ERASMUS UNIVERSITY ROTTERDAM
Erasmus School of Economics
Master Thesis International Economics

The Effect of Preferential Trade Agreements on Latin American Trade

Alexandre Boisseau
572273
Supervisor: Prof. dr. J. Emami Namini
Second Assessor:
Date Final Version:

Abstract

Latin American countries have in the 1990's rapidly changed perspective on international trade which led to the creation of three preferential trade agreements; ACN, CACM and Mercosur. While trade liberalisation is often praised for its positive effects on a country's trade and general economic development, member countries of such Latin American PTAs had low initial engagements in intra-regional trade and low levels of industrialisation which posed the question whether implementing the three PTAs within the region would benefit its members. Using a gravity model, this research has found that the PTAs have had positive stimulating effects for intra-regional trade flows between member countries and trade flows with trade partners outside of the region. However, trade diversion affects were found for the members of the ACN and CACM agreement between other Latin American countries, suggesting that the implementation of those PTAs have led to become a significant obstacle for general economic integration in the region.

Table of Contents

1. Introduction

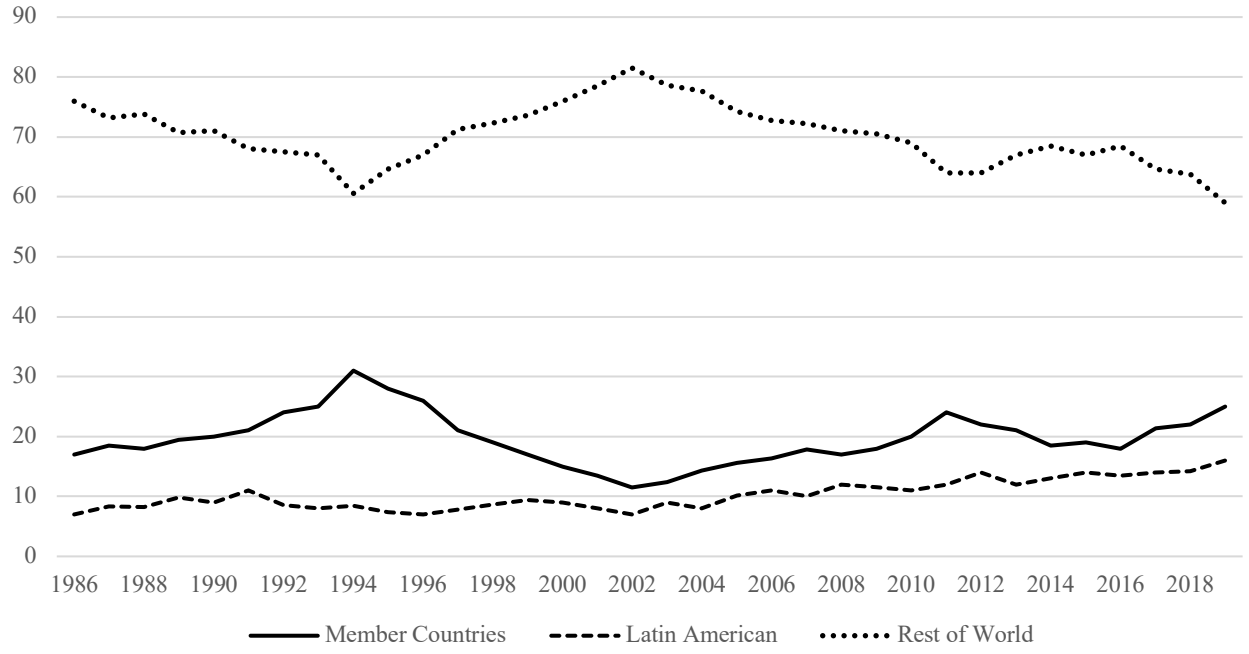
Many Latin American countries have since the early 1990's rapidly chosen a different approach on their international trade policies and their perspective on trade liberalisation. Just within several years, most of the continent's economies have turned from having restrictive policies to having the world's most open ones (Creamer, 2003). Next to an increase of policies determined by multilateral agreements, the most prominent way for these countries to implement their new perspective on trade has been the adoption of Preferential Trade Agreements (PTA) within the Latin American region.[1] Open regional trade agreements between countries and regions are often defined as crucial stages in the path towards integration in the world economy (Chaudhuri & Stallings, 1997). Accordingly, countries need to first accumulate the fundamental strength in order to participate at the global level and therefore engage in multilateral reduction of both tariff and non-tariff barriers to stimulate intra-regional trade to achieve this (Creamer, 2003). Moreover, the decision of Latin American countries to engage in such policy harmonisation has also been studied to be the results of efforts by nations to maintain control of their economies faced by the increasing levels of globalisation process around the world (Axline, 1994).

The case for Latin American free trade agreements have been often investigated with various conclusions about their possible trade creation and diversion effects on Latin American trade. Blackhurst & Henderson (1993) consider these PTAs in the Latin American region as advantageous towards a multilateral free trade environment. More specifically, Creamer (2003) evaluates the extent to which the Andean Community of Nations (ACN) has affected intra- and extra-regional trade. Using trade data from its member countries from before and after the creation of the ACN, his research provides evidence that the trade liberalisation efforts of the country-bloc has had positive effects on both intra- and extra-regional trade. Contrarily to these findings, Bhagwati, Greenaway, & Panagariya, (1998) present evidence of trade diversion for the Common Market Mercosur (hereafter referred to as Mercosur) and argue that this particular PTA could potentially become a costly and an inferior policy decision towards free trade. Furthermore, Michaely (1999) finds strong evidence which suggests that the likelihood of the PTA agreements within Latin America to be successful are low. This argument is explained in twofold. First, low starting tariffs and non-tariff barriers on trade flows among Latin-American counties would lead to a more adverse impact. Second, only a small share of Latin American countries is actively engaged in extra- and intra-regional trade. This line of argument combined with evidence of low levels of economic development and a significant absence of economic diversification in the majority of Latin American countries contribute to the discussion

[1] An overview of the relevant preferential trade agreements and their country members can be found in Table 1. of the appendix

of the effectiveness of the implemented PTAs in the region. In addition, the highest possible combination of Latin American countries in terms of intra-regional trade were found to be between Brazil and Uruguay. The two partners of the Mercosur agreement were found to account for merely 20-25% of their total trade flows in 1996 (Michaely, 1999). To create a more complete and recent picture of this intra-regional trade development between the Mercosur member countries, Figure 1 displays the share of total trade flows from Mercosur member countries towards other member countries, countries in the Latin American region and the rest of the world. Here, it can be observed that trade flows between the Mercosur member countries as a fraction of total trade flows have declined significantly after the initial implementation of the PTA in 1991 and has started to move upwards in recent years, albeit still remaining lower than the highest point of intra-regional trade observed in 1994.

Figure 1. Mercosur trade flows between member countries, Latin American countries and the rest of the world (as a % of total Mercosur trade flows, 1986-2019):



Source: Author's own calculations, trade flows data retrieved from UN Comtrade (2021)

Considering the two lines of arguments provided by Michael (1999) concerning the effectiveness of the implementation of different PTAs within the Latin American region in combination with the contradictory views of the effectiveness of the implemented Latin American PTAs by the existing literature. This research will investigate the effects the three PTAs have had on the trade flows of Latin American countries. In order to disentangle the effects of these PTAs, intra- and extra-regional trade flows will be explored using panel data between Latin American countries which are member of the same PTA, the trade flows between Latin American countries which are member of a different

PTA and the trade flows between Latin American countries with the rest of the world. This paper's contribution to the existing literature is twofold. First, it adds to the broad literature on international trade and on the effectiveness of PTAs for countries which have a relatively low impact on world trade. Second, while several papers have been published on Latin American trade, none have evaluated the effectiveness of the trade policy harmonisation conducted by these countries considering all three PTAs currently implemented in the region.

Moreover, most studies relevant to this string of research carried thus far have followed a different empirical approach on estimating the effects on trade after implementing a PTA. While Trotignon (2010) and Martinez (2003) researched the impact of PTAs on trade flows, both authors solely focus on generalized extra-regional trade of several country blocs across several continents without observing the effects of an individual and specific region containing several country blocs and PTAs. This paper on the contrary, will distinguish the impacts between both intra- and extra-regional trade for all individual PTA member blocs consisting of the Latin American countries described in Table 1. Another paper by Carrillo, & Li (2004) has specifically investigated the impact of PTAs on trade between the Mercosur and ACN country blocs between 1980 and 1997. While this paper has found a positive correlation between these PTAs and their trade flows it also does not take into account the effects on trade flows between the two country blocs nor the CACM PTA or trade flows with the rest of the world. Furthermore, while several studies have investigated the trade creation and trade diversion effects of PTAs on Latin American trade flows, few have implemented a gravitational approach in trying to estimate the causal relation between them (Wise, 1999; Burges, 2005; Briceño-Ruiz, 2010). The gravitational approach used in this paper will therefore allow to measure the contribution of PTAs in Latin America on trade flows in a way that has not yet been explored. This will be done in several ways. First, several adjustments in the gravity model will be introduced to account for a wider variety of country specific factors. This approach differs from Carrillo, & Li (2004) who uses limited country specific variables and more prominently, uses absolute geographic distances instead of relative distances, a considerable difference which will be discussed in the following sections. Second, a broader scope of individual countries in combination with the discussed trade blocs will be used in the data sample which has not yet been explored in a gravitational setting.

Moreover, the existing literature whom have investigated the trade flows of Latin American trade blocs using a gravitational approach did so with the use of data samples which were gathered only several years after their implementation (Martinez, 2003; Carrillo, & Li, 2004). The chosen data sample for this paper therefore allows for the use of a broader and more recent trade data which allows for more appropriate estimation results in order to comment on the level of regional integration of

Latin American countries since the implementation of the three different PTAs. This research is structured as follows. First, an overview of the relevant trade theory is explored followed with a brief historical background of each Latin American PTA. Second, the methodology is discussed where the gravitational approach and included variables are explained. Complementing this, the data and potential estimation challenges are described and taken into consideration. Lastly, the results of the estimation efforts are presented and discussed followed by the conclusion.

2. Literature Review - Latin American orientation towards trade liberalization

The prominent reason for a country to enter in a PTA is evidently to increase the country's welfare. The impact a PTA has on a country's trade flows and consequentially on the country's welfare stems from three stylised mechanisms; trade diversion, trade creation and consumption effects (Rousseaux & Meade, 1957). Thus, the more relevant the PTA becomes, the larger these mechanisms are affected. In general, the first mechanism on trade diversion has a negative effect on the economy's welfare; the second and third, trade creation and the consumption effect, have a positive effect and raise the welfare (Michaely, 1977). Such mechanisms occurred by a country thus depend on its inclusion or exclusion of a certain PTA within a specific region (Bulmer-Thomas, 1998). The creation of three separate PTAs in the Latin American region each consist of different trade policies, tariffs and other non-tariff barriers such as quotas and different regulations towards product standards. This policy divergence and general protectionism between the three country-blocs in the Latin American region are therefore argued to pose significant challenges towards economic integration and multilateral cooperation and intuitively, negatively affects intra-regional trade between countries within the region which are not member of the same PTA (Bulmer-Thomas, 1998).

Moreover, in order to evaluate the potential relevance of a PTA on an economy's welfare it is relevant to observe the pre-PTA trade conditions between the countries entering in the PTA. A PTA is more likely to be of significant and positive value between two partner countries, let's say Home and Foreign, when; the higher the Home country's tariffs are prior to the PTA, the higher are the tariffs of Foreign, the larger the economic size of the partner country, and the more diversified the exports for both Home and Foreign are (Michaely, 1999). Additionally, PTAs are also more likely to be relevant and lead to less trade diversion and more trade creation when the share of imports from the potential trade partner within the PTA is higher. Also beneficial to this mechanism is the existence of a higher share of exports to the partner countries which would contribute to an amelioration of the country's terms of trade following the removal of trade tariffs. In relevance to Latin American countries, it is argued that from this perspective the various PTA's would not yield positive results or to have relatively low significance on either three welfare mechanisms (Michaely, 1999). This is

prominently explained by the relatively low initial trade flows which crosses borders between member countries of the implemented PTAs, as displayed in Figure 1.

The time varying political orientation of the Latin American countries could furthermore be relevant in explaining relevant intra- and extra-regional trade flows when considering the unequal distribution of income and wealth in the countries. As trade liberalisation involves the lowering of trade barriers, resulting in the increased creation of efficiency in resource allocation to stimulate trade in the respective country, such efficiency gains depend on the domestic market structure of trade (Dijkstra, 2000). If government intervention is replaced by private monopolistic or oligopolistic control of exports, the potential increase in allocative efficiency will not maturate. Therefore, this adverse effect will be more prominent for economies with tendencies towards imperfect markets, such as Latin American countries (Dijkstra, 2000). In addition, small countries are more prone to the occurrence of market concentration due to their relative seize (Dominguez, 2002). For this reason, controlling for the overall governmental preferences of the Latin American countries towards redistributing income in their respective economies, proxied by political orientation, is particularly important considering the inclusion of many relatively small countries in the sample of this research.

However, prominent evidence from economies who have experienced significant economic growth after the adoption of export-oriented policies and the failure of inward-looking economies have also been attracting many countries to open up their economies towards foreign trade, regardless of their political orientation of being democratic or autocratic (Dicken, 2003; Friedman, 2005). Therefore, a convergence may be present between both democratic and autocratic countries towards trade liberalisation. Additionally, while political differences and instability between countries has been a significant stumbling block for Latin American bilateral trade, previous research finds that the extent of such political effects may be small. This is explained by the prevalence of external pressure by international institutions such as the World Trade Organization or the International Monetary Fund to guide countries towards trade liberalisation, regardless of their domestic political orientation. (Zhou, 2011).

The creation of free trade areas and customs unions is as previously discussed prominently intended to rapidly increase industrializing in the participating countries. Which in turn has the objective to be accompanied by a rise in productivity and income and to decrease a country's dependency on the rest of the world. These objectives are pursued through the freeing up of trade and the adoption of a common external tariffs between member countries and is agreed upon in a multilateral agreement where such benefits are intended to be equally distributed amongst participating countries (Cadot et

al., 2012). The efforts and orientation to engage and participate in such trade liberalisation measures were however not heterogenous amongst all Latin American countries and country blocs. Various country pairs and groups within the region have experienced different levels of economic cooperation but also economic and political disagreements in the periods leading up to the implementation of the string of PTAs in the 1990's (Quispe, 2015). Moreover, governmental orientation towards regional integration and general economic freedom in various countries of the region have experienced drastic and abrupt changes. Such changes in the orientation towards trade is considered primarily to have been led by changing regimes or governing political parties which resulted in the creation or abolition of democratic and capitalistic oriented institutions (Odello & Seatzu, 2015).

The various regional economic integration frameworks which have been implemented by the three Latin American country-blocs are also argued to face significant challenges to achieve the sought-after positive effects on intra- and extra-regional trade flows. One of such challenge, is argued to be the constraint created by the relatively small size and limited influence of the established institutions to adhere trade policies and stimulate growth for each of the three PTAs (Odello & Seatzu, 2015). These constraints combined with the fact that each of the three PTAs in the Latin American region has relatively few country members, further limit the ability of these small institutions to compete with the other large trade areas in the world and main international economic institutions such as NAFTA, the EU and Japan (Odello & Seatzu, 2015). Secondly, the economic asymmetries between the member countries within the three PTAs are argued to potentially induce political instability and policy incoherence. This line of argument is notably relevant for the Mercosur agreement, which is composed of two relatively economic large countries (Brazil and Argentina) and two relatively economic smaller countries (Paraguay and Uruguay) (Odello & Seatzu, 2015). Lastly, the creation of three separate PTAs within the Latin American region imposes significant stumbling blocs towards the efforts of economic and social integration between all countries within the region (López-Jacoiste Díaz, 2015).

In order to provide a better understanding of the events leading up to the creation and implementation of the ACN, Mercosur and CACM agreements, the following sections present a concise overview of the individual PTA's objectives and historical context.

2.1 The Andean Community of Nations (ACN)

The Andean Community of Nations comprising of the South American countries of Bolivia, Columbia, Ecuador and Peru knows a long historical narrative where economic cooperation between the group of countries already started in the nineteenth century (Odello & Seatzu, 2015). The

historical and ideological precedents of the cooperation between the countries stems from various attempts to maintain a macro-region in Latin America of the "Andean" culture. The geographic and cultural link between this group of countries have seen various previous attempts towards more economic integration and cooperation before the implementation of the ACN free trade area. Most prominently, the Andean Pact was signed by the group of countries in 1969 in Bogota which had the objective of addressing the various integration and development objectives of the countries (Ametoglo, 2016). These multilateral efforts ultimately led to the creation of the free trade area between the countries in 1993 and in 1995 the adoption of a Common External Tariff. Regional integration and economic factors were not the only consideration for the ACN member countries to see the successful implementation of the PTA happen. As various member countries of the ACN have experienced various political turmoil in the form of civil unrest and coup d'etas, the expected economic growth from the PTA implementation was also considered as a crucial step towards more political stability (Ametoglo, 2016).

2.2 The Central American Common Market (CACM)

The origins of the CACM knows like the ACN free trade area a lengthy historical narrative which began in 1960 where, negotiations between potential member countries began. These negotiations were however halted in the 1970s and again resumed in the late 1980s (Bulmer-Thomas et al., 1992). The ultimate customs union agreement between Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama was signed in 1991 and implemented in 1993. While the trade liberalisation efforts of these countries were seen as significant improvements for the economic and cultural integration of the region, its effects on the trade flows of the countries were put into question. This negative perspective of the creation of the union was two-fold. First, the intra-regional trade between the countries before the creation of the union was negligible and the industrial capacity for potential trade creation effects between the countries were lacking. Nor did the countries hold significant comparative advantages with each other except in the case of the production of primary goods (Cáceres, 1994; Rodlauer & Schipke, 2005).

In spite of this, the creation of a custom union which was believed to become net trade diverting may not be entirely irrational. In his paper, Bulmer-Thomas (1998) explores the several mechanisms which has led to the creation of the CACM. Here, it is discussed how it could still hold positive effects on the welfare of its member countries despite potentially being net trade diverting. Because of the relative importance of Central American countries on the world supply of certain commodity markets (such as bananas), trade diversion effects could theoretically lead to an improvement in the external terms of trade of member countries. Therefore, a decrease in output as a consequence of trade

diversion may not be welfare reducing when the objectives of dependency reduction on the external sector are met and rapid industrialisation is achieved in combination with the improvement of the net terms of trade (Bulmer-Thomas, 1998).

2.3 The Southern Common Market (Mercosur)

Similar to the ACN and CACM agreements, the main aim of Mercosur has been the focus on trade liberalisation with the objective to stimulate trade and create more political stability between its member countries (Argentina, Brazil, Venezuela, Uruguay and Paraguay). The first negotiations of the cooperation began in 1961 between Brazil and Argentina in order to discuss ways on how to increase bilateral trade between the two countries. The first steps towards realising this however were not relevant to trade-barriers but to overcome the traditional military rivalry between Argentina and Brazil (Odello & Seatzu, 2015). These talks however were halted by political unrest in both countries which were followed by the overthrowing of various military and authoritarian leaders in both countries. Talks for a bilateral trade agreement resumed in the 1980's and led to the signing of the Integration Cooperation and Development Treaty setting the ambition of creating a common market which was ultimately signed by both countries in 1988. The following years saw the joining of Paraguay and Uruguay to the negotiations and the four countries eventually signed the Treaty of Asuncion in 1991 which established the Mercosur free trade area (Odello & Seatzu, 2015). This treaty led to the creation of the customs union affirming free trade of goods and services among the member countries and the establishment of a Common External Tariff. The treaty was later also signed by Venezuela in 1997 which led to the ascension of the country into the Mercosur agreement.

3. Methodology

3.1 The Gravity model

This research will use a gravitational approach on estimating the effects of PTAs on Latin American trade. The gravity equation explains cross-sectional variation in trade flows between certain country pairs and allows for the inclusion of various controlling factors which may influence bilateral trade. The general form of the gravity equation developed by Leibenstein & Tinbergen (1966), makes trade flows (T) dependent upon the product of the incomes (Y) of the two countries i and j, which is then divided by the distance between them (D):

$$T_{ijt} = A\frac{Y_{it}^{\beta_1} Y_{jt}^{\beta_2}}{D_{ij}^{\beta_3}}$$

Here, the gravity model provides an insight of bilateral trade flows, which is assumed to be positively correlated with the size of a trade partner's economy and negatively related by the geographic distance which separates them. This negative relation between distance and trade flows is explained due to increasing transport costs which are more prominent when trade partners are further away from each other (Leibenstein & Tinbergen, 1966).

3.2 Time-variant variables

Following the framework provided by Trotignon (2010), this research will use the gravity equation developed by Leibenstein & Tinbergen (1966) with several adjustments. The first adjustments are the introduction of variables which accounts for the similarity between the GDPs of a country pair, where it is argued that a high level of similarity would be an important determinant factor of trade flows with a positive relationship (Linder, 1962). This positive relationship between trade and similarity of GDP by countries is explained by Linder (1962), where it is argued that a higher level of similarity signifies that a certain country pair has similar preferences and similar albeit differentiated products, and therefore will trade more with each other (Frankel, 1997). This variable is denoted as $SIMIL_{ijt}$ which is introduced by De Santis, De Benedictis & Vicarelli (2005) and is used as a similarity index of two trade partner's GDP. It is formulated as the following:

$$SIMIL_{ijt}\left[1-\left(\frac{GDP_{it}}{GDP_{it}+GDP_{jt}}\right)^2-\left(\frac{GDP_{jt}}{GDP_{it}+GDP_{jt}}\right)^2\right]$$

Second, a variable to measure the absolute value of the difference of the per capita GDPs of countries *i* and *j* is used. This absolute differences in GDP between a country pair, measured by $GDPdif_{ijt}$ is used to test the differences in factor endowment. Where a positive coefficient would be expected which reflects the possibilities of a country to participate in intra-industrial trade, according to their relative comparative advantage (Trotignon, 2010). It is calculated by the following equation:

$$GDPdif_{ijt}=\frac{GDP_{it}}{POP_{it}}-\frac{GDP_{jt}}{POP_{jt}}$$

Third, as argued in the research of Trotignon (2010), the choice of distance variable as a proxy for transportation costs also requires adjustments rather than solely using the time-invariant absolute geographic distance between a country pair's borders or capitals. To prevent omitted variable bias which might occur when only using these absolute distances, a measurement is proposed for the relative distance of a country pair. The reason for using a relative distance measurement lies in the fact that trade is assumed to be elevated between a pair of countries that is remote from the world's

largest economic centres than it is between two economies that are geographically close to them. To give an example, while the absolute distance between Australia and New Zealand is approximately the same between Portugal and Austria, it would still be expected that the former country pair have higher trade flows than the latter due to their relatively greater distance from large countries (Trotignon, 2010). Using only physical distance between country pairs is furthermore argued not to be sufficient to properly measure bilateral trade costs since it is not time varying, does not cover the whole trade costs and takes the assumption that the trade costs between countries is symmetric (Drzewoszewska, 2015).

The variable for measuring relative distance is denoted as $REMOT_{ijt}$ and is expected to yield a positive impact on the trade flows between country pairs (Wei, 1996). The relative distance variable introduced by Wei (1996) is used, where the relative distance of a country by the sum of the distances separating it from a trade partner weighted by the size of the trade partner's GDP as a fraction of the total world GDP:

$$REMOTE_{it} = \sum \left(DIST_{kl} \times \frac{GDP_{jt}}{GDP_{world\_t}} \right)$$

While previous research notes that the difference in political regimes between country may have a relatively small effect on bilateral trade, the frequent and significant changes in political orientation in Latin American countries may deviate from previous research. In order to account for the political orientation of the Latin American countries included in the sample, a variable which measures the extent of institutional democracy in each respective country is introduced. This democracy score of each country is obtained from the Polity IV data set created by Marshall and Jaggers from the Polity Project (2009). This democracy score is based on three interdependent elements. First, the presence of institutions and procedures through which citizens of a country can express their preferences about alternative policies and leaders. Second, the presence of institutionalised constraints on the use of power by the political executives in charge is included in the measurement. Third, the guarantee of civil liberties to all the citizens of a country in their quotidian lives and in political participation. This includes the measurements of several aspects of a plural democracy such as the rule of law, freedom of press and systems of checks and balances. This score is then translated into a Democracy Index on an eleven-point scale (0-10) for each relevant country at year *t,* where a larger score implies a more democratic regime (Marshall, 2020). This variable is indicated by $DEMOC_{it}$ for which the logarithm is taken and a positive sign is expected where, a more democratic regime, is expected to engage more in international trade (Zhou, 2011).

3.2 Time-invariant variables

Several explanatory dummy variables will be used to account for other factors which might have an impact on bilateral trade between Latin American countries. The presence of a common border between a country pair will be accounted for with a dummy variable to estimate its potential impact on bilateral trade, equalling one if a country pair shares a common border and zero otherwise. Moreover, Latin American countries are prominently Spanish or Portuguese speaking. To account for this factor of cultural closeness a second dummy variable is introduced which will equal to one if a country pair shares a common language and zero otherwise. Both variables for relevant country pairs which control for having a common border are denoted by $COMM_{ij}$ and a common language by $LANG_{ij}$. Both are thus considered to be important positive determining factors for trade flows between country pairs and are especially relevant for the Latin American continent where shared borders and languages are prominent.

While the dummy variable for a common border between Latin American countries controls for the exogenous factor of having a shared border and consequentially taking the assumption of the presence of transport infrastructure between both countries that would allow them to have border trade, it does not take into account the considerable natural barriers which are present in the region. As several of the country pairs are bordered by one another by the Amazon jungle or the Andes mountain range where, limited infrastructure and few urban areas are present, actual border trade between these regions and countries is limited (Carrillo-Tudela & Li, 2004; Fortanier & Miao, 2007). In order to control for these geographic factors, a set of geographic dummy variables are introduced. First, the dummy variable $ANDES_i$ is introduced which equals to one for country pairs which are bordered by the Andean mountain range. A second dummy variable is added equalling to one for country pairs which are bordered by the Amazon jungle and is denoted by $AMAZO_i$. Both of these dummy variables are expected to have a negative relationship with bilateral trade flows between the country pairs. Third, a dummy variable denoted as $LOCK_i$ is introduced equalling to one when a Latin American country is landlocked which is expected to negatively impact export trade flows from these countries due to the lack of sea access (Drzewoszewska, 2015).

3.3 Trade policy variables

Through the inclusion of a set of three dummy variables per Latin American PTA (ACN, CACM and Mercosur) the implemented gravity model will allow to test simultaneously the effects of the several PTA agreements on intra-regional trade, extra-regional trade between Latin America countries being member of one of the three PTAs and extra-regional trade between Latin American countries and countries outside of the Latin American region. Therefore, these sets of dummy variables in the main

regression model will allow for the estimation of possible presence of trade creation or diversion effects between the relevant country blocs and PTAs.

The first main explanatory variable denoted by PTA_{intra_t} will allow for the estimation of the effects of the PTA on intra-regional trade between members of the same PTA since its implementation. It will equal to one if a Latin American country pair were both members of the same PTA at year *t.* It is expected to have a positive relationship with the trade flows between the countries due to the policy harmonisation endeavours between the country pairs. The second dummy variable is denoted by $PTA_{extra\_latin\_t}$ and will estimate the effects of the implementation of a certain PTA has had on the trade flows between Latin American countries which are not member of the same PTA. Therefore, it will equal to one if a Latin American country pair is a member of one of the three PTAs albeit not the same one, at year *t.* It is expected that the relationship between this dummy variable and the trade flows variable may vary between the three PTAs and country pairs. As argued by Michaely (1999), relatively smaller countries (when measured by GDP) in the Latin American region may encounter negative effects of the implementation of a PTA. Where such negative effect would be due to the inclusion of only similarly sized countries as members and thus the absence of a large country where equal trade policy harmonisations efforts have occurred. The last dummy variable denoted by $PTA_{extra\_world\_t}$ equals to one when the trade partner country does not lie in the Latin American region and zero otherwise. With this dummy variable, the effects of the PTA implementation have had on the trade flows with countries outside the region and which therefore did not enter one of the three PTAs can be estimated. Taking everything into consideration, the following baseline estimation equation can be constructed[2]:

$$\ln(X_{ijt}) = \beta_1 ln(GDP_{it}) + \beta_2 ln(GDP_{jt}) + \beta_3 ln(DIST_{ij}) + \beta_4 ln(REMOT_{ijt}) + \beta_5 ln(GDPdif_{ijt}) + \beta_6 ln(SIMIL_{ijt}) + \beta_7 ln(DEMOC_{it}) + \beta_8 (AMAZO_i) + \beta_9 (ANDES_i) + \beta_{10} (LOCK_i) + \beta_{11} (COMM_{ij}) + \beta_{12} (LANG_{ij}) + \beta_{13} (ACN_{intra\_t}) + \beta_{14} (ACN_{extra\_latin\_t}) + \beta_{15} (ACN_{extra\_world\_t}) + \beta_{16} (CACM_{intra\_t}) + \beta_{17} (CACM_{extra\_latin\_t}) + \beta_{18} (CACM_{extra\_world\_t}) + \beta_{19} (MERCO_{intra\_t}) + \beta_{20} (MERCO_{extra\_latin\_t}) + \beta_{21} (MERCO_{extra\_world\_t}) + \varepsilon_{ij,t}$$

Where X_{ijt} is the logarithm of trade flows between a Latin American country described in Table 1 and another country in period *t* and will act as the dependent variable for this estimation strategy. The logarithm of GDP of the Latin American country in question is depicted by the variable GDP_{it} and the logarithm of the relevant trade partner country's GDP by GDP_{jt} at time *t.* These variables are added to control for the positive impact of economic growth has on the love of variety of consumers

[2] An overview of the content of each variable can be found in Table 2 in the appendix.

and consequentially the demand for foreign goods (Sauré, 2011). The absolute distance between the country pair's capitals measured in kilometres is measured by $DIST_{ij}$. Being used as a proxy for trade costs, it is expected this variable will have a negative relationship with the amount of trade flows since an increase in distance consequentially increases the costs of trade (Leibenstein & Tinbergen, 1966).

4. Data

For this research, a panel dataset is constructed of annual data from multiple sources, including trade flows and GDP data from a total of 189 countries between 1986 to 2019. A complete list of the countries included in the sample can be found in Table 4 in the appendix. Annual GDP data of each country described in Table 4 will be used between this period are obtained from the World Bank online database in constant 2010 US$ (World Bank Group, 2021a). The dependent variable, annual trade flows from country *i* to country *j* is gathered from the United Nations Comtrade Database (UN Comtrade, 2021). This database presents data on the trade flows values in thousands of current US$ between the 189 countries included in the sample and the Latin American countries being a member of one of the three PTAs described in Table 1. The US Consumer Price Index (CPI), obtained from the World Bank online database (World Bank Group, 2021b), is used to deflate the annual trade flows from the UN Comtrade database to constant 2010 US$ values. The geographical distance in kilometres between a country pair's capitals as well as the data on landlocked countries which are included in the dataset are retrieved from the Centre d'Etudes Prospectives et d'Information International (CEPII, 2021). The democracy score of each country included in Table 4 at year *t* is obtained from the Polity IV dataset created by Marshall and Jaggers (2020) from the Polity Project. The dummy variables accounting for shared country pair borders situated in the Amazon rainforest or in the Andes mountain range are constructed with the use of detailed maps and spatial data gathered by ESRI and obtained via ArcGis (2021). Table 3 presents the descriptive statistics of the constructed panel data.

5. Estimation Challenges

While the gravity model can be considered as a workhorse model in economics with a solid theoretical and empirical background, various estimation challenges that may lead to biased or inconsistent estimates needs to be addressed. The most common explanatory variables used in past gravity model research are the inclusion of national income, distance measure between country pairs and a set of dummy variables controlling for common borders, common language and a common past coloniser (Drzewoszewska, 2015). While differences in past literature which implement the gravity model in

Table 3. Descriptive statistics

Variables	Obs	Mean	Std.Dev	Min	Max
$ln(X_{ijt})$	74.715	13,137	4,691	-7,600	21,438
$ln(GDP_{it})$	95.370	22,239	2,957	14,399	26,806
$ln(GDP_{jt})$	93.821	20,401	4,203	9,931	30,552
$ln(DIST_{ij})$	105.573	15,289	2,120	4,639	16,8018
$ln(REMOT_{ijt})$	95.481	6,088	4,274	-12,107	14,981
$ln(GDPdif_{ijt})$	94.461	6,690	3,190	-1.410	9,759
$ln(SIMIL_{ijt})$	94.548	-3,388	2,759	-15,689	-0,693
$ln(DEMOC_{it})$	108,070	1,894	0,428	0	2,302
$COMM_{ij}$	109.888	0,017	0,132	0	1
$LANG_{ij}$	109.888	0,113	0,317	0	1
$ANDES_{i}$	109.888	0,001	0,035	0	1
$AMAZO_{i}$	109.888	0,001	0,043	0	1
$LOCK_{i}$	109.888	0,125	0,330	0	1
ACN_{intra_t}	109.888	0,006	0,079	0	1
$ACN_{extra\_latin\_t}$	109.888	0,014	0,117	0	1
$ACN_{extra\_world\_t}$	109.888	0,236	0,425	0	1
$CACM_{intra\_t}$	109.888	0,008	0,093	0	1
$CACM_{extra\_latin\_t}$	109.888	0,014	0,120	0	1
$CACM_{extra\_world\_t}$	109.888	0,275	0,446	0	1
$MERCO_{intra\_t}$	109.888	0,008	0,092	0	1
$MERCO_{extra\_latin\_t}$	109.888	0,014	0,117	0	1
$MERCO_{extra\_world\_t}$	109.888	0,245	0,430	0	1

their empirical approach includes the use of different country samples and time periods, the most distinguishable differences however, stems from the methods and strategies implemented in order to overcome specific estimation challenges (Drzewoszewska, 2015). Hence, it is not uncommon in previous research to use more than one estimation methods.

5.1 Multilateral trade resistance

The first challenge in order to obtain reliable estimates with the gravity model lies in properly controlling for the multilateral trade resistance (MTR) between country pairs. Where the MTR measures the joint average trade resistance between a country pair in terms of trade barriers (Anderson & van Wincoop, 2003). These trade resistances are in theory present for all countries since intuitively, all countries have various different alternative trading partners with whom they can engage in international trade, which consequentially influences the bilateral trade-resistance between a certain country pair. Therefore, the trade barriers between countries should not only be accounted for by including geographic distances, as a proxy for bilateral trade costs (Drzewoszewska, 2015). The challenge of measuring the MTR however, lies in that it is not directly observable.

Various treatment methods of the MTR have been explored and discussed in previous research with contradicting results. While the inclusion of the $REMOT_{ijt}$ variable, as described in the methodology section, is used in various research while using a gravity model to treat the MTR, it is not without criticism. More specifically, Head and Mayer (2014) criticise this relative remoteness as a measurement for the MTR as such approach would deliver limited resemblance to their proposed theoretical counterpart on handling the challenge of accounting for the MTR when estimating a gravity model. Despite this criticism of the use of this variable, the relative remoteness variable provides significant insights in the context of this specific research as it accounts for the weight of the GDP of the trade partner country, relative to the total world GDP. This is an important consideration as the use of the remoteness variable allows this research to take into account that Brazil is the largest economy relative to the other Latin American countries when measured by GDP.

An alternative approach is to use exporter and importer fixed effects in the baseline estimation equation (Hummels, 1999; Feenstra, 2003). With this approach, the MTR should be accounted for in the estimations and also allows for the inclusion of the possible time-invariant unobserved factors influencing trade flows for each country pair (Egger & Staub, 2015). This approach is however also not with its limitations. This is argued by Cipollina, De Benedictis, Salvatici & Vicarelli (2016), which point out that the identification of trade policy effects using a gravity model that includes fixed effects to control for the MTR may cause inaccurate estimates when the trade policy is measured by

a dummy variable. Nevertheless, in order to ensure the proper treatment of the MTR, a second regression equation is introduced with the inclusion of a full set of exporter and importer fixed effects. This second estimation equation will be run with the $REMOT_{ijt}$ variable and with the $DIST_{ij}$ variable which measures the absolute distance between country pairs in kilometers separately. This way, both approaches towards controlling for the MTR can be explored and the different obtained estimation results can be discussed. The inclusion of importer and exporter fixed effects and substituting the $REMOT_{ijt}$ variable for the $DIST_{ij}$ results in the following equation:

$$\ln(X_{ijt}) = \beta_1 ln(GDP_{it}) + \beta_2 ln(GDP_{jt}) + \beta_3 ln(DIST_{ij}) + \beta_4 ln(GDPdif_{ijt}) + \beta_5 ln(SIMIL_{ijt}) + \beta_6 ln(DEMOC_{it}) + \beta_7 (AMAZO_i) + \beta_8 (ANDES_i) + \beta_9 (LOCK_i) + \beta_{10}(COMM_{ij}) + \beta_{11}(LANG_{ij}) + \beta_{12}(ACN_{intra\_t}) + \beta_{13}(ACN_{extra\_latin\_t}) + \beta_{14}(ACN_{extra\_world\_t}) + \beta_{15}(CACM_{intra\_t}) + \beta_{16}(CACM_{extra\_latin\_t}) + \beta_{17}(CACM_{extra\_world\_t}) + \beta_{18}(MERCO_{intra\_t}) + \beta_{19}(MERCO_{extra\_latin\_t}) + \beta_{20}(MERCO_{extra\_world\_t}) + \pi_{it} + \chi_{jt} + \varepsilon_{ij,t}$$

Where π_{it} are the importer fixed effects and χ_{jt} are the exporter fixed effects. This set of fixed effects will, next to accounting for the MTR, also absorb exporter and importer observable and unobservable characteristics.

5.2 Zero trade flows

The second challenge in obtaining reliable estimates lies in the use of the OLS estimator as estimation approach. The use of the OLS estimator has the drawback of not being able to take into account the information of zero trade flows which are present in the constructed dataset. This occurs as these zero trade flows observations are dropped from the sample when the value of trade is transformed into a logarithmic form (Piermartini & Yotov, 2016). One approach to solve this challenge, would be to drop all of the zero-value observations in the sample or to add a constant to the zero observations ($X_{ijt} + 1$) in combination with the OLS estimator method. Such approaches however are best avoided considering that the estimation results depend on the component of measurement resulting in inaccurate estimates and because the zero observed trade flows are not randomly distributed in the dataset (Burger, van Oort & Linders, 2009). Furthermore, since the data sample used in this research uses a relatively broad time frame and 189 countries as trade partners, zero trade observations are frequent and dropping all of these values from the sample would signify a significant loss in the amount of observations.

In order to avoid this, a frequent used approach to this estimation challenge in the existing literature has been to estimate the gravity model with the use of the Poisson Pseudo Maximum Likelihood (PPML) estimator. The use of this approach is frequent as it is a relatively simple and reliable solution

for zero observed trade flows. The PPML estimator eliminates this challenge by naturally including observations for which the observed trade flow is zero and allows for a straightforward interpretation of the obtained estimates (Santos-Silva & Tenreyro, 2011). Moreover, the PPML estimator also solves any heteroskedasticity issues which may be present in the trade data sample when estimating the gravity model in log-linear form with an OLS estimator (Santos-Silva & Tenreyro, 2011). The PPML estimator accomplishes this by weighting all observations equally and provides therefore unbiased estimates in the presence of heteroskedasticity.

5.3 Endogeneity concerns

The third estimation challenge which is particularly important to address considering the setting of this research, are the endogeneity concerns of trade policies. In order to obtain reliable estimates, the effects of trade policy within the gravity model must be endogenous (Piermartini & Yotov, 2016). In other words, it could be possible that a country pair could have decided to engage in a PTA because the trade flows between the countries was already high. This is in line with the general trade theory that, trade liberalisation between countries is more likely to happen when they are already significant trade partners (Michaely, 1999). This is a prominent example of the reverse causality issue within the use of a gravity model when analysing trade flows between countries. In order to solve this endogeneity concern, the use of country-pair fixed effects is often described in previous research. This approach would account for the unobservable linkages between the endogenous PTA between a country pair (Piermartini & Yotov, 2016). With the use of these country pair fixed effects however, all bilateral time-invariant independent variables such as distances and the presence of a common border are absorbed. Because of this, the implementation of country pair fixed effects in the estimation equation will be run separately such that differences in estimation results can be again explored and discussed separately. The estimation equation for this model therefore becomes the following:

$$\ln(X_{ijt}) = \beta_1 ln(GDP_{it}) + \beta_2 ln(GDP_{jt}) + \beta_3 ln(DIST_{ij}) + \beta_4 ln(REMOT_{ijt}) + \beta_5 ln(GDPdif_{ijt}) + \beta_6 ln(SIMIL_{ijt}) + \beta_7 ln(DEMOC_{it}) + \beta_8 (ACN_{intra\_t}) + \beta_9 (ACN_{extra\_latin\_t}) + \beta_{10} (ACN_{extra\_world\_t}) + \beta_{11} (CACM_{intra\_t}) + \beta_{12} (CACM_{extra\_latin\_t}) + \beta_{13} (CACM_{extra\_world\_t}) + \beta_{14} (MERCO_{intra\_t}) + \beta_{15} (MERCO_{extra\_latin\_t}) + \beta_{16} (MERCO_{extra\_world\_t}) + \mu_{ijt} + \varepsilon_{ijt}$$

Where μ_{ijt} is the country pair fixed effects controlling for all bilateral time-invariant characteristics.

6. Results

Taking into consideration the possible estimation challenges described above, several models and their specifications are discussed in this section. In order to account for zero observed trade values, all estimation specifications are run with the use of the OLS and PPML estimator. Hereafter, possible differences in estimation results between the two estimation strategies can be observed and discussed. Moreover, in order to verify that the chosen variable for relative distance between a country pair is appropriate in the models, the same estimation equations will be run with the $REMOT_{ijt}$ variable as well as the $DIST_{ij}$ variable, which measures the absolute distance differences between the country pair's capitals measured in kilometres. Next to this, several model specifications will be run in consideration to the two estimation strategies and distance variables such that the specific effects of including an additional explanatory variable can be discussed.

First, in order to estimate the different effects the additional explanatory variables have on explaining the effects of PTAs have on Latin American trade, each set of variables will be added to the estimation equation separately. Therefore, model (1) consist of the basic and necessary variables of the gravity model namely, the GDP of trade partner pair, the distance variables and two dummy variables equalling to one if a country pair shares a common border or a common language. Hereafter, importer and exporter country fixed effects are added to this basic form of the gravity equation to account for unobserved time invariant factors in model (2). In model (3), country pair fixed effects are added into the estimation equation to account for unobserved country pair characteristics. Hereafter, model (4) includes the $GDPdif_{ijt}$ and $SIMIL_{ijt}$ variables discussed in the methodology section, where the former accounts for factor endowments between both countries while the latter accounts for the economic similarity between the countries. Then, the variable for democracy scores is added in model (5) to account for the effect of political changes and orientation of the Latin American country towards trade and general regional economic cooperation. Lastly, model (6) includes a set of geographic dummy variables which have aim to estimate the effects natural barriers in the Latin American region pose for engaging in international trade such as, being landlocked and having a shared country border situated in the Andes mountains or in the Amazon rainforest. The estimation results are displayed in Table 5, where an OLS estimation strategy is used, whereas Table 6 displays the estimation results when using the PPML estimator approach.

Comparing the results of the $REMOT_{ijt}$ variable as a measurement for relative distances with the estimates obtained when using the absolute distances measurement $DIST_{ij}$, a strong difference in

statistical significance between the two can be observed.[3] The $REMOT_{ijt}$ variable appears to be strongly statistically significant across all six models for both OLS and PPML estimation approaches. The variable is moreover positive across all models, suggesting that a country pair which is more remote from countries with large economies holding all else equal, would trade relatively more with each other (Drzewoszewska, 2015). Where moreover, a relatively richer/larger importing country will have larger demands for imports, intuitively decreasing the barriers to trade with this country resulting in a lower 'remoteness' measure (Piermartini & Yotov, 2016). These findings correspond with the research of Drzewoszewska (2015) which concludes that the use of the $REMOT_{ijt}$ variable can be an appropriate approximation of the MTR in gravity models. These estimates furthermore suggest that trade barriers in the form of trade costs are not symmetric and time varying, contrarily to what is captured by using physical distances between a country pair. Taking into account the obtained estimates in comparison to the existing literature, it is concluded that the $REMOT_{ijt}$ variable functions as a proper measurement for taking into account the MTR in the implemented gravity equation. Therefore, the estimation results obtained using the $REMOT_{ijt}$ variable across all six models will solely be discussed in the remainder of this section.

As described in the Estimation Challenges section of this paper, country pair fixed effects are explored in order to control for possible reverse causality issues which might bias the obtained estimates. The estimation results of implementing country pair fixed effects can be found in column 3 of Table 5. Due to statistical constraints, the country pairs fixed effects are not possible to be implemented while using a PPML estimation approach.[4] One can observe in Table 5 that similar estimation results in the coefficients of the variables across the other models (which do not implement country pair fixed effects) are obtained. While similar in coefficient size, the use of country pair fixed effects has obtained relatively less statistically significance and weaker coefficients. This is notably the case for the dummy variables depicting the effects of having a regional PTA for the $ACN_{extra\_latin\_t}$ and $MERCO_{intra\_t}$ variables. Considering the objective of this research is to shed light on the potential impacts of the implementation of PTAs for the Latin American region, the inclusion of the control variables, which can only be interpreted when excluding country pair fixed effects, are of significant explanatory value. While the inclusion of country pair fixed effects is common albeit not considered a necessity in the previous literature, several existing researches have implemented a similar approach as this research due to the explanatory value of including a set of control variables when researching

[3] The estimates using the physical distance between a country pair as measurement for the Multilateral Trade Resistance (MTR) can be found in the Appendix. Table 7 uses an OLS approach as estimation strategy whereas Table 8 displays the estimates when a PPML approach is used.

[4] Such statistical constraints are common in the existing literature, see for example: Piermartini & Yotov, (2016); Drzewoszewska, (2015); Macphee, & Sattayanuwat, (2014).

Table 5: OLS Estimates of the Effects of Preferential Trade Agreements

	(1)	(2)	(3)	(4)	(5)	(6)
$ln(GDP_{it})$	-0,039*** (-3,79)	0,069*** (8,67)	0,035*** (6,19)	0,130*** (4,33)	0,128*** (17,09)	0,127*** (16,95)
$ln(GDP_{jt})$	0,056*** (4,65)	-0,025* (-1,85)	0,057*** (9,89)	0,054*** (17,44)	0,052*** (4,23)	0,050*** (4,01)
$ln(REMOT_{ijt})$	0,390*** (3,76)	0,291** (2,51)	0,403* (0,29)	0,272** (2,98)	0,263** (2,70)	0,246** (2,49)
$COMM_{ij}$	3,817*** (19,93)	4,317*** (20,82)		3,978*** (23,04)	3,828*** (23,31)	3,720*** (25,74)
$LANG_{ij}$	1,993*** (29,92)	2,117*** (31,35)		2,010*** (30,27)	2,012*** (30,18)	2,003*** (30,07)
$ln(GDPdif_{ijt})$				0,124** (15,57)	0,120** (15,02)	0,077** (8,98)
$ln(SIMIL_{ijt})$				-0,041*** (-4,59)	-0,041*** (-4,62)	-0,035*** (-4,04)
$ln(DEMOC_{it})$					0,245** (2,56)	0,594*** (5,66)
$ANDES_i$						-0,644* (-1,51)
$AMAZO_i$						0,228 (0,89)
$LOCK_i$						-1,347*** (-13,12)
ACN_{intra_t}	0,843*** (3,13)	-0,225*** (-0,59)	1,256** (2,39)	0,691*** (2,58)	0,694** (2,59)	0,976*** (3,62)
$ACN_{extra\_latin\_t}$	-0,128* (-0,73)	-1,173* (-4,10)	0,338 (0,83)	-0,335** (-1,82)	-0,330* (-1,78)	-0,072 (-1,41)
$ACN_{extra\_world\_t}$	0,323*** (4,24)	1,402*** (6,56)	0,239** (2,35)	0,581*** (3,49)	0,580** (3,36)	0,252** (3,11)
$CACM_{intra\_t}$	0,895*** (3,72)	0,867** (2,53)	3,111*** (3,02)	1,080*** (4,50)	1,121*** (4,79)	1,203*** (5,03)
$CACM_{extra\_latin\_t}$	-1,034*** (-1,80)	-1,298** (-4,53)	-0,298* (-0,89)	-0,657*** (3,57)	-0,686*** (3,72)	-0,762*** (4,14)
$CACM_{extra\_world\_t}$	0,033** (3,79)	0,470** (4,02)	-0,147** (-2,08)	1,260*** (1,74)	1,290*** (1,39)	1,372*** (1,42)
$MERCO_{intra\_t}$	2,041** (4,89)	0,188 (0,68)	0,388 (1,25)	1,819** (3,82)	1,799** (3,63)	2,062** (3,37)
$MERCO_{extra\_latin\_t}$	2,137*** (2,73)	0,298* (1,05)	2,115*** (1,08)	1,712*** (1,11)	1,686*** (0,92)	1,547*** (0,86)
$MERCO_{extra\_world\_t}$	1,791*** (2,16)	-0,293 (-1,41)	0,996*** (1,09)	1,333*** (1,32)	1,304*** (1,52)	1,288*** (1,34)
Importer & Exporter fixed effects	No	Yes	No	No	No	No
Country pair fixed effects	No	No	Yes	No	No	No
N	40.945	40.945	40,945	40.945	40.945	40,945
R^2	0,205	0,181	0,195	0,205	0,195	0,192

Dependent variable is the logarithm of annual trade flows between country *i* and country *j*. In parenthesis, the *t*-statistics are given. *, ** and *** indicate a significance level at the 10%, 5% and 1% respectively.

a particular region or countries.[5] Therefore, considering the similarity of the obtained estimates between the inclusion and exclusion of the country pairs fixed effects and the explanatory value of the regional PTA variables, the estimation results including the various set of controls will solely be considered in the upcoming sections.

Furthermore, in order to account for the possible presence of heteroskedasticity and of zero trade flows in the data sample, the use of the PPML estimator is used. As previously discussed, the PPML estimator weights all observations equally and therefore takes advantage of the information contained in the zero trade flows observations contrarily to when using the OLS estimator approach (Piermartini & Yotov, 2016). The PPML estimates for all six specifications can be found in Table 6. Overall, the reported estimation results remain similar to those when using the OLS approach, several signs of coefficients have changed when including exporter and importer time fixed effects, which is an often-reported phenomenon in past research using the PPML estimator.[6] In comparison to the estimates reported in Table 5, the magnitude of various variables is reduced including the dummy variables depicting the presence of a PTA, more specifically, both the $CACM_{extra\_world\_t}$ and $ACN_{extra\_world\_t}$ coefficients are significantly reduced. This could be the result of more zero trade flows observations present between the members countries of each respective PTA and between the trade partner countries included in the data sample described in Table 4. The interpretation of the sixth model specification will be further drawn from the PPML estimation approach reported in Table 6 such that, biases in the estimates resulting from zero trade flows and heteroskedasticity can be avoided.

6.1 General results

Observing the estimation results from Table 6, the estimated coefficient for the GDP per capita is, as can be expected in a gravitational approach positive for both exporting and importing countries, suggesting that as national income rises, demand for trade increases (Leibenstein & Tinbergen, 1966). The $REMOT_{ijt}$ variable is likewise, positive and highly significant, suggesting that country pairs engage in more trade when they are located further away from the world's largest economic centers than between a country pair which are geographically close to them (Trotignon, 2010). Moreover, the dummy variables controlling for a shared border and language between the country pairs are found to be highly significant and positive determinants for trade flows across all specifications. The second set of geographic variables, the Andes, Amazon and Landlocked variables show different from expected estimation results. While the dummy variable controlling for the rigorous Andes mountain

[5] See for example the research by: Seid, (2015); Drzewoszewska, (2015); Macphee, & Sattayanuwat, (2014); Ekanayake, et al., (2010).
[6] See for example: Drzewoszewska, (2015); Piermartini & Yotov, (2016).

Table 6: PPML Estimates of the Effects of Preferential Trade Agreements

	(1)	(2)	(3)	(4)	(5)
$ln(GDP_{it})$	0,101*** (13,37)	-0,005*** (-2,03)	0,098*** (13,26)	0,097*** (13,04)	0,094*** (12,81)
$ln(GDP_{jt})$	0,037*** (5,22)	0,889*** (4,49)	0,045*** (5,77)	0,046*** (5,86)	0,043*** (5,60)
$ln(REMOT_{ijt})$	0,219*** (3,45)	0,883*** (4,48)	0,184*** (2,89)	0,181*** (2,73)	0,172*** (2,69)
$COMM_{ij}$	1,035*** (27,07)	2,701* (6,63)	1,894*** (30,88)	1,780*** (29,01)	1,673*** (31,89)
$LANG_{ij}$	0,839*** (22,93)	0,472*** (8,93)	0,836*** (22,94)	0,839*** (22,95)	0,842*** (23,07)
$ln(GDPdif_{ijt})$			0,049*** (6,71)	0,046*** (6,19)	0,045*** (5,55)
$ln(SIMIL_{ijt})$			-0,023*** (-3,66)	-0,025*** (-3,83)	-0,024*** (-3,75)
$ln(DEMOC_{it})$				0,323*** (4,01)	0,342*** (4,11)
$ANDES_i$					-1,705* (-8,67)
$AMAZO_i$					0,695* (3,96)
$LOCK_i$					-0,026 (-0,35)
ACN_{intra_t}	0,650*** (5,14)	3,33*** (2,57)	0,634*** (5,12)	0,644*** (5,19)	0,628*** (4,73)
$ACN_{extra\_latin\_t}$	-0,439** (-3,85)	0,123* (6,86)	-0,385** (3,44)	-0,399* (3,55)	-0,390* (3,21)
$ACN_{extra\_world\_t}$	0,237*** (4,23)	0,302*** (4,61)	0,140** (2,44)	0,154*** (2,69)	0,177*** (2,70)
$CACM_{intra\_t}$	0,613*** (5,10)	0,271*** (5,04)	0,662*** (5,52)	0,691*** (5,74)	0,669*** (5,61)
$CACM_{extra\_latin\_t}$	-0,152* (-1,37)	1,419** (2,55)	-0,237** (2,12)	-0,271** (2,42)	-0,259** (2,31)
$CACM_{extra\_world\_t}$	0,263*** (4,48)	0,219*** (2,88)	0,346*** (5,84)	0,379*** (6,33)	0,369*** (6,17)
$MERCO_{intra\_t}$	1,004*** (3,25)	-0,047** (-1,94)	0,942*** (3,93)	0,915*** (4,17)	1,100*** (4,41)
$MERCO_{extra\_latin\_t}$	1,352*** (1,64)	0,453** (2,41)	1,193*** (1,97)	1,159*** (1,58)	1,119*** (1,48)
$MERCO_{extra\_world\_t}$	1,275*** (1,42)	0,166** (3,58)	1,099*** (2,87)	1,066*** (2,96)	1,078*** (2,26)
Importer & Exporter fixed effects	No	Yes	No	No	No
N	56.934	56.934	56.934	56.934	56,934
R^2	0,181	0,176	0,169	0,172	0,114

Dependent variable is the logarithm of annual trade flows between country *i* and country *j*. In parenthesis, the *t*-statistics are given. *, ** and *** indicate a significance level at the 10%, 5% and 1% respectively.

range and its effect on trade flows is negative although weakly statistically significant, the coefficient of the Amazon variable is estimated to increase trade between country pairs albeit being weakly statistically significant. Lastly, the variable controlling for countries being landlocked in the Latin American region is as expected negative although statistically insignificant. The estimations in column 4 and 5 moreover, demonstrate that an increase in the $DEMOC_{it}$ variable, the proxy for economic and political freedom, is highly significant and acts as a positively related determinant for trade flows in the region. Suggesting that an increase in governmental orientation towards economic and social freedom leads to an increase in trade flows. The estimates of the variable $GDPdif_{ijt}$, measuring the absolute differences in GDP per capita has, across all six specification of the gravity model, a positive coefficient and is found to be statistically significant. While the coefficients remain relatively weak, it can be concluded that an increase of absolute difference in GDP between country pairs increases trade flows. Signifying that trade increases in proportion to the increase in the difference in per capita income, where a country participates in intra-industry trade according to their comparative advantage (Trotignon, 2010). The $SIMIL_{ijt}$ variable however, is statistically significant and has a negative sign across all specifications. This is contrary to the prior beliefs where an increase in similarity between the GDP's of a country pair would lead to increased trade flows due to having similar preferences albeit differentiated products (Frankel, 1997). Hence, this negative sign of GDP similarity thus implies that increased GDP similarity between a certain country pair leads to a decrease trade volume in the Latin American region (Ekanayake, et al., 2010).

6.2 Impact of PTAs on Latin American trade flows

The framework provided by Trotignon (2010) and further expanded by Macphee & Sattayanuwat (2014) will be followed to determine the trade creation / diversion effects the implementation of each PTA has had on Latin American trade flows. This will be done via the obtained coefficients of the set of intra and extra-regional trade flows coefficients for each PTA in Table 6. Considering the concerns raised in the existing literature about the potentially dominating trade diversion effects of the three PTAs in the Latin American region, we must first describe each trade flows creation / diversion mechanisms which may have occurred. Table 9 presents the designation and typology of each category for the possible creation and diversion effects identifiable from the obtained estimates in Table 6, to the corresponding trade flow effects. Correspondingly, Table 10 configures these different trade flow effects in function of the respective signs and values for the coefficients obtained in Table 6 of the; intra-bloc trade flows (d_1)[7], extra-regional trade flows between Latin American countries member of a different PTA at year t (d_l)[8] and extra-regional trade flows between Latin

[7] $(t^{\beta} - 1)$, where $\beta = PTA_{intra\_ij}$ & t = t statistic
[8] $(t^{\beta} - 1)$, where $\beta = PTA_{extra\_latin\_ij}$ & t = t statistic

American countries and the rest of the world (d_w)[9] (Trotignon, 2010; Macphee & Sattayanuwat, 2014).

Following from Table 10, we can therefore observe that when the coefficients of d_l and d_w are positive, the country-bloc and corresponding PTA constitutes to a building bloc for regional integration between the country members of said PTA. It furthermore suggests, that the implemented PTA has led to trade creation effects for the member countries on three different levels; within country members, within the Latin American region and between the rest of the world. Whilst when both d_l and d_w are negative, the contrary is the case. Meaning that the implemented PTA has led to trade diversion effects between the PTA member countries and other Latin American countries and between countries from the rest of the world. Furthermore, when the sum of both the d_w and d_l are larger in magnitude than the positive coefficient for d_1, the said PTA is argued to lead to trade diversion, where exports to the rest of the world are replaced by intra-bloc trade (Trotignon, 2010).

Table 9. Typology of Trade Creation and Diversion effects

Acronym	Designation	Effects of Regional Trade Agreement
ITC	Intra-Bloc trade creation	Stimulating effect on trade flows between PTA member- countries partners
LTC	Extra-Latin trade creation	Stimulating effect on trade flows between Latin American countries *i* and *j*, not member of same agreement at year *t*
LTD	Extra-Latin trade diversion	Trade flows between Latin American countries *i* and *j,* not member of same agreement at year *t,* are replaced by intra-bloc or extra-regional trade with RoW trade
WTC	Extra-RoW trade creation	Stimulating effect on trade flows between Latin American country *i* and RoW country *j*, not member of same agreement at year *t*
WTD	Extra-RoW trade diversion	Trade flows between Latin American country *i* and RoW country *j*, not member of same agreement at year *t,* are replaced by intra-bloc trade or extra-regional trade with Latin American country not member of same PTA

Note: RoW= Rest of World

[9] $(t^{\beta} - 1)$, where $\beta = PTA_{extra\_world\_ij}$ & t = t statistic

Table 10. Creations / Diversions effects corresponding to sign of estimated coefficient

Sign of Regional Coefficient			
d_1 Intra-Bloc Trade	d_l Extra-Bloc Trade in Latin America	d_w Extra-Bloc Trade with Rest of World	Effects of Trade Creation/Diversion
+	+	+	ITC, LTC and WTC
+	+	-	If $d_1 > \|d_w\|$: ITC, LTC, WTD If $d_w > \|d_1\|$: LTC, WTD
+	-	+	If $d_1 > \|d_l\|$: ITC, LTD, WTC If $d_l > \|d_1\|$: LTD, WTC
+	-	-	If $d_1 > \|d_l+d_w\|$: ITC, LTD, WTD If $d_1 < \|d_l+d_w\|$: ITD, LTD, WTD

6.2.1 The effect of regional PTAs on intra-regional trade of Latin American member countries.

One of the three subject this research explores is whether the implementation of the PTAs in the Latin American region has resulted in increased trade flows between the member countries of said PTA. This is explored by using three separate dummy variables depicting whether a country pair is part of the same PTA at year *t.* The previous literature has a lot of common ground on this, arguing that the creation of a PTA reduces the trade- and non-trade barriers resulting in increasing trade flows between the country pairs which are both member of the same PTA. Looking at the results presented in Table 6, the coefficients across all six specification and PTAs are positive and strongly statistically significant, except for the Mercosur trade agreement which is estimated with a negative coefficient when using an importer and exporter time fixed effects. While the estimates also differ in magnitude, they remain positive and strongly statistically significant. For the member countries of the ACN regional trade agreement, the estimates suggest that the introduction of this PTA has led to an increase of 165,3% of intra-regional trade, when all the sets of controls are added in the model which can be found in column six of Table 6.[10] The CACM agreement presents similar results, where the estimates suggest that the implementation of the PTA in 1993 has led to an increase of 216,99% in intra-regional trade. Lastly, increased trade flows since the implementation of an FTA has been the most elevated between the Mercosur member countries. The implementation of the Mercosur would namely have positively affected trade flows between its member countries with 411,5%. These findings thus

[10] ($\beta_8(ACN_{intra})$ = 0,628 & t statistic. = 4,74), $[(t^{\beta} - 1) \times 100\%]$

correspond to the existing literature where trade flows are expected to increase after the implementation of policy harmonization efforts regarding intra-regional trade. We can furthermore conclude that, the implementation of the PTAs has had positive effects for intra-regional trade during the chosen time sample of 1986 till 2019 and has resulted in intra-regional trade creation where, all three PTAs have led to stimulating effects on trade flows between PTA member countries.

6.2.2 The effect of PTA on extra regional trade within the Latin American region between different PTA member countries.

The prominent contribution of this research is the inclusion of the variable accounting for trade within the Latin American region between country pairs which are member of a PTA albeit a different one. The presented results Table 6 using the PPML estimator as estimation approach demonstrate differentiated results between the $ACN_{extra\_latin\_t}$, $CACM_{extra\_latin\_t}$ and the $MERCO_{extra\_latin\_t}$ variable. Here, the $ACN_{extra\_latin\_t}$ and $CACM_{extra\_latin\_t}$ variable has turned negative while the $MERCO_{extra\_latin\_T}$ variable remains strongly positive and statistically significant across all six specifications. These results imply that, the implementation of the ACN and CACM PTAs have led to a decrease in extra regional trade between Latin American countries. Where the negative coefficient of the ACN_{extra_latin} variable suggests the negative effect on trade flows has accounted for -36,54% less trade flows between member countries of the ACN and non-member countries in the Latin American region. For the $CACM_{extra\_latin\_t}$ variable, the implementation of the PTA has resulted in -19,49% less trade flows. From the trade creation / diversion effects described in Table 9 and 10 we can furthermore conclude that, for the ACN and CACM trade agreement extra-regional trade diversion is present. Where trade flows between Latin American countries *i* and *j,* not member of same agreement at year *t,* are replaced by intra-bloc trade or by trade flows from countries outside of the Latin American region. The trade flows of the country bloc of the Mercosur agreement however, has led to an increase in extra-regional trade between Latin American countries which are not member of the Mercosur agreement with an estimated increase of 55,06%.

These estimates are in accordance with the existing literature where, these differentiated effects on extra-regional trade can be the result of dynamic effects of trade liberalisation described by Dijkstra, (2000) related to the occurrence of increasing returns to scale. Where, domestic firms can benefit from a larger market created by trade liberalisation and obtain increased returns to scale, prominently in the manufacturing industry. These positive returns to scale however, may only maturate if the country has already achieved a certain level of industrialisation (Michaely, 1999). Despite a potential low level of industrialisation in a country, the developing country may still hold a relative comparative advantage in the manufacturing industry in the form of having an abundance in relative

cheaper labour or the processing of primary resources. Although trade liberalisation in such manufacturing sectors may lead to positive allocative efficiency effects, the specialisation of these raw resources or cheap labour orientated manufacturing industries are less likely to enjoy positive dynamic effects. This is because the specialisation process of the domestic markets which occur after the reduction of the trade barriers towards these sectors are such where, income elasticities of demand are lower, no economies of scale apply, and less innovative activities take place (Dijkstra, 2000). The two most industrialised countries in Latin America before the string of PTAs were implemented in the region during the 1990's, measured by the fraction of manufacturing exports of total exports, were Brazil and Argentina (Michaely, 1999). Accordingly, the estimates suggest that the implementation of PTAs have caused an increase in extra-regional trade for the country bloc where these two countries are part of, namely the Mercosur agreement. This factor of initial industrialisation can therefore potentially explain the positive estimated effects of the Mercosur agreement on trade flows between Mercosur countries and non-members countries in the Latin American region. While less industrialised countries, including those taking part in the ACN and CACM agreement, demonstrate a negative effect on trade flows since the adoption of the PTAs on extra-regional trade between Latin American countries. Therefore, these findings provide evidence towards the critical proposals given by Bulmer-Thomas (1998) which argued that, the implementation of three different PTAs within the Latin American region would result in a stumbling block for general regional economic integration between the various countries participating in these different PTAs.

6.2.3 The effect of PTAs on extra-regional trade with countries outside the Latin American region

Having discussed effects on intra-regional and extra-regional trade within PTAs and Latin American countries, we turn our attention to the variables estimating for each Latin American PTA the effect the implementation of the trade agreement has had on trade flows between their member countries and other countries situated in other parts of the world. The estimates presented in Table 6 demonstrate for all three PTAs that extra-regional trade with the rest of the world has not led to any trade diversification from the rest of the world towards intra-regional trade since the implementation of the trade liberalization processes. The estimates furthermore suggest that the contrary is the case where, for all three PTAs in the region, its implementation has led to stimulating effects on trade flows between Latin American country *i* and country *j* from the rest of the world outside of the Latin American region in the form of trade creation.

Moreover, while the coefficients are for all three PTAs positive and statistically significant, the $MERCO_{extra\_world\_t}$ estimates stand out. It can be observed in column 5 that, the increase in trade with

countries outside of the Latin American region with member countries of the Mercosur has increased with more than 140% percent since its implementation, which can be again partially explained due to relatively larger returns to scale due to higher initial industrialisation in both Brazil and Argentina. These positive estimation results moreover correspond to findings in the existing literature where it was found that regional trade integration within country blocs in Latin America has led to positive effects on extra-regional trade flows with developed countries such as the US and the EU (Gordillo, et al., 2010).

7. Conclusion

Latin American countries have experienced a rapid change in regulatory environments and perspective towards international trade in the 1990's. This has led to the creation of three different PTAs within the Latin American region; Mercosur (1991), ACN (1992) and the CACM (1993). Using a Gravity model with panel data including trade flows figures of 189 partner countries between the period of 1986-2019, this research provides new evidence on the efficiency of the Latin American PTAs. First, evidence has been presented which indicates that for all three PTAs, intra-regional trade between member countries have been positively affected by the implementation of the regional trade agreements. These findings provide support against the sceptic views against Latin American trade liberalisation, where it is argued in various existing researches that, due to low initial trade flows amongst member countries and low levels of industrialisation, the implementation of three different PTAs could have potentially adverse effects on the participating countries' trade flows.

Moreover, this research provides evidence of positive effects for trade flows between Latin American countries and the rest of the world due to the implementation of the three PTAs, resulting in trade creation between such country pairs. Which is prominently explained by positive dynamic effects which domestic firms experience as a result of trade liberalisation (Dijkstra, 2000). Lastly, the obtained estimations suggest that for the ACN and CACM trade agreements, intra-regional trade between Latin American countries which are not member of the same PTA have decreased as a result of the implementation of the PTA. Contrarily, the Mercosur PTA has demonstrated to have increased trade flows between other Latin American countries and its member countries. This corresponds to the previous literature on international trade in which initially higher industrialised countries can reap the most benefit from specialisation and returns to scale effects as a result of an increased access to international markets. Such effects were however not present for the member countries of the ACN and CACM countries, resulting in trade diversion from other non-member Latin American countries (Michaely, 1999). These effects are argued in this research to pose a significant stumbling bloc for the general economic integration between all Latin American countries in the region.

Due to the empirical approach of this research, the evidence discussed in this research has disentangled the various trade effects of the three implemented PTAs in the Latin American region. While the positive intra-regional and extra-regional world trade effects suggest that these efforts towards trade liberalisation amongst the countries have positively affected trade flows for the member countries of each PTA, the different PTAs have proven to complicate general economic integration and cooperation in the region. Therefore, local and international policy makers concerned with the region should make more efforts towards the general integration of the Latin American region in order to create a more equal distribution of the positive trade effects which are currently exclusively enjoyed by member countries of the Mercosur agreement. Moreover, future research is needed to determine the exact mechanisms related to this intra-regional trade diversion effects between Latin American countries which are not member of the same PTA such that, possible frameworks and policies can be constructed and proposed in order to resolve such adverse effects of trade liberalisation.

Appendix

Table 1. Regional PTA's on Latin American Continent

Acronyms	Name of agreement	Implementation date	Type of Agreement	Member Countries
ACN	Andean Community of Nations	1992	Customs Union	Bolivia, Columbia, Ecuador, Peru
CACM	Central American Common Market	1993	Customs Union	Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama
Mercosur	Southern Common Market	1991	Customs Union	Argentina, Brazil, Paraguay, Uruguay, Venezuela (1997)

Table 2. Variable Denomination and Content

X_{ijt}	the annual trade flows from country *i* to country *j,* at year *t* (in constant 2010 US$)
GDP_{ijt}	gross domestic products for country *i* and *j,* at year *t* (in constant 2010 US$)
$DIST_{ij}$	geodesic distance in kilometres between the capitals of country *i* and *j*
$REMOT_{ijt}$	relative distances between country *i* and *j,* at year *t*
$GDPdif_{ijt}$	the absolute difference of the per capita GDPs of country *i* and *j,* at year *t*
$SIMIL_{ijt}$	measurement of the similarity in size of the GDPs of country *i* and *j,* at year *t*
$DEMOC_{it}$	measurement of the level of political and economic freedom in each exporting country *i*, at year *t*.
$COMM_{ij}$	dummy variable for the presence of a common border between country *i* and *j*
$LANG_{ij}$	dummy variable for the presence of a common language between country *i* and *j*
$ANDES_i$	dummy variable for the presence of a common border between country *i* and *j* albeit located in the Andean mountain range
$AMAZO_i$	dummy variable for the presence of a common border between country *i* and *j* albeit located in the Amazon rainforest
$LOCK_i$	dummy variable if country *i* is landlocked
PTA_{intra_ijt}	dummy variable for being member of the same PTA between country *i* and *j* at year *t*
$PTA_{extra\_latin\_ijt}$	dummy variable for being a member of a different PTA in Latin America between country *i* and *j* at year *t*
$PTA_{extra\_world\_ijt}$	dummy variable for *i* being a member of a PTA in Latin America and *j* being a country outside of Latin America at year *t*

Table 4. Trade partner country list

Afghanistan	Chile	Guinea	Mexico	Slovenia
Albania	China	Guinea-Bissau	Moldova	Solomon Islands
Algeria	Colombia	Guyana	Mongolia	Somalia
Andorra	Comoros	Haiti	Montserrat	South Africa
Angola	Congo, Dem. Rep.	Honduras	Morocco	Spain
Anguilla	Congo, Repub. of the	Hong Kong	Mozambique	Sri Lanka
Argentina	Costa Rica	Hungary	Namibia	Sudan
Armenia	Cote d'Ivoire	Iceland	Nepal	Suriname
Aruba	Croatia	India	Netherlands	Swaziland
Australia	Cuba	Indonesia	Netherlands Antilles	Sweden
Austria	Cyprus	Iran	New Caledonia	Switzerland
Azerbaijan	Czech Republic	Iraq	New Zealand	Syria
Bahamas, The	Denmark	Ireland	Nicaragua	Taiwan
Bahrain	Djibouti	Israel	Niger	Tanzania
Bangladesh	Dominica	Italy	Nigeria	Thailand
Barbados	Dominican Republic	Jamaica	Norway	Togo
Belarus	Ecuador	Japan	Oman	Tonga
Belgium	Egypt	Jordan	Pakistan	Trinidad & Tobago
Belize	El Salvador	Kazakhstan	Panama	Tunisia
Benin	Equatorial Guinea	Kenya	Paraguay	Turkey
Bermuda	Eritrea	Kiribati	Peru	Turks & Caicos Is
Bhutan	Estonia	Korea, South	Philippines	Uganda
Bolivia	Ethiopia	Kuwait	Poland	Ukraine
Bosnia & Herzegovina	Faroe Islands	Laos	Portugal	United Arab Emirates
Botswana	Fiji	Latvia	Qatar	United Kingdom
Brazil	Finland	Lebanon	Romania	United States
British Virgin Is.	France	Liberia	Russia	Uruguay
Brunei	French Guiana	Libya	Rwanda	Uzbekistan
Bulgaria	French Polynesia	Lithuania	Saint Kitts & Nevis	Venezuela
Burkina Faso	Gabon	Luxembourg	Saint Lucia	Vietnam
Burma	Gambia, The	Macedonia	Saint Vincent and the Grenadines	Yemen
Burundi	Georgia	Madagascar	Sao Tome & Principe	Zambia
Cambodia	Germany	Malawi	Saudi Arabia	Zimbabwe
Cameroon	Ghana	Malaysia	Senegal	
Canada	Gibraltar	Maldives	Serbia	
Cape Verde	Greece	Mali	Seychelles	
Cayman Islands	Greenland	Malta	Sierra Leone	
Central African Rep.	Grenada	Mauritania	Singapore	
Chad	Guatemala	Mauritius	Slovakia	

Table 7: Additional OLS Estimates of the Effects of Preferential Trade Agreements

	(1)	(2)	(3)	(4)	(5)	(6)
$ln(GDP_{it})$	0,131*** (17,57)	0,069*** (8,63)	0,035*** (6,20)	0,130*** (17,51)	0,129*** (17,13)	0,128*** (17,09)
$ln(GDP_{jt})$	0,016** (2,73)	0,002 (0,34)	0,058*** (10,19)	0,026*** (3,97)	0,027*** (4,01)	0,026*** (3,84)
$ln(DIST_{ij})$	-0,017** (-1,64)	-0,007* (-0,82)		-0,015** (-1,48)	-0,017** (-1,66)	-0,0113* (-1,07)
$COMM_{ij}$	3,965*** (20,01)	4,599*** (20,98)		4,257*** (22,71)	3,982*** (23,19)	3,781*** (23,61)
$LANG_{ij}$	1,970*** (29,36)	2,107*** (30,93)		1,996*** (29,73)	1,997*** (29,65)	2,002*** (29,91)
$ln(GDPdif_{ijt})$				0,126*** (15,83)	0,129*** (15,27)	0,081*** (9,28)
$ln(SIMIL_{ijt})$				-0,040*** (-4,60)	-0,042*** (-4,74)	-0,036*** (-4,01)
$ln(DEMOC_{it})$					0,243** (2,62)	0,593*** (6,13)
$ANDES_i$						-0,679* (-1,38)
$AMAZO_i$						0,331 (1,02)
$LOCK_i$						-1,214*** (-12,83)
ACN_{intra_t}	0,970*** (3,64)	-0,264 (-0,69)	1,274** (2,42)	0,775*** (2,92)	0,776*** (2,93)	1,051*** (3,62)
$ACN_{extra\_latin\_t}$	-0,078* (-0,43)	-1,153 (-4,02)	0,320 (0,79)	-0,302* (1,64)	-0,301* (-1,54)	-0,146 (-1,61)
$ACN_{extra\_world\_t}$	0,293** (3,86)	1,398** (6,53)	0,245** (2,41)	0,562** (7,26)	0,562** (7,21)	0,236* (2,89)
$CACM_{intra\_t}$	0,750*** (3,15)	0,896** (2,62)	3,135*** (6,06)	0,893*** (4,14)	1,019*** (4,32)	1,122*** (4,81)
$CACM_{extra\_latin\_t}$	-0,388** (-2,11)	-1,283*** (-4,26)	-0,322* (-0,96)	-0,617*** (3,36)	-0,645*** (3,46)	0,722*** (-3,97)
$CACM_{extra\_world\_t}$	-0,996*** (-3,39)	-1,472*** (-8,03)	-1,156*** (-12,25)	-1,223*** (-6,38)	-1,268*** (-6,24)	-1,351*** (-7,25)
$MERCO_{intra\_t}$	2,156*** (1,57)	0,134 (0,48)	0,428 (1,38)	1,893*** (1,28)	1,866*** (1,23)	2,134*** (1,78)
$MERCO_{extra\_latin\_t}$	2,165*** (1,91)	0,326 (1,16)	2,121*** (4,10)	1,727*** (1,21)	1,701*** (2,04)	1,561*** (1,83)
$MERCO_{extra\_world\_t}$	1,822*** (2,67)	-0,292 (-1,39)	0,988*** (1,01)	1,351*** (1,56)	1,323*** (1,77)	1,303*** (1,55)
Importer & Exporter fixed effects	No	Yes	No	No	No	No
Country pair fixed effects	No	No	Yes	No	No	No
N	40.945	40.945	40.945	40.945	40.945	40,945
R^2	0,205	0,178	0,125	0,216	0,212	0,206

Dependent variable is the logarithm of annual trade flows between country *i* and country *j*. In parenthesis, the *t*-statistics are given. *, ** and *** indicate a significance level at the 10%, 5% and 1% respectively.

Table 8: Additional PPML Estimates of the Effects of Preferential Trade Agreements

	(1)	(2)	(3)	(4)	(5)
$ln(GDP_{it})$	0,103***	0,031***	0,098***	0,029***	0,096***
	(13,50)	(1,26)	(13,37)	(13,18)	(13,01)
$ln(GDP_{jt})$	0,016**	0,033***	0,027***	0,098***	0,027***
	(4,08)	(1,17)	(5,52)	(5,66)	(5,49)
$ln(DIST_{ij})$	-0,003**	-0,013**	-0,003**	-0,004*	-0,004*
	(-0,49)	(-1,67)	(-0,42)	(-0,50)	(-0,51)
$COMM_{ij}$	1,042***	2,703***	1,931***	1,851***	1,757***
	(27,39)	(6,74)	(30,88)	(30,35)	(30,09)
$LANG_{ij}$	0,839***	0,473***	0,836***	0,836***	0,837***
	(22,63)	(9,45)	(22,61)	(22,73)	(22,65)
$ln(GDPdif_{ijt})$			0,051***	0,047***	0,046***
			(6,89)	(6,39)	(5,77)
$ln(SIMIL_{ijt})$			-0,023***	-0,026***	-0,024***
			(-3,66)	(-3,89)	(-3,63)
$ln(DEMOC_{it})$				0,334***	0,355***
				(4,61)	(4,02)
$ANDES_i$					-1,738
					(-8,63)
$AMAZO_i$					0,693*
					(3,91)
$LOCK_i$					-0,031
					(-0,40)
ACN_{intra_t}	0,734***	4,033***	0,701***	0,712***	0,696***
	(5,93)	(2,53)	(5,74)	(5,79)	(5,33)
$ACN_{extra\_latin\_t}$	-0,456*	-0,513*	-0,400**	-0,412*	-0,403*
	(-3,97)	(-7,69)	(-3,55)	(-3,68)	(-3,30)
$ACN_{extra\_world\_t}$	0,253***	0,462***	0,153***	0,167***	0,191***
	(4,52)	(7,75)	(2,66)	(2,91)	(2,93)
$CACM_{intra\_t}$	0,541***	1,092**	0,602***	0,631***	0,623***
	(4,53)	(2,15)	(5,06)	(5,30)	(5,23)
$CACM_{extra\_latin\_t}$	-0,127*	2,192***	-0,216*	-0,251**	-0,239**
	(-1,14)	(3,91)	(1,94)	(2,31)	(2,18)
$CACM_{extra\_world\_t}$	0,246***	0,556***	0,333***	0,369***	0,359***
	(4,20)	(7,45)	(5,63)	(6,29)	(6,07)
$MERCO_{intra\_t}$	1,057***	0,297***	0,985***	0,956***	1,147***
	(1,93)	(2,55)	(1,57)	(1,26)	(1,82)
$MERCO_{extra\_latin\_t}$	1,364***	1,161***	1,199***	1,167***	1,129***
	(3,66)	(6,15)	(2,0)	(1,78)	(1,02)
$MERCO_{extra\_world\_t}$	1,289***	0,945**	1,107***	1,073***	1,089***
	(3,66)	(2,26)	(1,00)	(1,07)	(1,15)
Importer & Exporter fixed effects	No	Yes	No	No	No
N	56.964	56.964	56.964	56.964	56.964
R^2	0,168	0,114	0,169	0,169	0,171

Dependent variable is the logarithm of annual trade flows between country *i* and country *j*. In parenthesis, the *t*-statistics are given. *, ** and *** indicate a significance level at the 10%, 5% and 1% respectively.

References

Ametoglo, M. (2016). Regional economic Integration and income inequality in Latin America: the case of the Andean Community of Nations. *Journal of Economic Integration. 33*(1). 604-628.

Anderson, E., & van Wincoop, E. (2003). Gravity with Gravitas: A Solution to the Border Puzzle. *American Economic Review*, *93*(1), 170–192.

ArcGis. (2021). *Land cover, Central and South America.* Retrieved from: https://www.arcgis.com/home/item.html?id=d5d55f53894d40ed8d44d0f00d540788

Axline, A. (1994), *Cross Regional Comparisons and the Theory of Regional Cooperation: Lesson from Latin America, the Caribbean, South East Asia and the South Pacific.* London: University Press

Baker, A. (2003). Why is Trade Reform So Popular in Latin America? A Consumption-Based Theory of Trade Policy Preferences. *World Politics, 55*(3), 423-455.

Bhagwati, J., Greenaway, D., & Panagariya, A. (1998). Trading Preferentially: Theory and Policy. *The Economic Journal*, *108*(449), 1128–1148.

Blackhurst, R., Richard, R., & Henderson, D. (1993), Regional Integration Agreements, World Integration and the GATT, in Kym, A., & Blackhurst, R. (eds.), *Regional Integration and the Global Trading System*, New York: St. Martin's Press.

Briceño-Ruiz, J. (2010). From the South American Free Trade Area to the Union of South American Nations: The Transformations of a Rising Regional Process. *Latin American Policy*, *1*(2), 208–229.

Bulmer-Thomas, V. (1998). The Central American common market: From closed to open regionalism. *World Development*, *26*(2), 313–322.

Bulmer-Thomas, V., Cerdas Cruz, R., Gallardo, E. & Seligson, M. (1992) *Central American Integration.* Miami: University Press

Burger, M., van Oort, F., & Linders, G. (2009). On the Specification of the Gravity Model of Trade: Zeros, Excess Zeros and Zero-inflated Estimation. *Spatial Economic Analysis*, *4*(2), 167–190.

Burges, S. (2005). Bounded by the Reality of Trade: Practical Limits to a South American Region. *Cambridge Review of International Affairs*, *18*(3), 437–454.

Cáceres, L. (1994). Central American Integration: its costs and benefits. *Cepal Review*, (54).

Cadot, O., Carrère, C., & Strauss-Kahn, V. (2012). Trade diversification, income, and growth: What do we know? *Journal of Economic Surveys*, *27*(4), 790–812.

Carrillo-Tudela, C., & Li, C. (2004). Trade Blocks and the Gravity Model: Evidence from Latin American Countries. *Journal of Economic Integration*, *19*(4), 667–689.

Carrillo, C., & Li, A. (2004). Trade Blocks and the Gravity Model: Evidence from Latin American Countries. *Journal of Economic Integration*, *19*(4), 667–689.

Centre d'Etudes Prospectives et d'Information International. (2021). *Gravity Database.* Retrieved from: https://www.cepii.fr/CEPII/fr/bdd_modele/presentation.asp?id=37

Chaudhuri, M., & Stallings, B. (1997). Global Change, Regional Responses: The New International Context of Development. *Contemporary Sociology*, *26*(1), 54.

Cipollina, M., De Benedictis, L., Salvatici, L., & Vicarelli, C. (2016). Policy Measurement and Multilateral Resistance in Gravity Models. *Working Papers Luisslab, 16.*

Creamer, G. (2003). Open regionalism in the Andean Community: a trade flow analysis. *World Trade Review*, *2*(1), 101–118.

de Santis, R., De Benedictis, L., & Vicarelli, C. (2005). Hub-and-Spoke or Else? Free Trade Agreements in the "Enlarged" European Union. *SSRN Electronic Journal*, *2*(2), 245-260

Dijkstra, A. (2000). Trade Liberalization and Industrial Development in Latin America. *World Development, 28*(9), 1567-1582.

Dominguez, J. (2002). Trade Liberalization and Industrial. In *Mexico, central and South America: Economics*, 377–393. New York: Garland Publishing.

Drzewoszewska, N. (2015). Searching for the Appropriate Measure of Multilateral Trade-Resistance Terms in the Gravity Model of Bilateral Trade Flows. *Dynamic Econometric Models*, *14*(29).

Egger, H., & Staub, K. (2015). GLM estimation of trade gravity models with fixed effects. *Empirical Economics*, *50*(1), 137–175.

Ekanayake, M., Mukherjee, A., & Veeramacheneni, B. (2010). Trade Blocks and the Gravity Model: A Study of Economic Integration among Asian Developing Countries. *Journal of Economic Integration, 25*(4), 627-643.

Feenstra, C. (2003). *Advanced International Trade* (2nd ed.). Princeton: Princeton University Press.

Fortanier, F. & Miao, G. (2017). Estimating Transport and Insurance Costs of International Trade. *OECD Statistics Working Paper. 80*(1).

Dicken, P. (2003). *Global Shift: Reshaping the Global Economic Map in the 21st Century* (4th ed.). New York: Guilford Press.

Dijkstra, G. (2000). Trade Liberalization and Industrial Development in Latin America. *World Development*, *28*(9), 1567-1582.

Gordillo, D., Stokenberga, A., & Schwartz, J. (2010). Central America's Intra and Extra-Regional Trade Potential: A Gravity Model Approach to Understanding Regional Integration. *Sustainable Development Occasional Series, 2*.

Head, K. & Mayer, T. (2014) Gravity Equations: Workhorse, Toolkit, and Cookbook. In Gopinath, G., Helpman, E. & Rogoff, K. (4th ed.) *The Handbook of International Economics*. Amsterdam: Elsevier.

Helleiner, G. (1996). Why small countries worry: neglected issues in current analyses of the benefits and costs for small countries of integrating with large ones. *The World Economy*, *19* (6), 759-763.

Hilbun, B., Kennedy, K., & Dufour, A. (2006). A Determination of the Trade Creation and Diversion Effects of Regional Trade Agreements in the Western Hemisphere. *American Agricultural Economics Association.*

Hummels, D. (1999). Toward a Geography of Trade Costs. *SSRN Electronic Journal*.

Ikenberry, J., & Friedman, T. (2005). The World Is Flat: A Brief History of the Twenty-First Century. *Foreign Affairs*, *84*(5).

Jurn, I., & Park, H. (2002). The Trade Effects on the Non-Member Countries of the Regional Integration: The Case of the Mercosur. *Multinational Business Review, 10*(2).

Leibenstein, H., & Tinbergen, J. (1966). Shaping the World Economy: Suggestions for an International Economic Policy. *The Economic Journal*, *76*(301), 92.

López-Jacoiste Díaz, E. (2015) The Latin American Integration Association. In Odello M., Seatzu F. (eds) *Latin American and Caribbean International Institutional Law.* The Hague: Asser Press.

Macphee, C., & Sattayanuwat, W. (2014). Consequence of Regional Trade Agreements to Developing Countries. *Journal of Economic Integration, 29*(1), 64-94.

Marshall, M. (2020). *POLITY5: Dataset Users' Manual*. Center for Systemic Peace. Retrieved from: http://www.systemicpeace.org/inscr/p5manualv2018.pdf

Marshall, G., & Jaggers, K. (2009). Polity IV Project: Political Regime Characteristics and Transitions, 1800–2007. Center for Systemic Peace.

Martinez, I. (2003). Gravity model: An application to trade between regional blocs. *Atlantic Economic Journal*, *31*(2), 174–187.

Michaely, M. (1999). Trade Preferential Agreements in Latin America: An Ex-Ante Assessment. *Policy Research Working Papers*.

Michaely, M. (1977). Exports and growth: An empirical investigation. *Journal of Development Economics*, *4*(1), 49-53.

Odello, M., & Seatzu, F. (2015). Latin American and Caribbean International Institutional Law. In *The Andean Community of Nations*, 118-135. The Hague: Asser Press.

Piermartini, R., & Yotov, Y. (2016). Estimating Trade Policy Effects with Structural Gravity. *Estimating Trade Policy Effects with Structural Gravity*.

Rodlauer, M., & Schipke, A. (2005). *Central America: Global Integration and Regional Cooperation*. International Monetary Fund.

Rousseaux, P., & Meade, E. (1957). The Theory of Customs Unions. *Economica*, *24*(93).

Ruiz, J., & Vilarrubia, M. (2007). The Wise Use of Dummies in Gravity Models: Export Potentials in the Euromed Region. *SSRN Electronic Journal*.

Santos Silva, J., & Tenreyro, S. (2011). Further simulation evidence on the performance of the Poisson pseudo-maximum likelihood estimator. *Economics Letters*, *112*(2), 220–222.

Seid, E. (2015). Regional Integration and Trade in Sub-Saharan Africa, 1993–2010: An Augmented Gravity Model. *Regional Integration and Trade in Africa,* 91-108.

Trotignon, J. (2010). Does Regional Integration Promote the Multilateralization of Trade Flows? a Gravity Model Using Panel Data. *Journal of Economic Integration*, *25*(2), 223–251.

UN Comtrade. (2021). *Annual Trade Flows*. Retrieved from UN Comtrade Database. Retrieved from: https://comtrade.un.org/data/

Wei, S. (1996), "Intra-National Versus International Trade: How Stubborn Are Nations in Global Integration", *NBER Working Paper.*

Wise, C. (1999). Latin American Trade Strategy at Century's End. *Business and Politics*, *1*(2), 117–153.

World Bank Group. (2021a). *World Development Indicator*. Retrieved from: https://data.worldbank.org/indicator/NY.GDP.MKTP.CD

World Bank Group. (2021b). Consumer price index (2010 = 100) - United States. Retrieved from: https://data.worldbank.org/indicator/FP.CPI.TOTL?locations=US.

Zhou, M. (2011). Intensification of geo-cultural homophily in global trade: Evidence from the gravity model. *Social Science Research*, *40*(1), 193–209.