries were based abroad (Wong, 1994).

According to Wong (1994), the CDA mostly disables any motor vessel that have called any Cuban port to call any US port. In addition, penalizes any company or organization that encounters any trade relations with Cuba to then trades with the US. Many economic powers in the World had complained about the CDA and tried to abolish it, just like the EU, Canada, Mexico and Dominican Republic.

However, the CDA weakened due to the inauguration of the World Trade Organization (WTO) in 1995, in which almost all major economies in the world signed an agreement as members, including Cuba. So, in order to keep the pressure to the Cuban government, Bill Clinton’s administration issued the Cuban Liberty and Democratic Solidarity Act, or so called Helms Burton Act, in honour to the Senator Jesse Helms and the representative
Dan Burton. The Helms-Burton Act together with the CDA forbids and punish US nationals and foreign companies that make transactions with any Cuban entity (Spanogle (1999) and CFR (2016)).

In the early 2000, Venezuela left wind government helped by high oil prices, agrees with Cuba to export subsidized oil in exchange for Cuban technology, health care, science and support services. In addition, Clinton’s policy makers drafted and issued a new reform with the aim of helping Cuban population and start to improve trade relationship with Cuba. In the end of year 2000 Trade sanctions reform and Export Enhancement Act was issued, significantly reducing trade barriers and restrictions for foreign companies trading with essentially both countries, Cuba and the US (CFR, 2016).

So, as from the year 2001, the Embargo was conform by the CAFR federal regulation and the following statutes (UST, 2015):

A. Antiterrorism and effective Death Penalty Act (AEDP) of 1996.
C. Cuban Liberty and Democratic Solidarity Act (Helms Burton Act) of 1996.
D. Sections 5 and 16 of the trading with the Enemy Act of 1917 (applicable since 1962).

The statues serve as boosting or restricting mechanism, enlarging the effects of the Embargo. For instance, the only statute that have been issued in order to enhance trade was statute E, which was established in the year 2000.

As it can be observed in figure 6, each statute has a contrasting, but apparently significant effect on trade. The CAFR has been there for many year, creating a stagnated barrier to trade, which constitutes an impediment for a broad estimation of the effect on trade nowadays (Haidar, 2013). However, the last 26 years of trade policy changes can be evaluated in order to estimate a full Embargo repeal. In that sense, the issuance of new statutes can be considered as changes in sanction restrictiveness, from limited to moderated sanction or from moderated to extensive or the other way around. With specific levels of sanctions, we can capture a more accurate conclusion of the Embargo’s effect (Hufbauer & Oegg, 2003).
2.4. **Actual Situation and expectations**

Last relevant wave of political changes started as from the year 2006. In February of that year, President Fidel Castro announces the handover of the seat to his brother Raul Castro, which has been more open towards trade relationships. In 2008, the ceremony is due and the change begins in Cuba, together with the world economy crisis. Just one year after, President Barack Obama eases travel restrictions and remittances from the US to Cuba, generating a significant flow of Cubans-Americans back to visits their homeland (CFR, 2016).

In October 2012, President Raul Castro announces the lifting of the exit visa that disables Cuban to leave Cuba without authorization. Later, for the first time since 1962, Cuba is incorporated in the Community of Latin American and Caribbean States (CELAC) and hosts the summit of 2014. The same year, US president Barack Obama and Cuban president Raul Castro announce restauration of diplomatic ties. Further, Cuba is finally removed from the terrorism list (Statute D). Mid 2015, US embassy is reopened in La Havana and Cuban embassy opens in Washington DC. Finally, after many year, commercial flights were restored from the US to Cuba, especially from the south of Florida (CFR, 2016).

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Actually, as we can see in figure 7 and 8, Cuba had major shifts on its trade partners compared to 1937. Venezuela, Canada and China came out to be the main partners for Cuba nowadays, instead of the US or Germany.

**Figure 7 – Cuba’s Export partners**  
*Source: Author through IMF (2016)*

**Figure 8 – Cuba’s import partners**  
*Source: Author through IMF (2016)*
We can clearly see a significant drop in political tensions between Cuba and the US. According to the US Treasury Department, trade and commerce has been gradually increased with the reduction of trade restriction. Several amendments have been issued in the beginning of 2016, after a friendly trip of US president Barack Obama to La Havana. It can be expected that, it is a matter of time when full lifting of trade Embargo will be finally announced (US Treasury, 2016).

2.5. Containerized trade

2.5.1. World containerized developments

The first metal boxes to standardized general cargo loads were used in the fifties. In 1955 Malcom P. McLean, whom had a trucking company, created containers to make easier load/discharge cargo to/from the ship (WSC, 2016). The idea took such relevance, that in few years the container became a worldwide standard unit of measure, known as “Twenty-Foot Unit Equivalent” (TEU), that represents one standard container.

We can see in figure 9 the steady increase in containerized trade measure in Million TEU. According to Stopford (2009) and Grammenos (2010), the increase of containerization of manufactured products and loose cargo has an important driver for containerized trade demand, considering that manufactured goods account for 70% of world trade in terms of value.

![Figure 9 – World containerized trade from 1996 – 2016 (million TEU)](source: Author via Clarksons (2016))
The major increase on containerized trade came from European and Asian trade routes. As it can be seen in figure 10, in the last fifteen-year North and Latin America have not increased containerized trade like Europe has done, which rises expectations on a potential increase around the Americas in the near future. Shipping lines benefited from the increase in trade. They currently keep a close look on the changes in container trends (Clarksons, 2016).

![Graph](image_url)  
*Figure 10 – Europe, North and Latin America containerized trade from 2002 – 2016 (million TEU)*  
*Source: Author via Clarksons (2016).*

2.5.2. *Current shipping lines’ performance*

Albeit the outstanding performance of the container market in the shipping industry, there are some obstacles that shipping lines are facing due to overcapacity and world economic trends (Jephson & Morgen, 2014). In the figure 11 we can observe a significant increase of the percentage of motor vessels being idle in the last five years. Almost 7% of the total fleet of containerships are being idle according to Clarksons (2016).
In the case of the freight rates charged through the main service routes and North-South trade, we can notice that rates are having a significant downturn. It is evident in figure 12 that income per TEU has been going down. It can be attributed to economies of scale and the large increase in supply of containers. However, shipping lines have been tide on margin and further decrease in freight rates can cause a severe damage to the industry (Stopford, 2009).
It seems that the shipping lines would benefit from further increase in containerized trade. Been acknowledged about shifting in trade patterns might also be of further help in potential increases in freight rates in certain trade lanes, which could derive from lifting Cuba’s Embargo.

2.5.3. Cuba’s containerized trade developments

As mentioned, there is a correlation between manufactured trade and containerized trade. Therefore, we can notice the export values of major Caribbean islands to Cuba since 1990 till 2015 in figure 13. Before the CDA was issued, little containerized cargo can be seen to be exported to Cuba. However, after restrictions were imposed, countries started to divert trade to Cuba in a larger extend. Trinidad and Tobago and Dominican Republic can be considered as the major exporters to Cuba among the Caribbean Islands.

In relation to other major partners in the Caribbean region, we can see in figure 14 that Mexico has been capturing all trade that has been left a side from countries that imposed trade sanctions against Cuba. It is also the case for Venezuela and Panama in the last five years.

Figure 13 – Representative containerized export values from major Caribbean Islands to Cuba from 1990 – 2015
Source: Author through TRAINS (2016).
Figure 14 - Representative containerized export values from Major economics in the Caribbean region to Cuba from 1990 – 2015

Source: Author through TRAINS (2016).

Apart from the US, other major countries that have imposed sanctions can be observed in figure 15. In this case, we can recognize that when the CDA was issued in 1992, trade suffered significantly and kept low values through the nineties. After the TSR & EEA was announced, exports, especially from Japan and Germany, exponentially increased till the year 2006. After the economic crisis, exports to Cuba were slowing down, but still much larger than in the nineties.
Ever-changing Cuba’s containerized trade developments can be considered as linked to trade policies from the US and major trade partners. We can foresee changes in trade flows if sanctions were to be lifted.

2.6. Outlook conclusion

Firstly, it was found that the CDA can be taken as the whole “trade Embargo”, which concerns just to the multilateral seaborne trade. The other issuances of statutes are considered as changes in trade restrictiveness and not as different types of sanctions.

Also, it can be concluded that the geopolitical situation shows a significant drop in political tensions in the relationship between Cuba and the US. Driven by TSR& EEA in 2000 and the neighbouring trade relationship, trade between Cuba and the US has been positively affected, rising volumes and expectations for growth in trade flows. It is expected that trade flows will come forward if the Embargo was to be lifted.

In addition, the implications of the CDA can be seen as a negative barrier to trade by sea, not just between Cuba and the US, but also among Cuba’s main trade partners.
Moreover, Shipping lines are expecting for future opportunities in order to increase efficiency. Changes in trade volumes and in scheduling can be translated into benefits for the shipping lines.

Lastly, we see that trade to Cuba has been quietly affected through the years by the Embargo. We can expect that countries in the Caribbean will divert trade to capture the changes in trade flows if sanctions are repealed. Dominican Republic and Trinidad and Tobago are candidates for a probable reduction of trade as a consequence of the increase in trade between US and Cuba. We can perceive that Cuba will best benefit from a potential repeal of the trade Embargo.
3. Theoretical Background – Trade and Sanctions

Thereafter evaluating the current situation between Cuba, the US and the Rest of the World, we draft the framework required to assess the potential that lifting the Embargo has on trade. The framework builds expectations and theoretical approach in order to explain the trade diversion effect and trade creation effect derived from trade policy changes. In addition, the theory helps us to measure possible benefits that can be obtain from valuating trade diversion and trade creation effect when lifting Cuba’s sanctions. Also supports the translation of the results into benefits for shipping lines.

In the following section it is described the relations between sanctions and the economy of Cuba. Further, it is discussed the consequences that sanctions might have on trade flows. Thereafter, we review the theoretical effects on decreasing trade barriers on trade. Ultimately, it is debated the effects of the Embargo on maritime trade possible benefits when lifting it.

3.1. Trade sanctions and the effect on the economy

The economic effect of sanctions on Cuba’s economy and welfare are out of the scope of the research. However, it is important to highlight the relevance of potential scenarios that might indirectly affect trade and container trade performance. In the following section we address the theoretical effect of sanctions repeal on economic growth. In addition, we discuss the effect on import and export prices. Then, it is related to the effect on trade.

3.1.1. Effect on economic growth

Trade sanctions are not solely affecting target countries performance, but also sender’s economy. The USITC (2007) suggests that there were severe losses on potential growth in the US agricultural sector. According to (Neuenkirch & Neumeier, 2014), sanctions have a significant impact of GDP growth. The effect that sanctions have depends on the degree of the sanctions (Mild, Moderate, Severe) and also how long sanctions has been imposed. Neuenkirch & Neumeier suggests that the largest impact sanctions can have on GDP growth is about 5 percent reduction, which implies a significant economic crisis for the target country. In the contrary, lifting trade bans may intuitively generate the contrary effect and might increase economic growth even further. In the case of Cuba, economic growth might be directly linked to the Embargo.

3.1.2. Effect on prices

Following the theories of trade competitive advantages, we can argue that barrier to trade causes inefficiencies and biases in prices of goods coming from banned country. The negative change in the terms of trade causes an inflation effect on traded goods. The Embargo causes a large increase in tariff till the point when just few consumers are willing to pay the price of that good. Thus, the prices of goods from banned country are so high that consumer and importer are not willing to pay for that. The prices include the ad
valorem tariff and other trade barriers. Changes in prices directly affect trade (Van Marrewijk, 2012).

3.1.3. Effect on trade

Recalling the neoclassical theories of trade, we can use the theories of Ricardo's comparative advantage to start assessing the benefits of trade. Countries producing goods from which they have comparative advantage, and trading the goods that they produce less efficiently is a reasonable first approach to justify trade. Also if we include the theories of Heckscher – Ohlin, which states that countries would trade factors and commodities that they have abundantly in their country. In addition, benefits of trade come even larger when comparing the advantage of production between specific trade partners. For that reason, countries come together and create trade unions, reducing barriers to trade. Benefits of trade brings society and trade flow a better optimal solution than when trade is restricted. The consequences of sanction on trade can be significantly negative, acting as a distortion to the optimal equilibrium (Van Marrewijk, 2012).

3.2. Consequences of sanctions on trade flows

One of the major responsible of the constant increase of trade flows in previous years is the contraction of trade restriction around the world and new free trade agreements. Many regions have had an extraordinary economic performance due to trade liberalization policies. When we talk about tariff or trade restriction of any kind, we address the fact of distortions. Moreover, if trade restrictions are repealed for a small country that is unable to retaliate, the distortions and loss of welfare worsen even further. According to Van Marrewijk (2012), tariff that are levied by a large country leads to a negative effect in trade. He states that custom unions affect trade flows essentially generating a trade creation and trade diversion effect.

Caruso (2003) suggest that sanctions are market disruptive phenomena that create biases in trade flows. He argues that trade sanctions have a negative effect on bilateral trade. An extensive unilateral sanction measure has a large negative effect on bilateral trade between sender and target country. Limited and moderate sanctions in the contrary might have positive or negative effect for the rest of trade partners. In the case of multilateral sanctions, the effect seems to be strictly negative for total trade flows.

We can conclude that lifting sanctions reduces trade barriers and ad valorem tariff just like custom unions do. In that case, trade creation effect and trade diversion effect shall be the outcome of lifting the Embargo in the case of international trade.

3.3. Trade creation Effect

In the case of US trade restriction, the regulation prohibits to encounter trade with Cuba or Cuban citizens. As mentioned by Van Marrewijk (2012), any trade restriction causes reductions in the trade flows. Whenever there is a lifting of sanctions, or a country is joining a customs union, there are 2 relevant effects: Trade Creation and Trade Diversion.
An Embargo is essentially an approach like having a significantly large ad valorem tariff. According to Van Marrewijk (2012), if we have a country “B” (figure 16) trading with country “A” with a commodity price and a tariff at pb+t and sanctions are lifted, the price of pb goes down to pb. Without the ad valorem tariff, the prices of commodities in country “B” are cheaper, increasing the amount of import from country “B” and less production of that good in countries “A” internal market. We would expect an increase of imports from B of Q3-Q1 to a larger extend of imports of Q4-Q0.

![Figure 16 – Trade creation effect](source: Author through Van Marrewijk, (2012))

When having a lifting of sanctions between a country pair, one of the trade partners has to be the most efficient producer of a specific commodity for the other trade partner in order to have a trade creation effect. In that case, reducing commodity prices in a bilateral trade agreement, as a consequences of sanctions repeal, will boost trade. However, if we are in a case where inefficient trade partners are also involved on the lifting of
sanctions, which is the case of Cuba's Embargo, trade diversion effect would be a consequence that needs to be assessed (Van Marrewijk, 2012).

### 3.4. Trade diversion effect

In a situation when we have a trade Embargo lifted and the target country is an inefficient producer, bilateral trade partnership between Embargo sender and target country is likely to encounter trade diversion effect. For instance, looking at figure 17, when having lifting of sanctions of country “A” against country “B”, prices of commodities in B drop from \( p_{b+t} \) to \( p_b \). In this case, because country B is more efficient producer than country C and country C has more restrictions, country “A” will increase trade with B diverting it from country’s C trade. Hence, in case of easing the terms of trade bilaterally, we can actually encounter a shifting of trade to a different set of trade flows. Imports from C diverted to B can be seen in the quantities \( Q_1-Q_0 \) and \( Q_4-Q_3 \), gained after sanction’s repeal. Countries that will capture the trade diversion are usually the ones in good political relation with the target country and also experienced exporter countries (Van Marrewijk (2012) and Haidar (2013)).

![Figure 17 – Trade diversion effect](source.png)

*Source: Author through Van Marrewijk, (2012)*
We have also to consider the impact that trade creation and diversion effect have on the maritime industry, especially the impact on container shipping lines.

3.5. The maritime industry and the Embargo

According to Stopford (2009), increases in demand for manufactured goods, that can be containerized, rises needs for seaborne trade. An increase in maritime transportation, triggers need for shipping line services. In addition, Stopford emphasises that any geopolitical issue causes a dramatic shift in maritime trade flows. As consequences of changes in demand for transportation, short run and long run freight rate averages are to be changed accordingly. It is also the case for changes in liner shipping routes, where trade lanes are subjected to changes in market trends. Stopford (2009) also adds up conclusions about changes in trade flows, service scheduling and capacity utilization of containerships, where ships need to fit to a specific trade route. In addition, supporting the ideas of Stopford, in the studies of Wijnolst et al (2000), it was argued that in the process of port hub selection, after including a gravity centre calculation, changes in trends of maritime trade flows are an important factor when nominating a major hub.

The principles of liner service economics that container shipping companies are interested in, as stated by Stopford (2009), are: the freight rates, the ship characteristics, the service schedule, capacity utilization, ship costs and economies of scale, port charges, container costs and administrative costs. Shipping companies focus on the principles to improve their performance. With regards to trade flows, the issues that might be influenced by trade changes in volume and direction are the freight rates, the service schedule and capacity utilization.

Freight rate changes are caused by the increase in demand for manufacture products, that triggers need for containerized trade, due to the trade creation effect. The increase in volume also drives the capacity utilization of the present fleet of container lines. In addition, trade diversion effect causes shift on the container trade dynamics, which affects service scheduling of the shipping lines. By optimizing these principles, container shipping lines can benefit from changes in trade flows.

3.6. Theoretical conclusion

Trade restrictions distort actual bilateral trade between Cuba and its trade partners. We can expect that lifting the Embargo re-establishes a new equilibrium, having an effect on trade output and also shifting the current patterns of trade between third party countries participating in a specific trade union. It is expected an increase on trade between the sender country and the target country (trade creation effect) and a shifting of current trade from countries that are not participating into the Embargo but are not as efficient as the countries that have repealed the sanctions, which instead are more efficient producing certain goods.

Furthermore, the trade creation effect and trade diversion effect influence the principles of liner container shipping services economics. Specially, freight rates, service schedule
and capacity utilization. Trade creation has a positive impact on Freight rates, where an increase in demand for a certain trade route, as a principle of microeconomics, rises prices for that specific route. Increases in demand for certain trade also has a positive impact on capacity utilization of current fleet, if all remains the same. Lastly, trade diversion impacts service scheduling due to shifts in trade patterns along specific regions.

In the following chapter, it is established an exhaustive review of previous research that measure the effect of sanctions on trade. In addition, it is shown a debate on models previously used, determinants of trade, debates on expectations of lifting sanctions and a literature conclusion that helps to frame a methodological approach.
4. Literature review – Some key theoretical contributions

In this chapter we briefly dive into selected academic literature that drafts a well-defined framework for the next steps on the methodology. Each specific study enables the reader to be acquainted with the outcomes and major findings of similar researches.

There are limited amount of studies that assess the impact of economic sanctions on trade flows. Most of the theoretical frameworks and studies focus upon measuring trade policies and its specific impact. Hence, a review of several relevant studies related to trade sanctions is used to assess best fit for methodological approach and possible outcomes from this research.

4.1. Debates on determinants of trade

Caruso (2003) adds Distance, GDP and population from each pair of countries that are encountering bilateral trade, distance between them, moderate, extensive and multilateral sanctions and intra or interstate war as dummy variables. It is also important to consider that there are network effects, where countries take opportunities even though they are not as efficient as other countries trading certain goods. That influences the effect of a sanction by offering better deals to the sanctioned country, which has a larger trade partner selection, reducing the final effect of sanctions.

He estimates the potential trade that countries like the US could have obtained if the sanctions were never imposed. Caruso (2003) roughly uses the coefficient of the sanctions to explain how larger would have being the trade with banned countries if sanction were never imposed. The outcomes of the model where significant. The model showed that sanctions shrank trade by more than 50% when unilateral sanctions are imposed and more than 82% when sanctions are imposed multilaterally, which is the case of Cuba.

The research of Hufbauer and Oegg (2003) assesses the changes in trade flows due to sanctions and the impact of those changes into US economy. After drafting the gravity equations, they added some other variables that are not usually used in the literature. They added sharing of a currency union as dummy variable, when countries belong to the same monetary union. Also, Landlocked or island depending on countries characteristics. Furthermore, they added a dummy variable to control for countries that share land borders, which also fixes the effect of large countries where capitals are far away, but they are still neighbouring countries.

Leslie, Marashi, & Parsi (2014) add to the determinants of trade additional variables. He argues that being part of the same set of ex colonies, sharing a common colonizer enhances trade. In addition, it is added common language as part of relevant socio-economic variables. Furthermore, they used oil prices as proxy variable to estimate the in transit cost changes around the world. They mention that the sanctions programs can be affected by lifting measures inside the whole ban. Also clarifies the fact that, for
measuring the effect of sanctions, it is relevant to split the sanctions in levels of intensity, decoding on the strictness of the measure, by splitting into low, medium or high level.

Other variables were also considered in previous studies but with a lower degree of significance. Depending upon the trade restrictions that wants to be measure and the methodological approach that is required, the selection of specific variables is considered.

4.2. **Debates on Trade Restrictions**

Caruso (2003) indicates that there are different trade restrictions techniques in order to sanction a country. The main sanctions are boycotts, financial sanctions and Embargoes. The boycott is essentially a method that restrict imports from target country, which focuses on a more specific sector or industry. The financial sanctions relate to the investment and lending mechanism of the target country. It restricts financial transaction, which harms directly the economy of the target country. At the last mechanism, we have the Embargo that directly restricts the bilateral trade flows between the imposer country and the target country. Embargoes can be total or partial, depending on each case. Independently from being total or partial, the Embargo directly increases prices of products from the target country, which reduces the amount of demand for that product in the sender country’s internal market.

Sanctions are rarely imposed alone. Several binding measurements are usually coming together with the sanctions. Can also be that sanctions are part of a strategic measure to achieve different economic goals. However, sanction measures are generally taken when crisis is already harming political relationship. In that case we can consider that sanctions are measures that are taken when limits on political relation has been overcome, as we so in previously between Cuba and the US. Therefore, sanctions can be used by politically strong countries as coercion, constrain or signalling mechanism (Giumelli & Ivan, 2013).

According to Haidar (2013), changes in terms of trade for Iran caused a significant change in trade volumes from countries that were imposing sanctions and that trade was diverted to other trade partner. In the following section we discuss previous methodological approaches that were used to estimate trade effects of sanctions.

4.3. **Debates on estimating trade effects of sanctions**

4.3.1. **The Tobit model**

Montenegro and Soto (2000) argue distortions and biases in the Cuban economy and trade policy are driven by factors such as country political definition. Nevertheless, Cuba’s economy is comparable to many other in the region, but trade has not come as large. They perform a detailed econometric analysis to identify the variables that distort trade in Cuba using the Tobit model. Final findings determined that there is a relation between Cuba and world communist regimes, were changes in geopolitical issues affect trade,
which is directly related to trade diversion. The Tobit model allows to estimate the elasticity of the determinants of trade flows. It captures the values of censured (zero trade) data and gives conclusions and the specific variables to be used.

Cuba has a close trade relation with CMEA\(^4\) countries. Exports were mostly concentrated in sugar, minerals, machinery and manufactured products. Montenegro and Soto (2000) divided the data into two major year segments. 1980-85 and 1986-1991. The first blocks relate to the years when Cuba was a pure communist orientated nation. The second block in the other hand, the communist orientation was relaxed and Cuba started to trade with a larger range of nations.

In the case of Myanmar, US, Canada and the EU were the countries which enforced the highest trade restrictions when it comes to punishments for the Burmese military regime. The research of Kubo (2013), assess the export potential of Myanmar after lifting the sanctions imposed in 1988, as political pressure to the military junta that was ruling Myanmar. The sanction includes major investment prohibitions and punishment entities that have relation with the Burmese regime. Kubo (2013) mentions some generalized system of preferences for developing countries that are used as incentives for enhance trade and economic development. The results were relevant, in which Myanmar’s export potential was calculated to be larger after lifting the sanctions.

4.3.2. The General Equilibrium Model

General equilibrium models are usually used to measure economic effects on internal economy of a country after changing a specific policy. It is also used to measure household welfare after any economic policy is in place (USITC, 2007).

In the works of Ianchovichina, Devarajan, and Lakatos (2016) it is quantified the general equilibrium effect of lifting Iran sanctions that were imposed after the UN security council nuclear agreement. The paper assesses 3 different sanctions repeal and the general equilibrium effect of each, Iran and its trade patterns: The lifting of the EU oil Embargo, the Reduction of Iran’s trade costs, and the liberalization of cross-border imports of financial and transport services. Results about trade volume changes are promising, were trade diversion and creation effect derived from reducing trade barriers. In the research it has been used the CGE model, which mainly measures the interaction between the produces and the consumers of a specific economy. In this case, the outcome of the model allows further assessment in economic impact of trade sanctions in Iran.

Sanctions usually fall behind their objectives of archiving a political goal due to difficulties in coalition among other countries. If restrictions are in place, trade diversion will play a role and act as a counter measure. Ianchovichina, Devarajan, and Lakatos (2016) explained that the lifting of Iran’s sanctions will be most beneficial for Iran, the EU and

\(^{4}\) The Council for Mutual Economic Assistance, also called Comecon. It was an organization from 1949 to 1991 of communist states, which economically cooperates to enhance trade relations.
the US. Using the Global Equilibrium Simulation, they were able to measure the effect on certain commodities for several countries evaluating bilateral trade with Iran.

4.3.3. The Gravity model

According to Caruso (2003), in the case of sanctions, there is a spill over effect on third countries when bilateral sanctions are imposed. We would have countries that might benefit from trade diversion and others expect a negative effect. The conclusions of the research state that sanctions have a comprehensive negative impact in trade volumes and direction. He uses the simple the gravity model developed by Tinbergen (1962) in order to measure trade diversion and trade creation effect when sanctions are imposed. Caruso (2003) drafts conclusion on trade flows by interpreting the coefficients of the gravity model.

Leslie, Marashi and Parsi (2014) focus their study upon trade, economic and welfare loss due to the sanctions imposed to Iran. The research assesses the drawbacks of the Sanctions, estimating trade with a gravity model and evaluating the impact of the sanctions. They conclude that sanctions have a negative impact through the US economy, which worth between $134.7 and $175.3 billion.

They mention that one of the reasons why countries apply sanctions is due to the absence of awareness about the cost of this policies into bilateral trade and also into the economic performance of the countries involved in the ban (Leslie, Marashi, & Parsi, 2014). They use the gravity model to estimate the effects of the sanctions into the US and EU economies, evaluating the perspective of the countries that impose the sanctions. On the research, the sanctions were imposed by sections. Firstly, unilateral sanctions were imposed by the US. Later, the UN Security Council and the EU participated as well. It took several acts and amendments to achieve the complete ban of trade, similarly to Cuba’s procedure.

Thereafter running the gravity model, Hufbauer and Oegg (2003) found that there is significant trade loss for the US when applying sanctions to a specific country. How severe the sanctions are, will determine also the magnitude of the trade loss that US might incur. It is also important to highlight that, the longer the sanctions are in place, the larger the benefits will be of lifting the sanctions.

The research of Kubo (2013) try to measure the trade potential of Myanmar by forecasting a policy change when sanctions are repealed. In addition, he estimates the effect of the repeal on bilateral trade flows by using the gravity model.

One of the major problem the gravity model has in order to estimate the real indirect effect of trade sanctions is the effect on third party countries involve in trade. Multilateral resistance is also a problem that can come across when modelling bilateral trade. In the studies of Kubo (2013), he includes exchange rate of both countries in order to account for multilateral resistance. In the analysis it is used a Poisson Pseudo Maximum Likelihood (PPML) estimator approach to calculate the trade values level and then a Tobit
model to measures the impact of export growth in the economy of Myanmar. As an important remark of the research, Kubo (2013) includes the direction of potential trade flows worldwide.

However, the gravity model does not calculate the trade diversion and trade creation effect per trade partner when sanctions are lifted. However, it calculates the real effect of sanctions that can serves as inputs for other models to estimate the trade creation and diversion effect of sanctions. In order to estimate the trade diversion and trade creation effect, an auxiliary model needs to be used to join the Gravity mode.

4.3.4. The GSIM model

According to the works of Francois and Hall (2003), the GSIM model approaches a partial equilibrium analysis on the effect of changes in trade policy, which relates to changes in tariff measures, on global, regional and national trade flows. The model can be used to estimate the shifting of trade patterns in the world when changing a specific trade condition. In order to estimate the change from the initial condition to the future condition when the change of trade policy has been applied, Francois and Hall (2003) use an ad valorem tariff, which includes not just the real tariff imposed for a specific commodity, but also Non-Tariff Barriers (Berden et al, 2009).

The Ad valorem tariff from the GSIM model captures all the Non-Tariff Barriers (NTBs) that bilateral trade encounters. Those barriers include difficulties such as paperwork, quotas, hard regulations and requirements that limit trade. On these barriers we can include trade sanctions as an additional Non-Tariff Barrier. As reported by Berden et al (2009), the GSIM model helps to measure the outcomes of a free trade agreement between the US and the EU on trade and investment. They capture the shifting of trade and the benefits or losses that a free trade agreement brings to a bilateral trade relationship. It was clearly obtained the effects on imports and exports and even changes in output. The results are promising in order to capture, with the use of the GSIM model, the trade creation and diversion effect of lifting the trade embargo imposed to Cuba.

4.4. Debates on Expectations of lifting sanctions

According to Montenegro and Soto (2000), lifting Cuba’s sanctions will ultimately shift the actual panorama and would reallocate trade. Cuba had its upturn when market reforms were applied from 1975 to 1985. We can intuit that changes towards liberalization might generate economic incentive that derive into economic and trade growth.

The estimation was made by using the Tobit model in order to measure the effect of censored data with zero trade values. Then large number of years ensure a high quality estimator. An issue with the gravity model is that distance is not necessary a significant estimator of transport cost and trade relation. It is also the case of economic size, which is not well proved in the literature (Montenegro & Soto, 2000).

The works of USITC (2007) highlights the high level of restrictiveness among products imported from Cuba or good exported to Cuba and its consequence on US production
and consumption. It is mainly focus on agricultural commodities and tourism activities. They also include commodities when restrictions were lifted for a certain period of time, for which a significant increase in trade of those commodities was obtained. In addition, they found that the restriction imposed against Cuba significantly rose the freight charges on cargo transported between US-Cuba trade lane.

According to USITC (2007), the US travel restrictions were used as limits on passengers imports from Cuba. In the case of restriction, it is usually represented by an increase in the price of imports, by an ad valorem tariff which shifts the supply and demand curve, reaching a lower point in the quantities imported.

Jolly and Thompson (2008) argue the potential of Cuba’s trade for the economy of Alabama State (US). They compare the situation prior the Embargo in 1957, when US was a major partner for Cuba’s trade. Essentially, their study measures the possible price changes in Alabama’s economy for certain basket of products. Having as results changes in income, trade and prices and increase in supply of Cuban products.

At last, Kubo (2013) concludes that the actual export was about one fifth of the potential exports. A repeal of the sanctions might increase significantly the trade relationship with US, EU and Canada mainly.

4.5. Literature Conclusion

It can be concluded that, in the cases of sanctions, the most common mechanism that best measures the impact of economic sanctions on trade is the gravity model. It is also important to highlight that the use of GDP, GDP per capita, Distance, Trade blocs, Language, colonial ties and border sharing are widely used variables which can be included into the gravity model in order to obtain relevant results and better estimate changes in trade flows in addition to the widely used “Sanctions” variable that captures the effect of the Embargo. According to the previous discussion, it can be expected positive values in the case of income variables. As explained by the Gravity model theory, the GDP enlarges the centre of gravity of the partner, which increases bilateral trade. Furthermore, Distance is expected to have a negative value due to the increase in trade cost when countries are farther away. Socio economic ties, such as sharing a trade bloc, common language or having the same colonial ties are variables expected to enhance trade according to the literature, given positive effects on trade. Additionally, border sharing variable is used in the same line as the distance variable, however, helping to correct for large countries with long distance between capitals. On that variable, we can expect a positive effect on trade, following the opposite logic of “distance”. Also, as mention previously, the sanctions variable is expected to have a negative effect on trade.

We can additionally conclude that the most suitable approach is the use of Poisson Pseudo-Maximum likelihood (PPML) to estimate the zero trade values in case of countries that have imposed sanctions (Shepherd, 2013).
With the current data availability, to perform a CGE model would be somewhat challenging. Theory previously reviewed suggests that the use of GSIM model to estimate the trade creation and diversion effect of lifting Cuba’s Embargo would have a more suitable and accurate approach in the case of a single-commodity study.

It can be seen in table 1 that using Gravity and GSIM model on several other countries with the sanction conditions as Cuba had a satisfactory outcome in measuring the effect on trade flows. In the following chapter we assess the methodological approach used in order to estimate the effect of the Embargo on trade flows.

<table>
<thead>
<tr>
<th>Research</th>
<th>Sanctioned Country</th>
<th>Trade Restriction</th>
<th>Outcome</th>
<th>Variables</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Losing Billions: The Cost of Iran Sanctions to the U.S. Economy</td>
<td>Iran</td>
<td>Partial and total trade restriction</td>
<td>Major significant of the sanctions into USA and EU potential earnings</td>
<td>Trade, GDP exporter, GDP importer, Distance, Contiguity, common language, common colonizer, crude oil price, trade bloc, low/medium/high sanctions, years.</td>
<td>Gravity model</td>
</tr>
<tr>
<td>How Distorted is Cuba’s Trade? Evidence and Predictions from a Gravity Model</td>
<td>Cuba</td>
<td>Total trade restriction</td>
<td>Model predicts a diversion of trade to US after lifting Embargo.</td>
<td>Trade, GDP, Distance, Area, Landlocked, Border, Difference in GDP per capita, Language, Trade block.</td>
<td>Gravity and Tobit model</td>
</tr>
<tr>
<td>US Agricultural. Sales to Cuba: Certain Economic Effects of US Restrictions</td>
<td>Cuba</td>
<td>Total and partial measures</td>
<td>Large Economic losses due to the trade restrictions</td>
<td>Supply and Demand of products and Tourism, prices, imports and exports</td>
<td>General Equilibrium Model</td>
</tr>
<tr>
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</tr>
<tr>
<td>Lifting Economic Sanctions on Iran: Global Effect and Strategic Response</td>
<td>Iran</td>
<td>Partial restriction measures</td>
<td>Ira can reach the trade of Gulf trade partner after the lifting</td>
<td>Trade, Tariff and Non-Tariff Barriers, Commodities and economic data (e.g. unemployment, wages, etc.), and other variables.</td>
<td>GTAP, CGE model</td>
</tr>
<tr>
<td>The Impact of International Economic Sanctions on Trade: An empirical Analysis</td>
<td>Various (around 53 sanctioned countries evaluated)</td>
<td>Total, Partial and Multilateral</td>
<td>Trade diversion effect and sanctions significance proved.</td>
<td>Trade, Population, Distance, Moderate, extensive and multilateral sanctions, Inter and intra war.</td>
<td>Gravity model</td>
</tr>
<tr>
<td>The Impact of Economic Sanctions on US trade: Andrew Rose’s Gravity Model</td>
<td>Various</td>
<td>Total, Partial and Multilateral</td>
<td>Major trade loss for the US by imposing Sanctions to trade partners</td>
<td>Trade, Distance, Area, Regional trade agreement, common language, common border, currency union, landlocked or island, colony, same nation.</td>
<td>Gravity Model</td>
</tr>
</tbody>
</table>

Table 1 – Literature summary and literature relevant results

Source: Author.
5. Methodology

After analysing the previous research and the theoretical framework, we set up the basis for estimating the trade creation and trade diversion effect into the container trade in the Caribbean.

In order to estimate the trade creation effect, we have to evaluate the impact that sanctions have into Cuba’s trade, so thereafter we can capture that value and evaluate potential increases in trade due to sanction’s repeal. Therefore, according to the assessment of preceding researches performed in the previous chapter, we can select the gravity model as best fit to measure the determinants of trade flow between Cuba and its trade partners.

Consequently, we use the outcomes of the gravity model and statistical assessment to estimate the effect that lifting the Embargo has on trade. Gauto (2012) found that the gravity model performs some difficulties to measure diversion effects. Thus, literature suggests the widely used Computable General Equilibrium (CGE) Model as an adequate approach to capture the policy effects of lifting the Embargo into the economy. However, the CGE Model is used to capture the changes in prices of several commodities in order to estimate the effect on general equilibrium, which is not covered in the scope of this research. We instead make use of the Global Simulation (GSIM) Model, which requires a lower sort of data and accurately estimates the effect of trade diversion and trade creation of a specific commodity (Ianchovichina, Devarajan, & Lakatos, 2016).

We firstly discuss the specification of the gravity model and its alternatives in order to estimate the effect of sanctions on trade. Thereafter, it is discussed the procedures that were taken to estimate the trade diversion and trade creation effect with the GSIM model. It is also included an explanation of data specification, decoding, collection and conversion. Lastly, we add a concise overview of the estimation process.

5.1. The gravity model

The gravity model’s basic theory derives from the well-known Newton’s law of universal gravitation equation. Shortly, we can intuit from Newton’s theory that force is proportional to the product of two masses and inversely proportional to the square of the distance between the two masses (Verlinde, 2011).

Tinbergen (1962) in his studies made use of the Newton’s approach to actually explain trade. He explains that bilateral trade was essentially defined by the size of the two trade partner’s economies and the distance between the two centres of economic activity. The size of the economies was defined by the GDP of each country and the distance by the linear kilometres between each state capital, which can be seen in equation 1 (Chaney, 2011).

\[ T_{AB} = K \left( \frac{(GDP_A)\alpha (GDP_B)\beta}{(Dist_{AB})^\theta} \right) \]  

(1)
where $K$ is a constant, $T_{A,B}$ is the bilateral trade between country A and country B, and $\alpha, \beta, \theta \approx 1$. Equation 1 explains the idea on Tinbergen (1962) approach to describe trade flows.

Bergstrand (1985) based his studies on the works of Tinbergen (1962), performing an analysis of how to model and use the gravity model in terms of international trade. He specifies the model in a log-linear form and adds an additional dependent variable to the equation, which is used to describe any other factor that can increase or decrease trade between two countries.

This research aims to obtain a comprehensive explanation on which determinants influence trade flows. According to Bergstrand (1985) we can actually add to the basic gravity equation, variables that can add or reduce trade between countries. In the following section we intuit on the model of Tinbergen (1962) and Bergstrand (1985) to the extent of getting an accurate approach on how to specify the final version of the gravity model.

5.1.1. Model intuition

The approach of Bergstrand (1985) on showing the relationships between variables in form of multiplication is somewhat complex to analyse. McCallum (1995) simplifies the model by using the logarithmic form of the equation to analyse trade patterns among US States. Adopting the logarithmic form, we explicitly obtain the elasticities of each independent variables through coefficient analysis. In our case, we obtain the direct effect of each variables on Cuba’s trade flows, as it can be seen in equation 2 (McCallum (1995) & Shepherd (2013)).

$$x_{ij} = \alpha + \beta y_i + \delta y_j + \gamma dis_{ij} + \theta D_{dummy_{ij}} + u_{ij}$$

(2)

Where $x_{ij}$ stands for the logarithm of bilateral trade flows between country $i$ and country $j$, $\alpha$ is a constant, $y_{i,j}$ is the logarithm of the GDP of country $j$ and country $i$. $dis_{ij}$ is the logarithm of the distance between country $i$ and $j$. $D_{dummy_{ij}}$ is a dummy variables equals to one if there is interprovincial trade and equals to zero if the trade is from province to the state and $u_{ij}$ is the standard error term (McCallum, 1995).

The gravity model is firstly modelled as advised by McCallum (1995) in order to prove the validity and prediction capacity of the gravity model. The approach of McCallum (1995) is essentially transforming the equation into a plain Ordinary Least Square (OLS) equation. With the OLS format using natural logarithm the elasticity of each variable can be directly captured, which implies that the coefficient of the variable gives an explicit perceptual change on trade flows. However, because we are measuring the effect of lifting trade sanctions, we might have a large amount of zero trade flows in our data. It is well known that the logarithm of zero is not defined, hence, we would need to drop those values, which leads to miss specification of the model (Linders & Groot (2006), Kubo (2013) & Montenegro and Soto (2000)).
As mentioned previously and following recommendations from the works of Herrera (2011), this research includes the calculation of the factors that determine the trade flows between countries with the OLS method. Afterwards, in order to avoid miss specification, it is performed a PPML estimator method using STATA tools, which allows the model to capture the censored trade flow’s data. The PPML method “provides consistent estimates of the nonlinear model” (Shepherd, 2013) and also gives results that can be interpreted as semi-elasticities.

Thereafter, we run the gravity model using the PPML estimator and adding each country trade effect on sanctions as dummies in the equation. The expanded gravity model calculates the coefficient of sanctions to be used. The effect of the dummy variables will be retrieved by using a simple calculation of the expected value of the coefficient. Then, subtracting one to the exponent of the value obtained, we could get the percentage change. However, the coefficients of sanctions are transformed into Trade Cost Equivalents (TCE) that will be added to the NTBs of the GSIM model. The transformation of those TCE is done through the following equation (Berden, Francois, Thelle, Wymenga, & Tamminen, 2009):

\[ TCE = e^{\beta_{ped}} - 1 \]  

(3)

Where TCE stands for the ad valorem Trade Cost Equivalent, \( e \) represent the base of the natural logarithm constant, \( \beta \) is the coefficient of sanctions dummy variable, and \( ped \) is price elasticity of demand.

The sanctions coefficient is then added into the GSIM model, to measures the degree in which sanctions affect the amount of trade.

5.1.2. Model Specification

We use the approach of McCallum (1995) as basic model specification to build our model which goal is to estimate trade flows as dependent variables and include relevant independent variables from the ones previously discussed in the literature review. Following the results of the literature conclusion, we specify the model in a log-linear format as follows:

\[
\ln(Trade_{ij}) = \beta_0 + \beta_1 \ln(GDP_i) + \beta_2 \ln(GDP_j) + \beta_3 \ln(GDP_{pc_i}) + \\
\beta_4 \ln(GDP_{pc_j}) + \beta_5 \ln(DIST_{ij}) + \beta_6 (SANC_{Lim}) + \beta_7 (SANC_{Ext}) + \\
\beta_8 (BLOC) + \beta_9 (BORDER) + \beta_{10} (COLONY) + \beta_{11} (LANG) + u_{ij} 
\]  

(4)

Where \( \ln(Trade_{ij}) \) is the natural logarithm of the bilateral trade flows between country \( i \) and country \( j \), \( \ln(GDP_i) \) and \( \ln(GDP_j) \) is the natural logarithm of the gross domestic product of country \( i \) and country \( j \), \( \ln(GDP_{pc_i}) \) and \( \ln(GDP_{pc_j}) \) is the natural logarithm of the gross domestic product per capita of country \( i \) and country \( j \). \( \ln(DIST_{ij}) \) is the natural logarithm of the distance between country \( i \) and country \( j \). \( SANC_{Lim} \) is a dummy variable indicating 1 when country \( i \) and country \( j \) have limitedly declared trade sanction
imposition, 0 otherwise. \( SANC_{Ext} \) is a dummy variable indicating 1 when country \( i \) and country \( j \) have Extensively declared trade sanction imposition, 0 otherwise. \( (Lang) \) is a dummy variable indicating 1 when country \( i \) and country \( j \) speak the same language 0 otherwise, \( (BLOC) \) is dummy variable indicating 1 when country \( i \) and country \( j \) belongs to the same trade union and 0 otherwise. \( (Colony) \) Is a dummy variable indicating 1 when country \( i(j) \) has been or is a colony of country \( j(i) \). \( (BORDER) \) is a dummy variable indicating 1 when country \( i \) and country \( j \) share a common border, 0 otherwise. Lastly, \( u_{ij} \) is the normally distributed random error term.

Following the works of Caruso (2003), we segmented the Sanctions depending upon the level of restriction. Limited, Moderated and Extensive sanctions are accurate approaches to best capture the effect of sanctions. For example, the partial liberalization (TSR& EEA) in 2000 -2001 of trade restrictions imposed against Cuba can be actually use to measure possible outcome of future events on lifting the embargo in order to reduce sanction restrictiveness from extensive to moderated or from moderated to limited. It also works in the other way, when new statutes were issued, we re-adjusted the level of restrictiveness of the sanctions.

### 5.2. The Global Simulation Model (GSIM Model)

Following the conclusion of the literature, the GSIM model is used to estimate the trade creation and diversion effect of lifting the Embargo. The model works by using a tabulated excel sheet which capture the changes in trade policies and estimates the import and export world prices changes, depending upon the level of elasticities. From those changes, the model derives changes on trade flows, output of trade, consumer surplus, producer surplus and tax revenue. The mathematical expression of model is specified as follows (Francois & Hall, 2003):

One of the main elements is the cross-price demand elasticity and own price elasticity. Therefore, it is assumed Import demand equation to be specified as (Francois & Hall, 2003):

\[
M_{(i,v),r} = f(P_{(i,v),r} , P_{(i,v),s\neq r} , Y_{(i,v)})
\]  

(5)

Where \( M_{(i,v),r} \) stands for imports from product \( i \) demanded from country \( r \) in country \( v \), \( Y_{(i,v)} \) is total expenditure on imports of \( i \) in country \( v \), \( P_{(i,v),r} \) is the internal price for commodities of region \( r \) in country \( v \) and \( P_{(i,v),s\neq r} \) represents the price of other product varieties.

According to Francois & Hall (2003), The composite National supply and demand for national product varieties can be linked with the following equation:

\[
P_{(i,v),r} = (1 + t_{(i,v),r}) \cdot P_{(i,r)}^* = T_{(i,v),r} \cdot P_{(i,r)}^*
\]

(6)
Where, \( P_{(i,v),r} \) refers to the internal price for a good, \( P_{(i,r)}^* \) is the export price received by exporter \( r \) on world markets and \( T_{(i,v),r} \) is the power of the tariff (tariff markup).

The power of the tariff is added as being function of world prices on the export supply equation (Francois & Hall, 2003):

\[
X_{i,r} = k_{s_{i,r}} \cdot (P_{(i,r)}^*)^{e_{s_{i,r}}} \tag{7}
\]

Where \( k_{s_{i,r}} \) is a constant term and \( e_s \) is the elasticity of supply.

The composite demand, which is considered a constant function of Elasticity, is defined as follows (Francois & Hall, 2003):

\[
E_{(i,v)} = k_{a_{(i,v)}N{A_{v+1}}} \tag{8}
\]

Where \( k_{a_{(i,v)}} \) is a demand constant that is used to calibrate the results of the GSIM and \( P_v^{N{A_{v+1}}} \) is the composite elasticity function of the countries composite price index.

Differentiating equation number 5 and following the substitution procedures explained by Francois & Hall (2003), we can obtain the following relationships for:

Cross-price elasticity:

\[
N_{(i,v),(r,s)} = \theta_{(i,v),s} (E_m + E_s) \tag{9}
\]

Own price demand elasticity:

\[
N_{(i,v),(r,r)} = \theta_{(i,v),s} E_m - \sum_{s \neq r} \theta_{(i,v),s} E_s = \theta_{(i,v),r} E_m - (1 - \theta_{(i,v),s})E_s \tag{10}
\]

Where \( \theta_{(i,v),s} \) is the expenditure share, \( E_m \) is the composite demand, \( E_s \) is the elasticity of substitution and \( \theta_{(i,v),r} \) is the demand expenditure share.

At last, with the relation of the equations above, we can now see the trade creation and trade diversion effect. If we assume that the world prices are fixed, the tariff changes can be interpreted as price changes, which will cause changes in trade creation and trade diversion. We can decompose the equation as follows (Francois & Hall, 2003):

\[
\hat{M}_{(i,v),r} = N_{(i,v),(r,r)} P_{(i,v),r} + \sum_{s \neq r} N_{(i,v),(r,s)} P_{(i,v),s}
= N_{(i,v),(r,r)} T_{(i,v),r} + \sum_{s \neq r} N_{(i,v),(r,s)} T_{(i,v),s} \tag{11}
\]

The equation above can be decomposed even further in order to disaggregated the trade creation and trade diversion effect (Francois & Hall, 2003):
Trade Creation effect:

\[ TC_{(i,v),r} = M_{(i,v),r} \times \left[ N_{(i,v),(r,r)} \hat{T}_{(i,v),r} \right] \]  

(12)

Trade Diversion effect:

\[ TD_{(i,v),r} = M_{(i,v),r} \times \sum_{s \neq r} N_{(i,v),(r,s)} \hat{T}_{(i,v),s} \]  

(13)

In a later stage, after obtaining the results on elasticities on how sanctions impact the volume of trade, we add up this value to the total Ad Valorem Tariff Equivalent, which can customarily calculate the change in trade policy with our Global Simulation Model (GSIM). The GSIM model, developed by Francois and Hall (2003), is a perfect tool to measure changes in trade flows after reducing trade restrictions. Essentially helps measure the effect of trade policy in a global level, but with a simplistic and convenient manner.

With the results of GSIM model output, we will evaluate the possibilities driving by this output that may have an impact on the container shipping companies. If there is an increase in the trade flow, the maritime flows in the Caribbean will increase as a consequence of lifting the Embargo. After having the results, a sensitivity analysis will be performed to see what is the effect of changing elasticities in the model. Furthermore, the changes of direction of the cargo transported will be used to perform recommendations to the container shipping lines in the Caribbean.

In order to address the limitations that the GSIM model has when estimating future changes in trade creation and diversion when bilateral trade flows are zero, it has been considered a GSIM model built on a hypothetical scenario in which sanctions were never imposed. In that scenario we used representative trade flows from a country similar to Cuba, just like Dominican Republic. Thereafter, it is estimated the negative effect of lifting Cuba’s trade Embargo.

5.3. Data Specification

5.3.1. Gravity model

The data to be used as part of the containerized cargo is based on the Standard International Trade Classification (SITC) data from the World Bank (UNSTATS, 2015), which can be obtain in the World Integrated Trade Solution (WITS) tool. The tool retrieves information from the TRAINS\(^5\) and Comtrade\(^6\) data base of the world bank. According to Stopford (2009), containerized trade is a type of general cargo or loose cargo, which mainly refers to manufactured products or other cargo that can be fitted into a 20 or 40-foot Standard Container. Therefore, we used the UN SITC standard classification, which accurately have segregated manufactured products in a broader scope.

\(^5\) Trade analysis information System, which belongs to the United Nations.

\(^6\) Also called, United Nations Commodity Trade Statistics (UNCTS).
SITC rev. 3 coding, which contains data available since 1986, and is conveniently aggregated, as it can be observed in table 2, in manufactured goods (code 6), beverage and tobacco (code 1) and miscellaneous manufactured goods (code 8), were all three are major products transported by container. With the trade data from TRAINS we can create a representative basket of this three codes (1, 6 and 8) and sum up the export values. As we can see in table 2, most of the data is mainly what Stopford (2009) consider as general cargo which is loaded in containers in the major container shipping trade.

<table>
<thead>
<tr>
<th>Commodity</th>
<th>UN code</th>
<th>Years to be used</th>
<th>Main commodities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beverage and Tobacco</td>
<td>SITC 1 rev3</td>
<td>1990 - 2013</td>
<td>Beverages, Tobacco and Tobacco manufactures</td>
</tr>
<tr>
<td>Manufactured goods classified chiefly by material</td>
<td>SITC 6 rev3</td>
<td>1990 - 2013</td>
<td>Leathers, Rubber, Cork, paper, textiles, non-metallic minerals, iron and steel, nonferrous metals, manufactures of metals.</td>
</tr>
<tr>
<td>Miscellaneous manufactured articles</td>
<td>SITC 8 rev3</td>
<td>1990 - 2013</td>
<td>Prefabricated buildings; sanitary; plumbing; heating and lighting fixtures; furniture and utilities; travel goods; articles of apparel and clothing; footwear; professional, scientific and controlling instruments and apparatus; photographic apparatus, equipment and supplies, optical goods, watches and clocks; miscellaneous manufactured articles.</td>
</tr>
</tbody>
</table>

Table 2 – Representative container
Source: Author via UNSTATS (2016)

The research uses the export values of reporter countries that trade with Cuba. It has been selected a group of 24 Cuba’s trade partners selecting Cuba’s larger trade partners (OEC, 2016), main Embargo imposers (TIES, 2013), main Caribbean economies (World Bank, 2016) and the Rest of World (ROW) as it can be seen in table 3. It has been covered data from 1990 till 2013, with a total of 24 years of trade flows for 25 reporter countries with 24 trade partner, giving a total of 14,400 observations. When export trade flows were missing from the reporter country, we used the information of reporter from the imports of the direct trade partner to complete the data set. In addition, we use mirror data and data bases to perform a data patching. Data from 2014 till 2016 trade years was disregarded due to the lack of reported data from many countries in the data set.
<table>
<thead>
<tr>
<th>Target country</th>
<th>Larger trading partners</th>
<th>Embargo Imposers</th>
<th>Main Caribbean Economies</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuba</td>
<td>The Netherlands</td>
<td>United States</td>
<td>Mexico</td>
<td>ROW</td>
</tr>
<tr>
<td></td>
<td>Italy</td>
<td>Japan</td>
<td>Trinidad and Tobago</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spain</td>
<td>Israel</td>
<td>Venezuela</td>
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<tr>
<td></td>
<td>France</td>
<td>Germany</td>
<td>Costa Rica</td>
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<tr>
<td></td>
<td>Argentina</td>
<td>United Kingdom</td>
<td>Colombia</td>
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<tr>
<td></td>
<td>Brazil</td>
<td>Bahamas</td>
<td>Panama</td>
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<tr>
<td></td>
<td>Canada</td>
<td>Barbados</td>
<td>Jamaica</td>
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<tr>
<td></td>
<td>China</td>
<td>Dominican Republic</td>
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<tr>
<td></td>
<td></td>
<td>Norway</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3 – Selected Cuba’s trade partners

Source: Author.

The Socio Economic indicators such as the nominal GDP and GDP per capita commonly used in the gravity approach were gathered from the World Bank database. Distance from capital of countries is based on an Internet based calculator that measures the distance between capital cities of different countries, for instance, between Washington and Havana (Distance Calculator, 2016).

We have disaggregated the effect of the GDP per capita of the reporter country with the GDP per capita of the trade partner in order to capture the individual elasticity of each coefficient. We can then directly understand how changes in the income of a specific population can actually have an effect on bilateral trade (Bergstrand, 1985).

Dummy variables such as Language, which indicates 1 when partner countries share the same official language, 0 otherwise. Language data has been taken from national government websites and trade union websites.

Border dummy variable was taken from the CIA (2016) fact book website. The border describes the land border only. Island countries are not having shared border, so all values of Border variables of the islands are zero. None of the overseas territories are counted as land border sharing. For example, Gibraltar is not counted as UK border sharing with Spain, neither French Guyana with Brazil.

We have used a socioeconomic variable to represent the case of belonging to the same trade bloc. In that case, a dummy variable is used, indicating 1 if countries are in the same major trade bloc in a given time, 0 otherwise. As it can be seen in table 4, the research has counted in the time series from the moment in which the country has started to participate on a specific trade bloc. Changes along the years, for instance from one trade bloc to the other, have been also consider in the data set. For example, Venezuela...
was part of the “Comunidad Andina de Naciones” (CAN)\(^7\), but it has changed from trade bloc to the “Mercado Común del Sur” (MERCOSUR)\(^8\) trade union in the year 2006.

<table>
<thead>
<tr>
<th>MERCOSUR</th>
<th>EU/EEA/EFTA</th>
<th>NAFTA(^9)</th>
<th>CARICOM(^10)</th>
<th>CAN</th>
<th>SICA(^11)</th>
<th>No trade bloc</th>
</tr>
</thead>
</table>

**Table 4 – Trade blocs and selected members including membership period**

*Source: Author via trade bloc websites*

The dummy variable Colony was used to identify whether a country is or has been part of the same colonial ties in the past. It I use one (COLONY=1) if true, zero otherwise. Information displayed in table 5 was gathered from the CIA fact book. (CIA, 2016).

<table>
<thead>
<tr>
<th>UK</th>
<th>USA</th>
<th>SPAIN</th>
<th>FRANCE</th>
<th>COLOMBIA</th>
<th>NO COLONY</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA Canada Jamaica Bahamas Barbados Trinidad &amp; T Israel</td>
<td>Costa Rica Cuba Dominican R.</td>
<td>Venezuela Argentina Mexico Colombia Costa Rica Panama Dominican R. Cuba</td>
<td>Canada Panama</td>
<td>China Japan Brazil Netherlands Italy France Germany Spain UK Norway</td>
<td></td>
</tr>
</tbody>
</table>

**Table 5 – Colonial ties from selected countries**

*Source: Author though CIA (2016) facts.*

---

\(^7\) In English, CAN stands for Andean Community.

\(^8\) In English, MERCOSUR stands for Southern Common Market

\(^9\) NAFTA stands for “North American Free Trade Agreement”.

\(^10\) CARICOM stands for “Caribbean Community”.

\(^11\) SICA stands for “Sistema de la Integración Centroamericana”, which in English writes for the “Central American Integration System”.
Sanction levels are intuitively taken from the works of TIES (2013) and from websites of each country’s foreign affairs institution. In order to capture the changes on the level of trade restrictiveness along the years, 3 types of sanctions effect have been used. According to Caruso (2003), there are different levels of trade restrictions. Limited, Moderate and Extensive sanctions are considered to be the level of trade restrictiveness in this research. Countries like the US, started to have an extensive level of trade restrictions since 1990. Other countries like Germany and The Bahamas started to restrict trade when CDA was imposed in 1992. In 1996, when the Helms Burton Act was issued, the level of restriction increased one additional step. For instance, if initial trade restrictions were limited, after 1996 it would then be considered as moderated. After the year 2000, trade restrictiveness was reduced due to the TSR& EEA. For example, if sanctions were extensive, after the year 2000, sanctions were considered for that country to be moderate and not extensive any longer.

5.3.2. GSIM model

We use the GSIM model in order to estimate the trade creation and diversion effect of lifting the Embargo. The GSIM model requires the following variables: Bilateral trade flows, Initial Ad Valorem Equivalent (AVE) rates, post Embargo AVE rates, composite demand elasticities, supply elasticities and elasticities of substitution.

As mention previously in the gravity model, the bilateral container trade flows are retrieved from SITC rev3 on the UN comtrade database using the World Integrated Trade Solution (WITS). The trade flows values are taken from 2010 trade flows from total import of reporter country to his trade partner.

The AVE is formed by mostly three main tariff, the real tariff, the Non-Tariff Barrier and the Sanctions coefficient which is obtained from the elasticity of SANC variable countries fixed effect. We have gathered the import tariff data from the WITS instrument, which takes the data from the TRAINS and WTO data base. We have focused on the TRAINS data and then we patched data with the WTO database if observations were incomplete. The patching of missing data points was done by using data from closest years or using the WTO as substitute of TRAINS data base. It has been used the representative import tariff of 2010 from each reporter, which is charged to each trade partner. For tariff value it was used the tariff imposed to manufactured products, assuming that tariff levy to containerized trade will be given by that specific tariff.

In addition, we have added the NTB to the tariff equivalent. The data has been taken from the Kee et la (2009) dataset, provided by the world bank using the Market Access Overall Trade Restrictiveness Index (MAOTRI) based on the applied tariff for manufactured products. Those restrictions are taken as import NTB for each country. The NTB are the same for each trade partner in the case of Origin and Destination. Furthermore, to the tariff equivalent, we have added the AVE coefficient of the countries that have imposed sanctions against Cuba as it can be seen in the truncated example in table 6.
<table>
<thead>
<tr>
<th>Importer</th>
<th>Partner</th>
<th>Tariff (t)</th>
<th>Non-Tariff Barrier (ntb)</th>
<th>Sanctions (sanc)</th>
<th>AVE (1+t+ntb+sanc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>Cuba</td>
<td>7.09%</td>
<td>8.05%</td>
<td>0.00%</td>
<td>1.1513561</td>
</tr>
<tr>
<td>Bahamas</td>
<td>Cuba</td>
<td>10.88%</td>
<td>1.43%</td>
<td>33.96%</td>
<td>1.462608849</td>
</tr>
<tr>
<td>Barbados</td>
<td>Cuba</td>
<td>16.92%</td>
<td>21.50%</td>
<td>12.71%</td>
<td>1.511242485</td>
</tr>
<tr>
<td>Brazil</td>
<td>Cuba</td>
<td>4.00%</td>
<td>4.11%</td>
<td>0.00%</td>
<td>1.0811203</td>
</tr>
<tr>
<td>Canada</td>
<td>Cuba</td>
<td>0.46%</td>
<td>1.09%</td>
<td>0.00%</td>
<td>1.0154905</td>
</tr>
<tr>
<td>China</td>
<td>Cuba</td>
<td>5.06%</td>
<td>3.95%</td>
<td>0.00%</td>
<td>1.0900773</td>
</tr>
<tr>
<td>Colombia</td>
<td>Cuba</td>
<td>0.05%</td>
<td>1.34%</td>
<td>0.00%</td>
<td>1.0138755</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>Cuba</td>
<td>3.99%</td>
<td>7.07%</td>
<td>0.00%</td>
<td>1.1105896</td>
</tr>
<tr>
<td>Dominican Rep.</td>
<td>Cuba</td>
<td>8.91%</td>
<td>6.89%</td>
<td>37.07%</td>
<td>1.528757435</td>
</tr>
<tr>
<td>France</td>
<td>Cuba</td>
<td>1.14%</td>
<td>7.91%</td>
<td>0.00%</td>
<td>1.0905341</td>
</tr>
<tr>
<td>Germany</td>
<td>Cuba</td>
<td>1.14%</td>
<td>7.91%</td>
<td>33.84%</td>
<td>1.428943084</td>
</tr>
<tr>
<td>Cuba</td>
<td>Argentina</td>
<td>4.73%</td>
<td>1.00%</td>
<td>0.00%</td>
<td>1.0572617</td>
</tr>
<tr>
<td>Cuba</td>
<td>Bahamas</td>
<td>14.98%</td>
<td>1.00%</td>
<td>33.96%</td>
<td>1.499312549</td>
</tr>
<tr>
<td>Cuba</td>
<td>Barbados</td>
<td>14.48%</td>
<td>1.00%</td>
<td>12.71%</td>
<td>1.281850185</td>
</tr>
<tr>
<td>Cuba</td>
<td>Brazil</td>
<td>2.95%</td>
<td>1.00%</td>
<td>0.00%</td>
<td>1.0394617</td>
</tr>
<tr>
<td>Cuba</td>
<td>Canada</td>
<td>7.84%</td>
<td>1.00%</td>
<td>0.00%</td>
<td>1.0883617</td>
</tr>
<tr>
<td>Cuba</td>
<td>China</td>
<td>9.26%</td>
<td>1.00%</td>
<td>0.00%</td>
<td>1.1025617</td>
</tr>
<tr>
<td>Cuba</td>
<td>Colombia</td>
<td>3.12%</td>
<td>1.00%</td>
<td>0.00%</td>
<td>1.0411617</td>
</tr>
<tr>
<td>Cuba</td>
<td>Costa Rica</td>
<td>12.22%</td>
<td>1.00%</td>
<td>0.00%</td>
<td>1.1321617</td>
</tr>
<tr>
<td>Cuba</td>
<td>Germany</td>
<td>10.97%</td>
<td>1.00%</td>
<td>33.84%</td>
<td>1.458070684</td>
</tr>
<tr>
<td>Cuba</td>
<td>Dominican Rep.</td>
<td>9.84%</td>
<td>1.00%</td>
<td>37.07%</td>
<td>1.479076235</td>
</tr>
</tbody>
</table>

Table 6 – Truncated Ad Valorem Tariff Equivalent (AVE) calculation

Source: Author.

Composite demand elasticity is retrieved using expert’s recommendation for elastic products such as manufactured products (Yasmin & Khan, 2006). Experts advise that average demand elasticity for the manufacturing industry is somewhat elastic, due to its largest amount of substitutes. It is advised to use -3.5 because trade of manufactured goods is sensible to price changes ((Imbs & Mejean, 2010) & (Tokarick, 2010)). In the case of supply elasticities and elasticity of substitution, it is used the standardized values given by the model itself which are 1.5 and 10, respectively (Francois & Hall, 2003).

As for the representative trade flows for Cuba’s trade in order to have a benchmark for running the GSIM backwards and better estimate the trade diversion and creation effect, we have taken Dominican Republic as proxy. Dominican Republic is a similar island in terms of size, population and GDP and is located in the same region (CIA, 2016). It seems reasonable to use it in order to obtained relevant results.
5.4. **Summary of the estimation process**

5.4.1. **Gravity model**

We have firstly modelled the theoretical gravity model described by Bergstrand (1985) and Shepherd (2013) in order to verify if specification of the model is in line with the theory. Furthermore, we have included socio-economic variables to better specify the model. The socio-economic variables were selected following the works of Ianchovichina et al. (2016) and Montenegro & Soto (2000) and the assessment of the theory in the previous chapter. The additional explanatory variables helped to increase the R-squared of the Ordinary Least Squared (OLS) model.

Albeit the good fit of the OLS model specification, the OLS has the disadvantage of not accounting for 0 trade flows. Due to the left censored data coming from country pair that does not encounter trade, or countries that have banned trade (Embargo countries), we have lost useful information. In order to reduce the misspecification, we have used, as discussed in the previous chapter, a PPML estimator, which considers the zero trade flows as part of a relevant trade information. Using the PPML we can directly see the impact that each variable has on trade flows. With the PPML we use adjusted trade flows and centred variables (STATA, 2013).

Afterwards, we have included a model to estimate the fixed effect of each sanction variable for an individual country against Cuba. In that case we include all variables separately as dummy accounting just for a specific country trade. For example, we have marked as 1 all trade flows of each year when the sanctions from Germany were imposed against Cuba, zero otherwise. That variable we called it “SANC_GMY”. The coefficient of the sanction’s fixed effect of each country were translated into Ad Valorem Equivalent with the previously explained formula.

5.4.2. **GSIM model**

We have calculated the trade diversion effect and trade creation effect using the excel spreadsheet given by Francois & Hall (2003). Due to the maximum of 25 slots that the spreadsheet has, Israel was taken out of the GSIM analysis due to the lack of trade relation with Cuba, and because it was not considered as major trade partner (OEC, 2016).

The GSIM model has the disadvantage of not been able to predict future trade flows when we are in presence of zero trade. When running the GSIM model 1, we do not obtain large changes in trade due to the zero trade presence.

In order to measure the real impact of lifting sanctions, we have built a scenario in which sanctions were never imposed. In that case, we inverted the initial AVE with the final AVE. Thus, we have an initial scenario where the SANC variables is not part of the tariff, and then in the final AVE we include the SANC variables in order to observe the reduction in trade due to the sanction imposition, like if it was an increase of trade barrier instead of a lifting. Then, we multiplied the results by minus one in order to get our representative values on trade creation and trade diversion effect with the right coefficient.
In the case of the GSIM model 2 we can better identify the real change in trade volume and trade direction. With those shifts, it was narrowed down the analysis to the changes in the Caribbean region.
6. Results and Data Analysis

As a purpose and scope of this research, we pursue relevant trade changes in volume and trade movements. Helped by the STATA software, the gravity approach allows to explain the determinants of containerized trade. In addition, it gives a quantitative effect coefficient that can be used to further model the effect of lifting sanctions. When the effect is obtained, the GSIM model, helped by GSIM excel spreadsheet, is used to measure the trade creation and trade diversion effect when lifting Cuba’s Trade Embargo.

The result enables the research to evaluate possible recommendations for the container shipping sector in the Caribbean. Together with the Panama Canal expansion, this might result in significant changes in today’s Caribbean picture.

This research firstly uses the gravity model to prove the theoretical relevance of the data and the model. Then, the gravity is used to better estimate trade flows, which is later used to obtain the sanctions fixed effect. Thereafter, trade creation and diversion results were obtained from the GSIM model using actual trade flows and representative trade flows.


It is firstly assessed, with the data gathered in the methodological approach, the theoretical capabilities of the gravity model to predict trade flows. In the table 7, we can observe the summary of the variables used to estimate trade flows and the coefficients of each independent variable. First of all, we assess the outcome of the model 1. Validity comes when the error term does not explain the changes on trade flows. In that case we could have biases and the results obtained from the gravity model would not give a coherent conclusion. The gravity model needs to comply with 3 conditions in order to be unbiased, consistent and efficient (Shepherd, 2013):

1. “The standard error must have mean zero and uncorrelated with other variables” (the orthogonality assumption)” (Shepherd, 2013).
2. “The error must be independently drawn from normal distribution with a fixed variance (the homoscedasticity assumption)” (Shepherd, 2013).
3. “None of the explanatory variables is a linear combination of other explanatory variables (the full rank assumption)” (Shepherd, 2013).

The three conditions were tested using STATA. As it can be seen in appendix 3, the mean of the standard error is zero and they seem normally distributed. In addition, we use the command robust\(^\text{12}\) to fix the homoscedasticity assumption. Lastly, we can corroborate with the correlogram (appendix 4) that there is no linear correlation between variables. Now that we validated our model, results can be assessed (Shepherd, 2013).

It can be seen in table 7 that the gravity model itself explains 76.41% of the changes in containerized trade (R-squared of 0.7641). The income of each country represented by the GDP matches with the theory, having a positive sign. A one percent increase in the

\(^{12}\)“Robust” is used in STATA to avoid problems of heteroscedasticity in the regression estimation (Shepherd, 2013).
GDP of the reporter (exporter) country will cause an increase of 1.18% in bilateral trade and the GDP of the trade partner increases trade by 0.80% with a one percent increase. In appendix 1 it is visible the positively trend of trade flows when GDP increases.

As expected, distance has a negative effect on trade. Comparing two pair of Bilateral trade volumes, the regressions tells that, countries one percent farther away in total kilometres, will tend to encounter 1.21% less trade.

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>InGDPr</td>
<td>1.18***</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
</tr>
<tr>
<td>InGDPp</td>
<td>0.80***</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
</tr>
<tr>
<td>InDIST</td>
<td>-1.21***</td>
</tr>
<tr>
<td></td>
<td>(0.02)</td>
</tr>
<tr>
<td>Constant</td>
<td>-31.98***</td>
</tr>
<tr>
<td></td>
<td>(0.32)</td>
</tr>
</tbody>
</table>

Observations: 14083
Adjusted $R^2$: 0.7641

Note:
Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7 – Output summary of the theoretical gravity model (Gravity model 1)
Source: Author.

Now we can use the gravity model to better estimate trade flows, adding socio-economic variables and adding the sanctions effect, which will be discussed in the next model.

6.2. Gravity model 2 – Gravity model with Socio-Economic Variables

Using STATA, we have included certain socio economic variables to better estimate the trade flows with the OLS method. In the analysis, it was added to the gravity model the GDP per capita of exporter country and partner and population of each country separately. In addition, it was included a dummy for border sharing, a trade bloc dummy, a dummy if sharing colonial ties, dummy if sharing same official language and Sanctions effects.

After testing and validating the variables to be used, Language was dropped due to the low significance of the variable. It might be that language has little difference between countries on this specific 25 countries sample. Countries that were considered in the data set were mostly Spanish or English speakers and the rest had no common language. In that case, Language was considered to be biased and was disregarded from the analysis.

The gravity model using OLS has increased R-squared. Now the model explains 78.3% of the container trade flows movements of the 25 sample countries in the analysis (table 8). However, because it has been taken the logarithm of trade flows as dependent
Because we are interested in explain also the zero trade values, it has been run a gravity model using PPML estimator as explained in the methodology. The variables have been adjusted as required by the model in order to obtain valid results.

With the PPML estimator the results of the R-squared, as expected, rises to 0.8114 (table 8). Going thru the variables, GDP of exporter and importer country follows the same conclusion of increasing trade by 1.08% and 1.02% when an increase of one percent of GDP occurs. In the case of GDP per capita, it has been obtained a decrease of 0.54% on trade when exporter country has an additional one percent GDP per capita and in the case of the importer, the GDP per capita was not significant. Distance reduces impact on trade when considering zero trade flows. Countries which

<table>
<thead>
<tr>
<th>Dependent Variable: lnTrade</th>
<th>Dependent Variable: Tradet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent Variable</td>
<td>Coefficient</td>
</tr>
<tr>
<td>lnGDPr</td>
<td>1.21***</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
</tr>
<tr>
<td>lnGDPp</td>
<td>-0.33***</td>
</tr>
<tr>
<td></td>
<td>(0.02)</td>
</tr>
<tr>
<td>lnGDPp</td>
<td>0.76***</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
</tr>
<tr>
<td>lnGDPpcp</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>(0.02)</td>
</tr>
<tr>
<td>lnDIST</td>
<td>-0.95***</td>
</tr>
<tr>
<td></td>
<td>(0.03)</td>
</tr>
<tr>
<td>SANC_Lim</td>
<td>-0.99***</td>
</tr>
<tr>
<td></td>
<td>(0.16)</td>
</tr>
<tr>
<td>SANC_Ext</td>
<td>-2.23***</td>
</tr>
<tr>
<td></td>
<td>(0.29)</td>
</tr>
<tr>
<td>COLONY</td>
<td>0.98***</td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
</tr>
<tr>
<td>BORDER</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
</tr>
<tr>
<td>BLOC</td>
<td>1.22***</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
</tr>
<tr>
<td>Constant</td>
<td>-31.11***</td>
</tr>
<tr>
<td></td>
<td>(0.30)</td>
</tr>
<tr>
<td>Observations</td>
<td>14083</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.783</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Note:</th>
<th>Note:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard errors in parentheses</td>
<td>Standard errors in parentheses</td>
</tr>
<tr>
<td>* p &lt; 0.10, ** p &lt; 0.05, *** p &lt; 0.01</td>
<td>* p &lt; 0.10, ** p &lt; 0.05, *** p &lt; 0.01</td>
</tr>
</tbody>
</table>

Table 8 - Output summary of the gravity model including socio economic variables and using the OLS and PPML estimator methods (Gravity model 2).

Source: Author.
are 10% farther apart will trade 5.6% less than similar pair countries located closer, leaving everything else constant.

In order to measure the impact of the dummy variables included, it has been calculated the expected value of the coefficient using the formula previously mentioned in the methodology and adding the demand elasticity of manufactured good as -3.5. In table 8 is shown that colonial ties, contiguity, common trade bloc and sanctions at 1% error margin for the PPML estimator output. Colonial ties are positively correlated with trade flows. With the conversion, it was calculated that sharing the same colonial ties increases bilateral trade by 12%. With regards to Border sharing, its visible that positively improve trade by 21%, which logically goes in line with the Distance variable, but correcting by far apart capital cities. When it comes to common trade blocs, it was proved the theoretical positive effect of trade unions on trade flows. Belonging to the same trade bloc increases container trade volumes by 19%.

Lastly, as it was expected and in line with the literature, sanctions showed a significant negative effect on trade. Countries that have imposed limited sanctions against Cuba trade almost 25% less with Cuba. Furthermore, countries that have imposed extensive sanctions encounter almost 67% less trade. It has been proven that the Embargo against Cuba has a significant negative effect on bilateral containerized trade flows.

Now, in order to estimate the trade creation effect and trade diversion effect that Cuba’s trade Embargo has, it has to be calculated the fixed effect that sanctions has in each imposer country adding country’s dummy variables.

### 6.3. Gravity model 3 – Sanction fixed effects

Running the changeless PPML gravity model and just adding each country specific sanction variable, it was obtained the results on table 9, all statistically significant. Each results coefficient represents the effect that the Embargo had on container trade flows with Cuba along the time series.
## Sanctions fixed effects

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Coefficient</th>
<th>TCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SANC_BAH</td>
<td>-1.45***</td>
<td>-0.339550849</td>
</tr>
<tr>
<td>SANC_BAR</td>
<td>-0.48**</td>
<td>-0.127088485</td>
</tr>
<tr>
<td>SANC_GMY</td>
<td>-1.45***</td>
<td>-0.338408984</td>
</tr>
<tr>
<td>SANC_UK</td>
<td>-1.28**</td>
<td>-0.306234014</td>
</tr>
<tr>
<td>SANC_ISR</td>
<td>-1.98***</td>
<td>-0.432800233</td>
</tr>
<tr>
<td>SANC_JPN</td>
<td>-3.12***</td>
<td>-0.589714375</td>
</tr>
<tr>
<td>SANC_NOR</td>
<td>-2.70**</td>
<td>-0.53790081</td>
</tr>
<tr>
<td>SANC_US</td>
<td>-6.93***</td>
<td>-0.861985072</td>
</tr>
<tr>
<td>SANC_DOM</td>
<td>-1.62**</td>
<td>-0.370714535</td>
</tr>
</tbody>
</table>

Observations 14400  
Adjusted $R^2$ 0.8131

### Note:
- Standard errors in parentheses  
- * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9 - Output summary of the gravity model sanctions fixed effect per Imposer country (Gravity model 3)

Source: Author.

Contrastingly, one can observe a large difference between countries’ trade restriction effect. Countries with large effect of sanctions are countries with a long trade relationship with the USA (OEC, 2016). As expected, USA has the largest negative trade effect of sanctions, which reduces 86% container trade. Followed by Japan and Norway, whose negative effects scale up to 59% and 54% respectively.

Consequently, Israel trade restrictions has a negative trade effect of 43%. However, Israel has not been regarded in the following sections due to the limited relevance to analyse major trade routes in the Caribbean that are considered in this research.

Then, on the countries part of the EU, we had Germany and UK that have involuntarily imposed sanctions to Cuba due to the CDA and agreements with the US (Roy, 2000). Sanctions cause 34% reduction in trade between Germany and Cuba and 31% in the case of UK and Cuba. Furthermore, in the Caribbean, due to several agreements and trade relations with the USA, Dominican Republic, The Bahamas and Barbados had significant negative effects. Dominican Republic had the largest reduction of trade due to
the Embargo, of about 37%. In the case of The Bahamas and Barbados the negative effect was slightly less, accounting for 33% and 13% less trade with Cuba, respectively.

Now that we gathered the relevant Trade Cost Equivalents (TCE), we can use them to fill in the initial trade tariff equivalents of the GSIM model, which results are discussed in the following section.

6.4. **GSIM model 1 – Scenario with actual trade flows**

It has been gathered the information needed to fill in the Excel spreadsheet matrices created by Francois & Hall (2003) in order to calculate the trade creation and trade diversion effect. As mentioned previously in the methodology, the GSIM model estimates changes in trade policies. So the results represent the changes in percentage of output and trade from the initial situation when the TCE is included in the AVE to the final situation when the sanctions are subtracted from the tariff equivalent.

Firstly, we discuss the results on changes in trade volumes in each specific trade partner. Thereafter, this section includes the trade projections from and to Cuba caused by the diversion effect.

6.4.1. **Trade Creation Effect**

The summary of the results (figure 18) shows that Cuba will be the country with the largest increase in trade flows. Thereafter the Embargo is lifted, container trade flows are expected to increase by 3.7% from/to Cuba. It is also relevant to mention that countries like Dominican Republic will encounter an increase of 0.06% on trade output. Germany and The Bahamas will actually have, roughly, a rise of 0.01% on their trade flows. Then, the UK, Japan and Norway will have a very slight increase in trade flows due to sanctions repeal and policy change.

On the down side, Spain will account with the largest loss of about 0.01% trade lost after sanctions are lifted. Other countries like Venezuela, Trinidad, Jamaica, Costa Rica and Colombia will be slightly affected with a trade reduction of about 0.005%. The rest of the countries, including the Rest of the World, will have a small drop on trade flows. The US did not have a relevant change in trade flows volumes due to the sanctions removal.

In the following section it is shown the results on trade diversion of Cuba’s trade flows obtained after lifting the sanctions values from the GSIM final tariff equivalents.
6.4.2. **Trade Diversion Effect**

Although countries do not encounter a large increase in trade, they do have significant turns in trade shifts. We can see that, in figure 19, Germany will divert 130 million USD in containerized trade to Cuba if sanctions are lifted. As expected, countries that have imposed sanctions against Cuba will increase exports of containerized trade to Cuba. Japan diverts 31 million USD, the UK 20 million and Dominican Republic 17 million USD. The US will just divert 3 million USD of export to Cuba with regards to the findings of GSIM model 1.

Countries which had close links with Cuba before the Embargo, will tend to shift trade patterns to other destinations after the Lifting. China, Spain and Mexico are having the
largest decrease of exports to Cuba. We can see in figure 19 that China will reduce the exports to Cuba by about 60 million USD. Furthermore, China is closely followed by Spain that will drop exports to Cuba almost 40 million USD. Then, on a lower scale, Mexico will reduce trade with the Caribbean country by 15.5 million USD after the Embargo’s repeal.

![Figure 19 – Output results Export to Cuba diversion effect of GSIM model 1 (In Thousand USD)](chart.png)

Source: Author.

Regarding the imports, as shown in figure 20, Germany will have the largest increase on imports from Cuba with 71 million USD more on containerized trade. Dominican Republic will import 61 million USD more from Cuba and Japan and the UK will import 17 million and 15 million USD more, respectively. Norway is still not becoming a major trade partner after the Embargo according to the GSIM model 1 results.

In the countries with the highest reduction on imports from Cuba we have Spain, The Netherlands and Venezuela, which were relevant importers of Cuban products previous
the Embargo was to be lifted. Spain reduces imports by almost 35 million USD. Further, The Netherlands drops imports of containerized trade from Cuba by 25.5 million USD and Venezuela by 15 million. It is also important to highlight that the Rest of World will also decrease imports from Cuba by 29 million USD.

![Figure 20 – Output results Imports from Cuba diversion effect of GSIM model 1 (in thousand USD)](image)

Source: Author.

Trade creation effect and trade diversion effect from the US were expected to be much larger and significant. However, results displayed above in figure 18, 19 and 20 can be hardly noticed. This could be derived from the difficulties of the GSIM model to estimate zero trade when trade sanctions are severe. The limitations of the GSIM model to predict or project future trade flows when trade was previously inexistent can lead to underestimation of the results. Therefore, the GSIM model is re-calibrated in order to better estimate the lifting of the Sanctions.
6.5. **GSIM Model 2 – Scenario with Representative trade flows**

We firstly have created a scenario in which sanctions were never imposed. We took Dominican Republic bilateral trade flows with the US and substituted with the ones between Cuba and the US, as mentioned in the methodology. When the proxy was ready, initial tariff equivalent were swapped with the final tariff equivalent ones without sanctions in order to simulate a situation in which sanction were never imposed. Hence, because sanctions are now in the final tariff, we obtain negative effect. In order to fix that, the results are multiplied by negative one and split in trade creation and trade diversion effect.

6.5.1. **Trade Creation effect**

The findings of the GSIM model 2 are more significant. Now it is obtained an extraordinary increase of 52% of Cuba’s trade volumes. As it happened with China, the opening of a closed economy might cause an exponential increase, as it can be seen in figure 21. In this case, we also capture an increase of 0.7% of US containerized trade, which goes in line with the theory previously discussed. Also Jamaica and Barbados will have a 0.03% and 0.03% trade increase, respectively, if the Embargo is lifted. The EU countries, except for Italy and Spain, will slightly gain additional containerized trade.

Whilst, Spain is the country with the largest reduction of trade flows with 0.2% of total. As expected, the close ties between Cuba and the Venezuelan government will tend to cease, causing a reduction of 0.17% of Venezuelan trade. In addition, countries that were benefited from the Trade Embargo against Cuba, such as Canada and Mexico, will have a decrease in trade of 0.10% and 0.14% respectively. Panama, Dominican Republic, Costa Rica, Colombia, Brazil and Argentina will have a slight decrease on total trade due to the lifting of the Embargo. The rest of the results are summarized in figure 21.
6.5.2. Trade Diversion effect

After running the GSIM model 2, the results interaction has changed. Now we can see a significant change in the exports from the US to Cuba. 9.5 Billion USD are expected to be exported to Cuba in containerized trade as proven by the model. The rest of the results are in line with the original model in the previous section but with a larger magnitude, where China, Spain, Mexico and Italy are the countries with the largest reduction in exports to Cuba. China reduces exports to Cuba by 1.5 billion USD. Spain drops exports by almost 1 billion USD, Mexico and Italy by 0.4 and 0.27 billion USD respectively. In figure 22 it can be noticed the summary of the changes in exports to Cuba after liftings the trade Embargo.
Similarly, when it comes to the Imports from Cuba, we again see that the US will have the largest increase in trade after the Embargo, with an increase of 3.5 billion US. In the other results summarized in figure 23 we can conclude that outcomes go in line with the results of the original model, in which Spain, The Netherlands and Venezuela are the countries with the largest reduction in import values to Cuba.
In the table 10 we can see the summary of changes with Cuba as destination, from each individual trade partner. As discussed, most of the changes were a reduction of trade, due to the extraordinary large increase of trade between Cuba and the US after the sanctions are lifted.

Now that we have a clear picture of how trade lane projections will look like, we can perform a sensitivity analysis to the GSIM model 2 results in order to see if results are considered to be sensible to changes in uncontrollable variables. By changing the elasticity of demand of the products we can have an idea of how the model is performing.
<table>
<thead>
<tr>
<th>Country</th>
<th>Imports</th>
<th>Exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>-USD 13,316.44</td>
<td>-USD 3,078.32</td>
</tr>
<tr>
<td>Bahamas</td>
<td>USD 4.21</td>
<td>-USD 92.30</td>
</tr>
<tr>
<td>Brazil</td>
<td>-USD 290,068.12</td>
<td>-USD 5,913.88</td>
</tr>
<tr>
<td>Barbados</td>
<td>-USD 2.63</td>
<td>-USD 91.13</td>
</tr>
<tr>
<td>Canada</td>
<td>-USD 222,026.61</td>
<td>-USD 20,063.52</td>
</tr>
<tr>
<td>China</td>
<td>-USD 1,497,037.72</td>
<td>-USD 2,431.79</td>
</tr>
<tr>
<td>Colombia</td>
<td>-USD 44,397.36</td>
<td>-USD 3,231.87</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>-USD 18,393.60</td>
<td>-USD 9,060.82</td>
</tr>
<tr>
<td>Germany</td>
<td>USD 21,814.66</td>
<td>-USD 20,202.02</td>
</tr>
<tr>
<td>Dominican Rep.</td>
<td>USD 3,564.64</td>
<td>-USD 12,232.61</td>
</tr>
<tr>
<td>Spain</td>
<td>-USD 998,491.04</td>
<td>-USD 289,204.13</td>
</tr>
<tr>
<td>France</td>
<td>-USD 48,516.54</td>
<td>-USD 36,247.82</td>
</tr>
<tr>
<td>UK</td>
<td>USD 836.13</td>
<td>-USD 4,649.98</td>
</tr>
<tr>
<td>Italy</td>
<td>-USD 267,992.88</td>
<td>-USD 42,302.24</td>
</tr>
<tr>
<td>Jamaica</td>
<td>-USD 259.39</td>
<td>-USD 3,488.81</td>
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<tr>
<td>Japan</td>
<td>USD 23,341.99</td>
<td>USD 1,444.18</td>
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<tr>
<td>Mexico</td>
<td>-USD 391,452.27</td>
<td>-USD 13,118.71</td>
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<tr>
<td>Netherlands</td>
<td>-USD 88,791.80</td>
<td>-USD 212,559.42</td>
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<td>Norway</td>
<td>USD 1,124.30</td>
<td>USD 170.07</td>
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<td>Panama</td>
<td>-USD 1,511.91</td>
<td>-USD 214.65</td>
</tr>
<tr>
<td>Trinidad &amp; T</td>
<td>-USD 3,463.65</td>
<td>-USD 6.28</td>
</tr>
<tr>
<td>United States</td>
<td>USD 9,503,266.40</td>
<td>USD 3,463,816.94</td>
</tr>
<tr>
<td>Venezuela</td>
<td>-USD 13,203.85</td>
<td>-USD 128,414.55</td>
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<tr>
<td>ROW</td>
<td>-USD 542,535.87</td>
<td>-USD 222,461.74</td>
</tr>
</tbody>
</table>

Table 10 – imports/exports changes summary from/to Cuba in trade values (Thousand USD)

Source: Author.

6.6. **GSIM model Sensitivity Analysis**

Due to the fact that we have utilized different types of commodities in order to create our representative container, it would be appropriate to better test the results of this research by changing the elasticity of demand of the commodities and illustrate if the results keep similar predicted results.

The results were calculated using the previously mention 3.5 demand elasticity (In absolute values), given that manufactured products are somewhat elastic. Changing the demand elasticity to a larger number, such as 5, we see the results are still the same, but
with a slight increase in volume of trade due to a more elastic nature. It has also been tried to reduce elasticity to a lower number, such as 2. The results continue to be in line with the original results, but with a slightly drop in volume. For example, the output change instead of being 52%, came out to be 51.6%.

6.7. **Analysis for the shipping lines**

Albeit the results of Cuba’s trade changes were to be expected, there are other results that might unexpectedly change the dynamics of the Caribbean islands after the sanctions were to be lifted.

In addition, shipping lines can benefit from being acknowledged on changes in trade to take decisions on freight rates, fleet composition and scheduling.

In this section we focus on the outcomes related to the major Caribbean Islands. Cuba had been already analysed and The US has just reduced trade with the rest of the Caribbean Island after the sanctions (see appendix 10). The void left by US reduction of trade along the rest of the Caribbean Islands, changes the perfective of the region. In the next section it is firstly assessed the results on trade diversion along the Caribbean. It is then further explained how these shits in trade can be translated into benefits for the shipping lines.

6.7.1. **Trade dynamics in the Caribbean**

The most relevant changes in the case of Bahamas as destination. On the side of the imports from Bahamas, it can be observed in figure 24 (below) that Mexico had an increase of 123 thousand USD on imports from Bahamas, followed by Dominican Republic and Panama, which had an increase on imports from Bahamas of 104 and 94 thousand USD respectively. Then, Costa Rica and Colombia had a relevant increase on imports of about 56 and 33 thousand USD, proportionately. On the exports side, just Trinidad and Tobago and Venezuela had a relevant increase of 16 and 3 thousand USD to Bahamas.
In the figure 25 below, it can be illustrated the summary of trade changes within the Caribbean, that had Barbados as destination. Trinidad and Tobago was the trade partner with the largest change in trade with Barbados. Trinidad will import 343.11 thousand USD more after sanctions repeal and will also export 58 thousand USD more containerized cargo. Panama, Costa Rica and Dominican Republic will follow in terms of imports from Barbados, with an increase of 58, 40 and 32 thousand USD. After that, Trinidad, Jamaica and Dominican Republic are the candidates to follow with the largest increase in exports to Barbados with 55 and 46 thousand USD.
For instance, Dominican Republic is the candidate with the largest changes in within the Caribbean Islands (figure 26 below). After lifting the Embargo, Mexico’s containerized imports from Dominican Republic are expected to increase to 6.7 million USD. Costa Rica expect to increase imports up to 2.4 million USD and Colombia 1.66 million USD from Dominican Republic. It is also important to mention that Trinidad follows with a large increase of 1.2 million USD on containerized imports from Dominican Republic. On the Exports side, the effects are slightly lower, were Costa Rica, Jamaica and Colombia play a role on the increase of 251, 200 and 125 thousand USD of exports to Dominican Republic after sanctions are removed.
It appears to be that Jamaica has also quite large changes in trade flows along the Caribbean. It seems that the tides with the CARICOM and other countries in South America will be increased by the Lifting of Cuba’s sanctions.

As it can be seen in figure 27 (below), the largest change will occur within bilateral trade from Jamaica to Trinidad. The imports will increase 740 thousand USD after sanctions and the exports to Jamaica will increase 38 thousand USD. Mexico, Costa Rica, Colombia and Dominican Republic increase their imports from Jamaica in about 342, 307, 259 and 200 respectively. Those countries follow Trinidad and Tobago as the countries with the largest trade change with Jamaica as Destination. When it comes to imports, Dominican Republic, Mexico and Trinidad are the candidates that would have the largest increase. Dominican Republic accounts for an increase of 56 thousand USD, Trinidad 38 thousand and Mexico 34 thousand USD. The rest of the partners are not negligible, but the changes have lesser magnitude.
In terms of trade diversion, Trinidad and Tobago as destination country takes the second place with the largest trade changes, after Dominican Republic. Figure 28 is self-explanatory in making a clear picture of how variant trade flows from/to Trinidad and Tobago will be. The candidate to have the largest export to Trinidad and Tobago is Jamaica, which will be increased 1.18 million USD. Venezuela exports to Trinidad will also encounter a large increase of 945 thousand USD. Dominican Republic, Costa Rica and Barbados follow with an increase in exports to Trinidad of 741, 629 and 343 thousand USD, respectively. Changes in Imports are slightly lower if we compare then with the exports. Mexico presents the largest change in imports from Trinidad, with abut 437 thousand USD. Costa Rican import changes from Trinidad are also quite substantial, with an increase of 230 thousand USD. Then, Venezuela and Colombia follow with an increase of 175 and 130 thousand USD in containerized imports from Trinidad and Tobago.
It can be intuited that results are quite promising. The containerized trade within the Caribbean region seems to have potential changes in the upcoming future if sanction against Cuba are lifted. Now that we certainty know that trade creation effect will occur and that it is somewhat evident the effects on trade diversion, analysis upon freight rates, fleet capacity utilization and vessel scheduling can be drafted and translated into benefits for the shipping lines.

6.7.2. Freight rates

Following the economic theories of supply and demand, we can intuit that, the estimated increase of Cuba’s trade flows and US trade flows will boost demand of manufactured goods, which will trigger the needs for containerized cargo transportation (Stopford, 2009). The consequences of the trade creation effect obtained by the GSIM model will ultimately rise container freight rates in the trade routes linked between Cuba and the US. We can recall that the increase in Cuba’s trade flows is expected to be around 52% of current trade. In addition, the US is expected to increase 0.7% its containerized trade. Due to the rise on freight, which will be beneficial for the shipping lines, we can
recommend further investment on cargo operations in main hubs in the Caribbean, especially in the Port of Miami in the US and Mariel container Terminal in Cuba, near Havana. Investments might press for further revenues to the container services in the Caribbean.

6.7.3. Capacity Utilization and Scheduling

Further to the changes in supply and demand of containerized goods, from our perspective, it appears that there will be relevant changes in trade routes along the Caribbean region. In that sense, shipping lines could better use their fleet capacity utilization, re-allocating their fleet into trade routes that would perform significant changes in volume after the Embargo is lifted.

Moreover, not only shipping lines can re-allocate ships into current existing trade routes, but they can also open or add into their daily/weekly/monthly service operations in the Caribbean, the routes that would have more significant change after sanctions are removed.

In table 11 (below) we can be acquainted with the potential major trade route changes along the Caribbean Islands. Generally, we can observe, Dominican Republic, Trinidad and Tobago and Jamaica carrying the outmost important changes after the Embargo is lifted. The results in table 11 are organized by magnitude of increase. Shipping lines can be recommended to consider Dominican Republic, Jamaica and Trinidad and Tobago in addition to Cuba and the US, when re-structuring their operations. Re-scheduling might increase efficiency on voyage management. None of the results that were not mentioned, are negligible, but we can classify as more relevant the ones in table 11, which are the ones with the largest change in volume.
<table>
<thead>
<tr>
<th>Position</th>
<th>Trade route (from (\rightarrow) to)</th>
<th>Change (thousand USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dominican Rep. (\rightarrow) Mexico</td>
<td>6,735.6</td>
</tr>
<tr>
<td>2</td>
<td>Dominican Rep. (\rightarrow) Costa Rica</td>
<td>2,423</td>
</tr>
<tr>
<td>3</td>
<td>Dominican Rep. (\rightarrow) Colombia</td>
<td>1,663.67</td>
</tr>
<tr>
<td>4</td>
<td>Jamaica (\rightarrow) Trinidad &amp; T.</td>
<td>1,178</td>
</tr>
<tr>
<td>5</td>
<td>Dominican Rep. (\rightarrow) Trinidad &amp; T.</td>
<td>1,179.9</td>
</tr>
<tr>
<td>6</td>
<td>Venezuela (\rightarrow) Trinidad &amp; T.</td>
<td>945</td>
</tr>
<tr>
<td>7</td>
<td>Costa Rica (\rightarrow) Trinidad &amp; T.</td>
<td>629</td>
</tr>
<tr>
<td>8</td>
<td>Trinidad &amp; T. (\rightarrow) Mexico</td>
<td>437.48</td>
</tr>
<tr>
<td>9</td>
<td>Barbados (\rightarrow) Trinidad &amp; T.</td>
<td>343.11</td>
</tr>
<tr>
<td>10</td>
<td>Jamaica (\rightarrow) Mexico</td>
<td>343</td>
</tr>
<tr>
<td>11</td>
<td>Jamaica (\rightarrow) Costa Rica</td>
<td>307.57</td>
</tr>
<tr>
<td>12</td>
<td>Jamaica (\rightarrow) Colombia</td>
<td>259.83</td>
</tr>
</tbody>
</table>

Table 11 – Major trade routes changes in containerized services in the Caribbean

Source: Author.

Lastly, we can see in figure 29 the New dynamics in the container services in the Caribbean that would be given by lifting the trade Embargo. The trade routes numbering is linked with table 11. In addition, a thicker arrow is added between Cuba and the US in order to show the largest expected increase in trade flows.
Figure 29 – Major Trade route changes in containerized services in the Caribbean

*Source: Author with map retrieved from maps.of (2016).*
7. Conclusions

In the following chapter it is illustrated the summarized primary findings of this research. In addition, the research drafts a short set of recommendations that can be derived from the final results. Moreover, it is explained the implications of the research, together with the limitations that were found on the elaboration. Ending with few final suggestions for further research.

7.1. Primary Findings

Primarily, the main focus of this research was leaded with the main research question of 'What would be the impact of lifting the Cuba Democracy Act against Cuba on maritime container trade and how can this be translated in potential benefits for shipping lines in the Caribbean'. With this question the research explains the direct impact of CDA, acting as the trade Embargo, specifically on container trade in the Caribbean. In order to help answering the main question, further sub-research questions were drafted. It was firstly asked 'What is the current geopolitical and trade situation and which are the implications of the Cuban Democracy Act against Cuba on the Container Services'. With this question, the research was able to build a base scenario, draw an actual situation and expectations which were later discussed and explained in the literature review and overview. Secondly and Thirdly, the sub-research questions ask 'What is the trade creation and What is the trade diversion effect of lifting Cuban Democracy Act on actual container trade flows in the Caribbean'. Those two questions help to narrow down the overall effect that lifting the sanctions has on trade, into two specific effects, trade creation and trade diversion. Lastly, this study asks ‘How changes in trade flows can be translated into potential benefits for the shipping lines’. This question summarizes the effect obtained in trade creation and trade diversion to then translated on recommendations for the shipping lines using an elementary economic analysis.

Regarding the first sub-research question, the research concludes that, as long as seaborne trade concerns, the CDA can be taken as “the Embargo” as one, without considering other statutes. Changes in trade policy just affects the level of restrictiveness of the Embargo. In addition, the geopolitical and trade situation provides relevant insides on the relation between Cuba and the US throughout the years. It was found a close relation between Cuba and the US before the Embargo was imposed. After years of tensions, Cuba and the US re-establish political relations, which gives a positive signalling for reduction in trade barriers and trade growth.

With regards to Cuba’s trade flows targeted on the main research question, it can be said that the theoretical foundations of the gravity are able to predict changes in trade flows. Helped by the gravity, it has been obtained a set of relevant explanatory variables that can be used to determine trade. Apart from the traditional GDP and Distance, which are typically used in the gravity, GDP per capita, colonial ties, border sharing, common and trade unions were proven to have a significant impact on trade. An increase on the GDP of the exporter country of 1%, increase trade by 1.08% and 1.02% in the case of the
importer country. Distance reduces trade flows by 5.6% if countries are 10% farther away. On the side of the socio-economic variables, having colonial ties increases trade by 12%, Share border increases trade 21% and being part of the same trade bloc increases trade by 19%. Although, it has been shown that countries of which limited Embargo was imposed, presented a reduction of 25% of containerized trade flows. In the case of countries that imposed extensive trade Embargo, the reduction of trade resulted to be 67%. In addition, each sanction fixed effects were proven to be significant. US accounts with the largest reduction of trade due to the Embargo, down to 86%. Japan and Norway follow with 59% and 54% respectively. In the Caribbean, Dominican Republic shows 37%, which is the largest reduction of trade due to the Embargo.

Helped by the GSIM, the research outline relevant results, which follows the theory on trade diversion and trade creation effect after a trade policy change. Results on trade creation show that Cuba and the US would have the largest benefit from lifting the sanctions. The increase on trade volume is calculated to be 52% of Cuba’s containerized trade and 0.7% of the US containerized trade. In the Caribbean, Jamaica and Barbados will have a notable increase in trade of about 0.03% and 0.02% respectively. On the down side, Spain is expected to reduce containerized trade flows by 0.2% after sanctions are lifted. It is also the case for Venezuela, Canada and Mexico with a reduction of 0.17%, 0.10% and 0.14% respectively.

On trade diversion effect with Cuba as destination, it was concluded that The US will increase its exports to Cuba by 9.5 billion USD and imports from Cuba 3.5 Billion USD. China, Spain and Mexico are expected to decline exports to Cuba by 1.5, 1, and 0.4 billion USD respectively. Further, on the imports side, Spain, Netherlands and Venezuela will be the countries with the largest decrease on imports from Cuba.

In the Caribbean, the picture was found to be affected if the Embargo was to be lifted. Dominican Republic is expected to encounter the largest change in trade volumes through its trade partners in the Caribbean, followed by Trinidad and Tobago and Jamaica. The route from Dominican Republic to Mexico is expected to have the outmost increase of 6.7 million USD. Dominican Republic to Costa Rica 2.4 and Colombia 1.66 million USD increase in trade. Jamaica is expected to see an increase on the trade lane to Trinidad and Tobago on 1.18 million USD and Trinidad will receive 945 thousand USD more trade from Venezuela, 629 thousand USD from Costa Rica and 343 thousand USD from Barbados. Trinidad will also increase trade to Mexico by 437 thousand USD.

In a not shell, according to the results obtained, we suggest that lifting Cuba’s trade Embargo is likely to stimulates new dynamics for the container services in the Caribbean. Following the last sub-research question about how to translate the results into potential benefits for the shipping lines, the next section focuses on the recommendations obtained from the results.
7.2. **Recommendation for the shipping lines**

Apart from the primary findings already mentioned, the objective of this research was to translate the trade creation and trade diversion effect into benefits for the shipping lines. Following the theory, it can be said that the increase on trade flows in Cuba, the US, Jamaica and Barbados will push freight rate upwards, giving a relevant boost to shipping lines actual revenues. Containership companies might improve further their performance by investing in the major container terminal hubs in the Caribbean, especially in the port of Miami in the US and Mariel container terminal in Cuba.

It can also be recommended to compare actual fleet route distribution and, if needed, reschedule operations where major changes will occur after lifting the sanctions in order to improve fleet capacity utilization. In addition, it is advisable to include the port of Rio Haina (Dominican Republic), Kingston (Jamaica) and Port of Spain (Trinidad and Tobago) as part of voyage scheduling in order to benefit from major trade routes changes along the Caribbean if sanctions are lifted.

It can be concluded that, there will be significant benefits for the shipping lines trading in the Caribbean if sanctions are lifted.

7.3. **Limitations of the Research**

We have found the results of the research to be quite satisfactory. However, there are some relevant limitations that needs to be consider in order to better understand the reach of the results.

Due to the limited amount of data, a proxy for containerized trade has been used. It was used a combination of several manufactured goods. All those goods are not necessarily part of the containerized trade and might reduce accuracy of the results but without affecting relevance and validity. In addition, the effect of the Initial Embargo imposed in the sixties was not possible to estimate with the data available, for which was obtained the effect of liftings several statues of the trade sanction.

The GSIM model is a partial equilibrium model, which primarily goal was to estimate changes in economic welfare and prices. Using the GSIM might reduce the effect on intra industry trade and general equilibrium effect derived from lifting trade sanctions. In addition, in the GSIM projections we are assuming that trade between US and Cuba would have similar values as the trade between Dominican Republic and the US. That assumption might present small variation on results if other proxy were taken.

It is also relevant to mention that sanctions are traditionally gradually lifted, which mitigates the effect on trade. Furthermore, there are still capacity and operational limitation in handling large increase on trade in the case of many Islands in the Caribbean and trade routes around the world, including Cuba. Hence, the changes on trade flows might happen progressively through the years to come the after lifting is announced. In
addition, the research writing period was unable to include latest geopolitical developments around Cuba and the US that might have a slight effect on current trade.

Lastly, recommendations for the shipping lines are not done by performing a cost-benefit analysis or an optimal allocation calculation in order to best schedule the current container service. In that sense, advisable results will ultimately depend on each current operational condition a needs of each specific shipping line.

7.4. **Final suggestions**

It is advisable for further researches on the topic of Cuba’s trade Embargo to partner with well-known data provider or company that might be interested on the research. First hand data from trade flows might benefit the final results of the research. It is also important to mention that TEU transformation of trade values will add value to the final results, where output can be more plausible for shipping companies to better benefit from it. Unfortunately, due to operational constraints, the transformation was not able to be performed. In addition, we suggest to perform a deep analysis on operational and scheduling optimization of trade route changes after lifting sanctions. That will give a rich approach for shipping companies to plan their voyage scheduling.

At last, we suggest further researchers to perform an analysis of changes in trade flows by lifting Cuba’s trade Embargo from the point of view of other sectors of the shipping industry.
Bibliography


Appendices

Appendix 1 – Relation between GDP and trade flows

Figure 30 - Relation between GDP and trade flows

Source: Author.
Appendix 2 – Relation between Distance and Trade

Figure 31 - Relation between Distance and trade flows

*Source: Author.*
Appendix 3 – Histogram of gravity model error term

![Histogram of gravity model error term](image)

*Figure 32 – Histogram of gravity model error term*

*Source: Author.*

Appendix 4 – Correlogram

<table>
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<th>Variables</th>
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<th>InGDP*p</th>
<th>InDIST</th>
</tr>
</thead>
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<td>-</td>
</tr>
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<td>0.1979</td>
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*Table 12 – Correlogram of classic gravity model variables*

*Source: Author.*
Appendix 5 - GSIM 2 Results Colombia’s Trade changes (in thousand USD)

Figure 33 - GSIM 2 Results Colombia’s Trade changes (in thousand USD)

Source: Author.
Appendix 6 - GSIM 2 Results Costa Rica’s Trade changes (in thousand USD)

Figure 34 - GSIM 2 Results Costa Rica’s Trade changes (in thousand USD)

Source: Author.
Appendix 7 - GSIM 2 Results Mexico’s Trade changes (in thousand USD)

Figure 35 - GSIM 2 Results Mexico’s Trade changes (in thousand USD)

Source: Author.
Appendix 8 - GSIM 2 Results Panama’s Trade changes (in thousand USD)

Figure 36 - GSIM 2 Results Panama’s Trade changes (in thousand USD)

Source: Author.
Appendix 9 - GSIM 2 Results Venezuela’s Trade changes (in thousand USD)

Figure 37 - GSIM 2 Results Venezuela's Trade changes (in thousand USD)

Source: Author.
Appendix 10 - GSIM 2 Results USA’s Trade changes (in million USD)

Figure 38 - GSIM 2 Results USA’s Trade changes (in thousand USD)

Source: Author.