South-south migration: With whom you trade matters

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Abstract
This paper investigates the role of regional trade agreements (RTAs) on bilateral international migration. First, we preprocess data for 37 countries in Latin America and the Caribbean, from 1990 to 2015, using entropy and control for observable characteristics. Then, we use the gravity model for migration proposed by Anderson (2011) and solve the zero migration stocks problem by using the PPML approach. Our results deliver consistent estimates and suggest a positive relationship between RTAs and bilateral migration stocks. Thus, south-south RTAs represent not only an opportunity to boost international trade, but also a way to ease migration towards member countries.

Keywords*:* Latin America and the Caribbean, international migration, regional trade agreements, entropy balancing, gravity model.

Área temática: 5. Relações Econômicas Internacionais

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1. Introduction

From the late 1990s through the early 2000s there had been a boom in literature on the impact of migrants from developing countries on the labor market of developed economies (BORJAS, 2003; CARD, 2005; OTTAVIANO & PERI, 2005). Despite its importance, this study trend has not been followed by the equivalent amount of researches covering the impact of south-south migration flows[1] (GINDLING, 2009). A World Bank study of country-to-country migration flows concluded that roughly half of the migrants from developing countries reside in other developing countries (RATHA & SHAW, 2007). For instance, Martin (2013) found that south-south migration represented in that year the largest flow of migrants in the world: over 82 million people moving from one developing country to another, accounting for 36% of the world's migrating population. Substantial south-south migration is not unprecedented. Hatton and Williamson (2002) noted that before 1914 more than 50 million people left China and India for jobs elsewhere in the periphery and that this type of migration has been unassumingly ignored by economists. This might represent a probable reason why there has been a limited number of researches involving this direction of migration flows.

Along with that, in the past decades, the international trading system has experienced a dramatic increase in the number of regional trade agreements (RTAs) followed by a slower growth in the quantity of preferential trade arrangements (PTAs)[2]. Such a growing number of trade agreements represents a prominent feature of international trade (WTO, 2018a). From the 1960s through the 1990s, the number of RTAs increased from two in the former decade to 19 in the latter. From the 1990s onwards, it achieved a strong growth reaching 284 in 2017 (WTO, 2018b). Conversely, the number of PTAs did not follow a high increase along the years. In the 1960s, only one PTA had been in force up to the 1990s, when the number increased to 13. From that decade onwards, the quantity of PTAs modestly reached 32 in 2017 (WTO, 2018c).

Trade agreements are believed to represent an indirect and important determinant of international migratory movements. Orefice (2015) and Figueiredo *et al*. (2016), for instance, analyzed this determinant for developed origin and destination countries and found a positive significant relation between trade agreements and migration settlements. What has not yet been done and is the aim of this paper, is the investigation of a possible indirect effect of trade agreements on international migration exclusively among developing nations. The selection of Latin American and Caribbean countries (henceforth also referred to as LAC) lies not only in the fact that they represent a noteworthy set of developing economies, but also in their historical, geographic and economic similarities. Pizarro and Villa (2005) noted that a characteristic of LAC countries is the frequency of population movement across national borders, a trend deeply rooted in the economic and social features of the countries in the region. By investigating this set of developing countries, we address the shortage of studies involving this type of origin and destination economies and present a relevant contribution to the literature.

Regional trade agreements primarily aim to liberalize global trade and to consolidate existing bilateral relationships among parties. Besides common benefits shared by participating nations, RTAs also increase the information on member countries, which could potentially reduce the transaction costs attached to migration stocks[3]. RTAs play a dual role in stimulating bilateral migration stocks. First, they reduce the cost of migration by increasing the information on prospective destination countries. Second, they increase migration stocks by including migration related provisions

[1] Flow refers to the number of international migrants entering or leaving a given country over the course of a specific period (UNITED NATIONS, 2018).

[2] RTAs are reciprocal trade associations between two or more partners while PTAs refer to unilateral trade preferences (WORLD TRADE ORGANIZATION – WTO, 2018a).

[3] Stock refers to the total number of persons born in a country other than that in which they reside (AMERICAN ASSOCIATION OF GEOGRAPHERS, 2018).

(OREFICE, 2015). Horn *et al*. (2010) show that more recently signed RTAs contain provisions that go beyond those considered traditional by the trade liberalization literature. As an example, the Southern Common Market (Mercosur) trade association, mostly thought for trade in goods and services, includes migration related provisions that ease the movement of workers among its signatory members (MERCOSUR, 2018). These provisions include visa, asylum and social security regulations that favor the movement of workers towards Mercosur members, and eventually contribute to a long-term stay in a prospective destination country (MERCOSUR, 2018).

Cultural and geographic proximity, the occurrences of natural disasters, inflation, inequality and the efforts at its economic integration are some of the characteristic features that we believe might stimulate intraregional migration in LAC. Our hypotheses are that migration in the region tends to be towards those countries where the same language is spoken and where production structures are more favorable to job creation. We also expect that natural disasters and inflation affect the decisions to emigrate and most importantly that our variable of interest - having a common RTA - is positively correlated with the stock of migrants. To confirm these hypotheses, we investigate empirically the role of RTAs as a determinant of bilateral migration stocks by estimating a modified gravity model of migration (ANDERSON, 2011; KARAMERA *et al.*, 2000; OREFICE, 2015). More specifically, we analyze the potential indirect influence of trade agreements on the migration stocks of 37 Latin American and Caribbean countries.

Our paper contributes not only to a deeper comprehension of migration patterns in LAC, but also and most importantly to a more critical analysis of trade policies. Through the understanding that by promoting international trade via a RTA there might exist an indirect effect, which is the movement of people across international borders, policymakers could formulate more coherent policies that incorporate such information in benefit of all involved countries. The outcome of our study allows policies to combine trade and migratory regulations in case the latter becomes an undeniable by-product of the former.

The following section presents some descriptive evidence regarding the evolution of migratory movements in LAC and shows the increase in the number of RTAs signed by its member countries. Section 3 presents a brief literature review of the economic determinants of international migration. Section 4 introduces Anderson's (2011) gravity model for migration, describes the empirical model and the data used in this study. In section 5, the estimation results. The last section provides our concluding remarks.

2. A first look

To ensure that there is sufficient coverage over time and across countries, this introductory analysis uses data from the United Nations Population Division database and from the WTO RTA database. The former dataset contains information on migration stocks for 48 Latin American and Caribbean countries over the period 1990-2017. These aggregated series show the evolution of the migration stocks over time and identify important trends in international migratory movements. Moreover, the database from the WTO provides valuable information on the numbers of RTAs signed by Latin American and Caribbean economies within the same period.

Figure 1 shows the immigrant population in LAC by origin over the period 1990-2017. More precisely, it decomposes the migrants' region of origin into two major groups. Line 1 in Fig. 1 shows the number of migrants residing in LAC who have been born in another country in the same region. Line 2 indicates those individuals who reside in LAC, but have been born elsewhere. The sum (plotted as Line 3) shows the variation in the total number of immigrants in LAC over time.

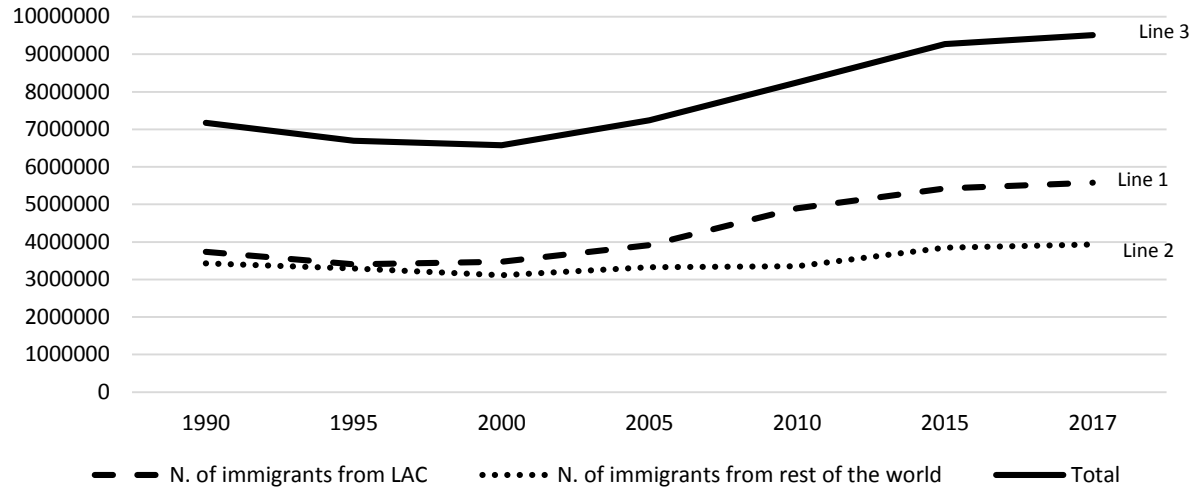


Figure 1. Number of immigrants by origin in LAC over the period 1990-2017.
Source: Authors'calculations based on the Trends in International Migrant Stock: the 2017 Revision, United Nations Population Division (2018).

Figure 1 suggests that from the 2000s onwards, the total number of immigrants increased steadily until 2015 and modestly from that year up to 2017. At the same time, Line 1 shows that the growth in the number of immigrants from LAC closely mirrors the expansion in the overall number of immigrants. Line 2, on the other hand, shows that the number of migrants from non-LAC countries fell little from the 1990s through the 2000s and stayed somewhat constant throughout the entire period. Line 1 points out that, through the entire period, the number of immigrants originally from other LAC countries is higher than the number of individuals born elsewhere, indicated by Line 2. From the 1990s up until the 2000s, the difference between the number of migrants coming from other Latin countries and from the rest of the world is relatively minor. However, it is from the 2000s onwards that the former type of migration begins to rise steadily until the end of the period under analysis. Such an upward slope may be associated with the increase in the number of RTAs in the same period. To confirm this assumption, Figure 2 presents information on both RTAs and migration stocks. For now, it is possible to assume that most immigrants in LAC did not come from other countries other than those in the same region.

In order to draw a more detailed comparison between RTAs and migration stocks, Figure 2 shows the evolution in the figures of RTAs and migratory movements in LAC within the 1990-2017 timeframe.

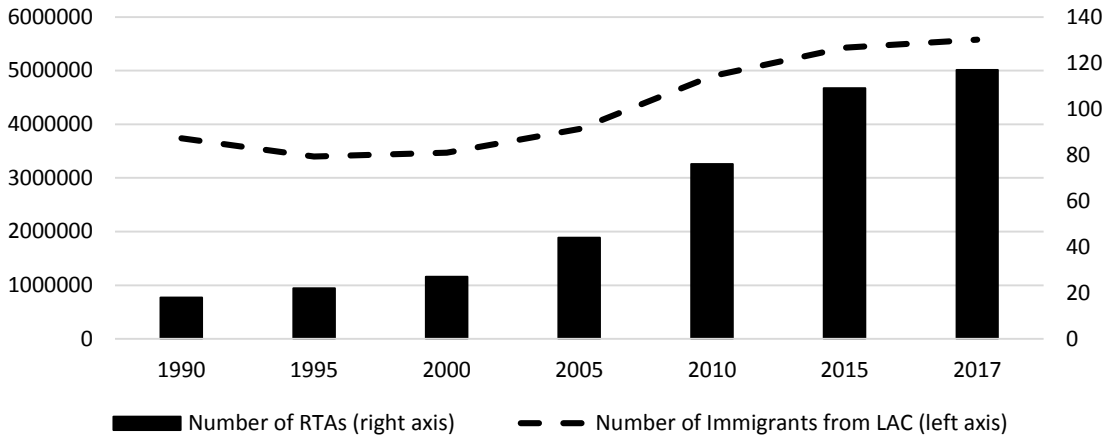


Figure 2. Increasing trend in LAC migration stocks and number of RTAs over the period 1990-2017.
Source: Authors' calculations based on Trends in International Migrant Stock: the 2017 Revision, United Nations Population Division (2018); RTA Database, World Trade Organization (2018).

The dotted line refers to the increasing trend in the migration stock of individuals of LAC descent residing in other Latin country other than their home country. The bars indicate the quantity of RTAs in which LAC countries are signatory members. From the mid-1990s onwards until the 2000s, the variation in the number of immigrants stayed rather constant, while it is possible to note a slight increase in the number of RTAs. The curve showing the evolution in the migration stock in LAC presents an upward slope from the 2000s onwards, which mirrors the growth in the number of RTAs within the same period. For this reason, it is sensible to think that these data could represent evidence that there might be a solid correlation between the number of RTAs and the migratory stocks among the countries under analysis.

3. Literature review

Mayda (2010) uses a database from the Organization for Economic Co-operation and Development (OECD) on annual legal inflows of workers by country of origin. She uses these data to investigate the determinants of migration inflows into 14 OECD countries and analyzes the effect of average income in origin and destination countries on migration from 1980 to 1995. Her analysis delivers estimates broadly consistent with the predictions of the international migration model by controling for country and year effects. She finds that *per capita* GDP in the destination country significantly increases the size of emigration rates. On the other hand, she uncovers that the impact of *per capita* GDP in the origin country is rarely negative as theory suggests would be the case with non-binding migration quotas and, when it is, the size of the effect is insignificant. She also finds that distance between origin and destination countries appears to be the most important variable affecting the costs of migration: its effect is negative, significant, and steady across all specifications.

Orefice (2015) uses yearly data on immigrant inflows for 29 OECD countries between 1998 and 2008; he investigates empirically the role of PTAs as a determinant of bilateral migration flows. In comparison with Mayda (2010), he expands his analysis to a higher number of countries and relies on data that are more recent. For that, he estimates a modified gravity model for migration providing evidence of a strong positive effect of PTAs on bilateral migration flows. In his analysis, he also considers the content of PTAs as a determinant of migration; by doing so, he finds that visa-asylum and labor market provisions stimulate bilateral migration flows when they are included in the PTAs.

Figueiredo *et al*., (2016) use data for 200 countries from the World Bank Global Bilateral Migration over the 1960–2010 period, in 10-year intervals; the authors investigate the role played by a common RTA on international migration stocks. Their paper applies a fresh econometric technique to address specific migration cases, common in their sample, which could eventually bias their

estimations. These cases refer to very large migration stocks involving the same country pairs across years, for example, Mexico-USA, Morocco-Spain, Poland-Germany. They use quantile regression to address such a problem in an attempt to avoid overestimation by the Poisson estimator. Their quantile regression estimation with country-year effects indicates that signing an RTA stimulates bilateral migration.

Gindling (2009) examines the impact of migration from one developing country, Nicaragua, on earnings, inequality and poverty in another developing country, Costa Rica. His hypothesis is that migration from Nicaragua contributes to falling wages, increased income inequality and stagnating poverty in Costa Rica. He uses yearly data from the Household Surveys for Multiple Purposes for the 2000-2004 period. In his estimation, concludes that it is unlikely that the influx of Nicaraguans into Costa Rica is directly responsible for the stagnation of poverty rates in the host country. Briefly, he finds no evidence to support the hypothesis that the intensification of Nicaraguan migration to Costa Rica is an important factor contributing to falling wages, an increase in earnings, inequality and stagnating poverty.

Beine & Parsons (2015) examine natural disasters and climatic factors as determinants of international migration. These authors implement a World Bank panel dataset of bilateral migration flows from 1960 to 2000. They use information on both developing and advanced economies and cover environmental data involving different sorts of natural disasters: droughts, earthquakes, extreme temperatures, floods, storms, to name a few. They find no direct effect of short- and long-run climatic factors on international migration across their entire sample. Gravity estimates regarding contiguity and common language are in line with Mayda (2010) and Orefice (2015).

Beaton *et al*. (2017) perform an extensive analysis of recent trends in emigration from and remittances to LAC in order to investigate possible engines of growth and macroeconomic stabilizers. Among other things, these authors evaluate patterns of migration and remittances in LAC and the demographic characteristics of emigrants and remittance senders. They analyze the channels through which remittances are sent and examine the impact of emigration and remittances on growth and macroeconomic stability. The authors analyze migration from LAC to the rest of the world and from different parts of the globe to LAC. For their empirical estimation, these researchers use data from the UN Population Division from 1990 to 2015. They find no direct effect of GDP growth, inflation, natural disasters and unemployment (destination) on migration stocks (as a share of the home population). Conversely, their results indicate that *per capita* GDP (origin), rural population, age dependency and war seem to influence migrants' decisions towards moving internationally.

Our study differs greatly from Mayda (2010) and Orefice (2015) in that we use the gravity model to explore the potential effects of RTAs on a specific direction of migratory movements: south-south migration. As Gindling (2009), we investigate the migratory routes from a developing economy to another; however, this paper covers not only one origin and destination country, but a rather representative sample of 37 LAC countries. With respect to Figueiredo *et al*. (2016), this paper differs not only in scope (sample of LAC developing economies) but also, because we use more recent data (i.e., years 1990 to 2015), in 5-year intervals, providing up-to-date figures and more precise time coverage. Unlike Beaton *et al*. (2017), our analysis focuses solely on the investigation of intraregional migration in LAC as a result of an indirect effect of RTAs. Our paper distinguishes from all mentioned studies in that we use entropy to match treated units to similar non-treated units and then estimate an unbiased effect of RTAs on migration stocks. Regarding the gravity model, we follow Orefice (2015) and Karamera *et al*. (2000) who introduced in their studies a modified gravity model for migration. These authors followed Anderson (2011) strictly deriving the structural gravity equation for bilateral migration stocks. We provide more details on the modified model in the following section.

4. Methodology

4.1. Empirical model

This paper's benchmark specification of the gravity equation for the bilateral migration stocks is the following:

$$M_{ij,t} = \beta_0 + \beta_1 RTA_{ij,t}^{both} + \beta_2 Merc_{ij,t}^{both} + \beta_3 Z_{ij,t} + \beta_4 environ_{i,t} + \beta_5 infla_{i,t} + \beta_6 inequal_{ij,t} + \chi_{i,t} + \mu_{j,t} + \delta_i + \rho_j + \psi_t + \varepsilon_{ij,t} \quad (1)$$

Where the subscripts *i, j* and *t* correspond to origin, destination and year respectively; $M_{ij,t}$ is the migration stock between countries *i* and *j* at time *t*. $RTA_{ij,t}^{both}$, the main explanatory variable, is a dummy that equals one if both origin and destination are signatory countries of the same RTA and zero otherwise. $Merc_{ij,t}^{both}$ represents a dummy variable that equals one if both countries in a pair are Mercosur members and zero otherwise.

A set $Z_{ij,t}$ of traditional gravity variables is included to control for the determinants of migration. Vector $Z_{ij,t}$ includes geographic distance, contiguity, linguistic similarity and *per capita* GDP – to capture factors that facilitate or impede migration. Geographic distance is measured as the natural logarithm of the distance (in kilometers) between each country's most populous cities. Contiguity is a dummy variable that takes the value one if the country pair shares a border. Language similarity is captured using a dummy variable that equals one if the country pair shares a common official language. *Per capita* GDP (in both destination and origin countries) is measured as the natural logarithm of the GDP (in current US dollars) divided by the country's total population.

Environmental occurrences are captured through a natural disaster variable $environ_{i,t}$, which comprises droughts, earthquakes, extreme temperatures, floods, storms, volcanic activity, epidemics, landslide, wildfire, wave action and insect infestations. This variable is calculated as the total number of natural disasters in a given five-year interval. The variable inflation $infla_{i,t}$, measured by the average consumer price index in a five-year interval, reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services. Similarly to Beine & Parsons (2015) and Beaton *et al*. (2017), respectively, we believe that a rise in the number of climatic incidents and higher inflation may contribute to outward international migration. Therefore, we expect that both variables ($environ_{i,t}$ and $infla_{i,t}$) are positively correlated with the dependent variable. Finally yet importantly, we follow Mayda (2010) and add another control variable – origin country's relative inequality or $inequal_{ij,t}$. This control gives a measure of the inequality in the origin country relative to the destination country – it equals the Gini coefficient in the origin country ($\sigma_{i,t}$) divided by the Gini coefficient in the destination ($\sigma_{j,t}$). We expect a positive correlation between the Gini coefficient in the origin country and the dependent variable, meaning that higher levels of inequality in country *i* might stimulate migration towards country *j*.

Origin (δ_i) and destination (ρ_j) country-effects control for unobserved country specific characteristics that are time-invariant. In particular, destination country fixed effects control for features of the destination country's immigration policy (entry-restrictive regulations). Year-effects (ψ_t) control for macroeconomic trends common to all countries in the sample. Finally, country-by-year fixed effects ($\chi_{i,t}$ and $\mu_{j,t}$) properly absorb inward and outward country specific migration resistance terms[4]. Using such time-varying country dummies also reduces dramatically the scope for omitted variables and potential mismeasurement.

We use a two-step approach to identify the effect of RTAs on migratory settlements. In the first step, we preprocess the data prior to the estimation and solely control for observable characteristics. We use the entropy balancing method proposed by Haimuller (2012) as a technique to obtain a balanced matching sample. By using Entropy, we are able to observe the 'pure' effect of RTAs on migratory stocks. Unlike other preprocessing methods, entropy balancing involves a reweighting scheme that directly incorporates covariate balance into the weight function that is

[4] Bertoli and Fernández-Huertas Moraga (2013) define multilateral resistance terms as the contradictory effect, that attractiveness of alternative destinations exert on the determinants of migration stocks.

applied to the sample units (HAIMULLER, 2012). More specifically, this method obtains a control group as similar as possible to the group of countries that have a common RTA (treatment), which allows us to compare the groups without any possible selection bias.

In the second step, we use the OLS and PPML estimation techniques. However, an econometric issue in our sample is the zero migration stocks problem. According to Santos Silva & Tenreyro (2006), in the presence of zero valued observations and logarithm transformation, OLS have very large bias that do not vanish as the sample size increases, confirming its inconsistency. Therefore, we rely on the PPML estimation as our preferred specification. This estimator is appropriate because it accounts for observed heterogeneity and provides a natural way of dealing with zero valued bilateral stocks through its fixed effects.

4.2. Data

Data on bilateral migration stocks come from the United Nations Population Division dataset and covers a sample of 37 Latin American and Caribbean origin and destination countries[5], for the period 1990-2015, in five-year intervals. The main variable is the existence of a RTA between migrants' origin and destination countries. Information on RTAs come from the WTO. This dataset represents a comprehensive mapping of 35 RTAs signed by LAC countries over the 1986-2015 period.

Gravity variables (distance, contiguity and linguistic similarity) come from the CEPII Bilateral Distance Database. We use data on *per capita* GDP and inflation from the World Bank Development Indicators. Data on the number of natural disasters are from the International Disaster database, which is compiled by the Center for Research on the Epidemiology of Disasters. Finally, data on Gini coefficients of destination and origin countries, used to construct the origin country's relative inequality variable, come from the World Bank dataset. When all independent variables are included, the sample size has 7,992 observations covering 1,332 country pairs.

5. Results and discussion

In this section, we first present descriptive statistics for all variables included in Equation (1), and then, we discuss the baseline estimates found in this research.

5.1. Summary statistics

Table 1 presents averages, standard deviations, extreme values for each regressor, and the number of available observations for the baseline sample.

The dependent variable 'bilateral migration stocks' presents a mean value of 3,264 individuals, which indicates the average number of immigrants in the baseline sample. However, it also presents a rather large standard deviation meaning that the values in the dataset are farther away from the mean. This indicates a large amount of variation in the distribution of the stocks among the studied countries. This interpretation reflects the different characteristics of the destination countries as well as possible preferences of potential migrants.

LAC countries have an extensive set of official languages including English, Dutch, French, Spanish, Portuguese and other local dialects. Many of the origin and destination countries under analysis share not only one, but multiple common languages accounting for approximately 45% of

[5] Antigua and Barbuda, Argentina, Aruba, Bahamas, Barbados, Belize, Bolivia, Brazil, Cayman Islands, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, Uruguay, U.S. Virgin Islands and Venezuela.

Table 1: Summary statistics for migration stocks.

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Bilateral migration stock	7992	3264	28901.64	0	973315
Common official language	7992	0.45	0.50	0	1
Contiguity	7992	0.04	0.21	0	1
Distance	7992	2722.67	1777.44	94.83	7563.5
Natural disasters	7992	7.69	8.06	0	44
Inflation	7992	60.24	379.99	-0.10	4810.81
Origin country's relative inequality	1824	1.01	0.15	0.58	1.70
Per capita GDP destination countries	7992	6544.03	7807.34	0	60687.53
Per capita GDP origin countries	7992	6544.03	7807.34	0	60687.53
Mercosur	7992	0.01	0.09	0	1
RTA	7992	0.30	0.46	0	1

Note: Figures for bilateral migration stock are in individual counts. Figures for distance and *per capita* GDP are in kilometers and current US dollars, respectively. Figures for natural disasters are in number of occurrences. Figures for inflation are expressed as a percentage. Numbers rounded to two decimal places.
Source: Authors' own calculations.

the baseline sample. In other words, 603 country pairs of the complete sample. Sharing a common language is believed to play an important role in the decision making process prior to international migration since it reduces the assimilation time and eases adaptation in the destination country.

Contiguity refers to a common border between a pair of countries. The mean value of this dummy variable suggests that only four percent of the baseline sample consists of a country pair that shares a common frontier. In other words, it accounts for 59 country pairs out of the total amount of 1,332. Contiguity might indeed influence migrants' options towards migrating, especially those individuals who reside in a border town in the origin country. However, an intrinsic characteristic to that may be a stronger determinant of international migratory movements, such as the distance between origin and destination.

The summary statistics presented in Table 1 show that the mean value of the variable distance is approximately 2,722 km. This figure indicates that Latin American and Caribbean countries' most populous cities are located, on average, 2,722 km away from each other. The extreme values for this variable suggest that the furthest distance amongst the cities involved is 7,563.50 km and the shortest distance, approximately 95 km.

Natural disasters refer to the total number of occurrences in a given five-year interval. Its mean value suggests that, on average, there is a rather small number of natural incidents in the sampled countries – approximately 8 compared to a maximum of 44. On the one hand, such a small mean value may indicate that natural disasters are scarce in LAC countries and thus play a minor role in influencing emigration. On the other hand, we ought to consider that the magnitude of a single incident might be responsible for stimulating outward migration. We discuss this further in subsection 5.2.

Inflation refers to the measure of the consumer price index. This variable is believed to have a ripple effect through the economic stability of a country affecting the population purchasing power and its inhabitants' employment status. These aspects could potentially stimulate an outflow of migrants towards more stable economies. Figures for this control variable (shown in Table 1) range largely when we analyze its extreme values. However, it is valid to take into consideration that these numbers might represent time-specific financial crises and may not lead to immediate outward migration.

Origin country's relative inequality represents a variable that equals the Gini coefficient in the home country divided by the Gini coefficient in the destination country; meaning that the closer it is

to 1 the more similar the country pair is in terms of income inequality. With a very low standard deviation of 0.15 and a mean value of 1.01, we can assume that the income distribution among most LAC countries is relatively similar to one another. A mean value of 0.51 for the Gini coefficient (not the ratio) suggests that income inequality in LAC is rather high. Given these figures, we not only observe that income distribution in the sampled countries is roughly similar, but also that it is highly concentrated.

Per capita GDP captures the variation in income distribution among LAC countries. This variable mean value shows that the average income in these countries equals nearly 6,544 dollars. It also presents a relatively high standard deviation of approximately 7,807, indicating that the involved economies are heterogeneous. Conversely, these economies do not present a wide *per capita* GDP variation as it would, for example, had the analysis taken into consideration developing and developed economies. Added to that, the data for *per capita* GDP includes a significant amount of zeros (missing values) for this variable, which may lead this estimate to bias[6].

Mercosur refers to a very small amount of observations of the baseline sample. The bloc consists of Argentina, Brazil, Paraguay, Uruguay and Venezuela[7]. The mean value for this dummy variable suggests that Mercosur country pair members account for nearly 1% of the total number of observations. This variable captures labor, visa and asylum provisions included in the trade association that might benefit migrants from these countries positively. The variable of interest is the existence of a common RTA between migrants' origin and destination countries. Based upon the summary statistics, we note that 30% of the observations account for country pairs that share a common RTA. In other words, approximately 2,402 out of 7,992 observations and roughly 400 country pairs, on average.

We now present the results of the entropy balancing method. Table 2 presents averages for both control and treatment groups for the non- and balanced samples.

Table 2: Results of the balancing method (mean of the variables).

	Non Balanced Sample				Balanced Sample			
Variables	**No RTA (Control)**	**RTA**	**No RTA (Control)**	**RTA**	**No RTA (Control)**	**RTA**	**No RTA (Control)**	**RTA**
Language	0.366	0.657***	0.637	0.762***	0.657	0.657^{ns}	0.762	0.762^{ns}
Contiguity	0.015	0.115***	0.020	0.236***	0.115	0.115^{ns}	0.236	0.236^{ns}
Distance	7.798	7.296***	7.955	7.621***	7.296	7.296^{ns}	7.621	7.621^{ns}
Natural disasters	7.688	8.249***	11.200	13.820***	8.249	8.249^{ns}	13.820	13.820^{ns}
Inflation	0.631	0.527^{ns}	0.394	0.509^{ns}	0.527	0.527^{ns}	0.509	0.509^{ns}
GDPpc origin	8.370	8.232***	7.945	8.110***	8.232	8.232^{ns}	8.110	8.110^{ns}
GDPpc dest.	8.357	8.261***	7.899	8.173***	8.261	8.261^{ns}	8.173	8.173^{ns}
Inequality	-	-	1.014	1.009^{ns}	-	-	1.009	1.009^{ns}
Observations	5,590	2,402	1,013	811	5,590	2,402	1,013	811

Note: ***means are statistically different from the control group (no RTA) at 1%. NS – means are statistically the same as the control group at 1%. Figures for distance (in ln) and *per capita* GDP (in ln) are in kilometers and current US dollars, respectively. Figures for natural disasters are in number of occurrences. Figures for inflation are expressed as a percentage. Numbers rounded to three decimal places.
Source: Authors' own calculations.

On average, nearly 66% of the countries that have a common RTA also have a common language opposed to countries that do not have a regional trade agreement, on average, 37%. This comparison is also possible when we add the origin country's relative inequality variable although its

[6] This problem is tackled using a PPML estimation to strengthen results (SILVA & TENREYRO, 2006).
[7] In December 2016 and in August 2017, Mercosur suspended Venezuela's membership for violating democratic principles and failing to comply with trade obligations adopted since its incorporation into the bloc in 2012 (MERCOSUR, 2018).

mean values differ less expressively. Countries that have a common RTA seem to have a higher share of bordering trade partners for both samples (without and with variable inequality). No major disparity has been observed in the averages of distance, natural disasters and *per capita* GDP.

Results shown under the 'Balanced sample' part of Table 2 present the mean values for the balancing method using the first moment of the sample. Prior to using this method, we observe statistically significant difference between treatment and control groups. Nevertheless, we find no statistically significant difference between these groups (test of equality of means) after using the entropy method. These results infer that we are able to obtain a very similar control for each treatment group, based on observable characteristics. By doing so, we are able to analyze the absolute effect of RTAs on the stock of migrants since the only difference between these two groups is having a common RTA.

Figures 3, 4 and 5 present information on the concentration of immigrants per region of destination country. Figure 3 shows the stock of immigrants from Latin America and the Caribbean in South American countries (shown on the horizontal axis) in 1990 and in 2015.

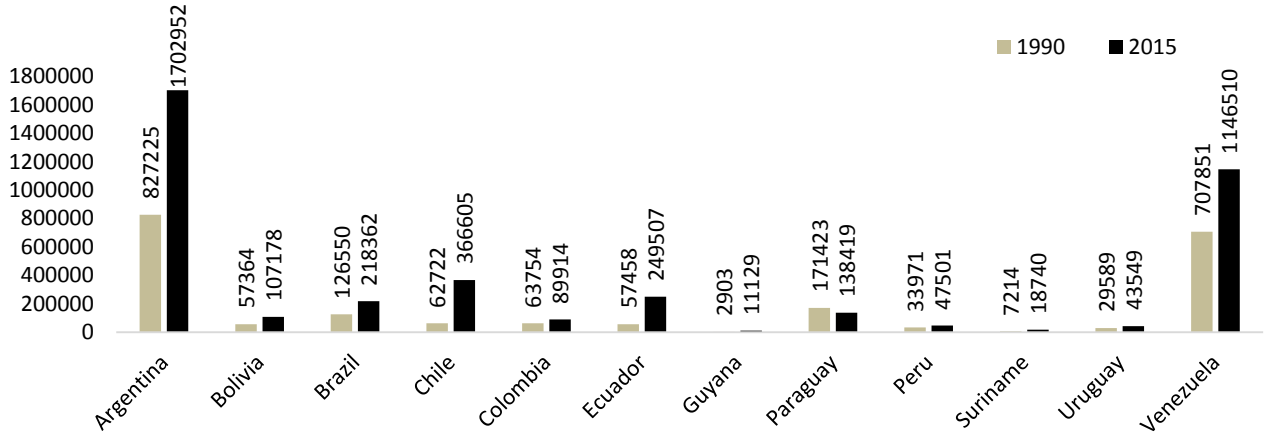


Figure 3. Stock of immigrants of LAC descent in South America.
Source: Own calculations based on Trends in International Migrant Stock: the 2017 Revision, United Nations Population Division (2018).

Argentina clearly stands out as the country with the largest number of immigrants of Latin descent in both 1990 and 2015. The increase in the number of LAC immigrants residing in Argentina was nearly 106% in the 25-year timeframe, followed by Venezuela as the second most attractive country for LAC immigrants in South America. Pizarro & Villa (2005) find that in 2000, almost two thirds of Latin Americans who were living within the region but outside of their native country were concentrated in Argentina and Venezuela. These authors highlight that Argentina has been the traditional host country of large contingents of Bolivians, Chileans, Paraguayans, and Uruguayans, as well as a significant number of Peruvians since the 1990s. In general, these groups have been attracted by job opportunities in agriculture, manufacturing, construction and services. Pizarro and Villa (2005) mention that migrants moving into Venezuela in the 1970s, following the economic upturn triggered by the oil boom, were mostly Colombians, which may still be reflected onto the data presented in Fig. 3 for both years.

Chile is the South American country whose immigrant population had the most substantial increase from 1990 to 2015. This country received nothing less than 303,883 immigrants; an inflow of migrants representing a 485% increase. Chile registered an important immigration from other South American countries in addition to return migration; in absolute numbers, this immigration is higher than any one received in Chile during its history but its relative incidence is small (it is only equivalent to 1% of the country's population) (MARTÍNEZ, 2003).

Figure 4 presents the total number of Latin American and Caribbean immigrants residing in Central American countries[8] (shown on the horizontal axis) in 1990 and in 2015.

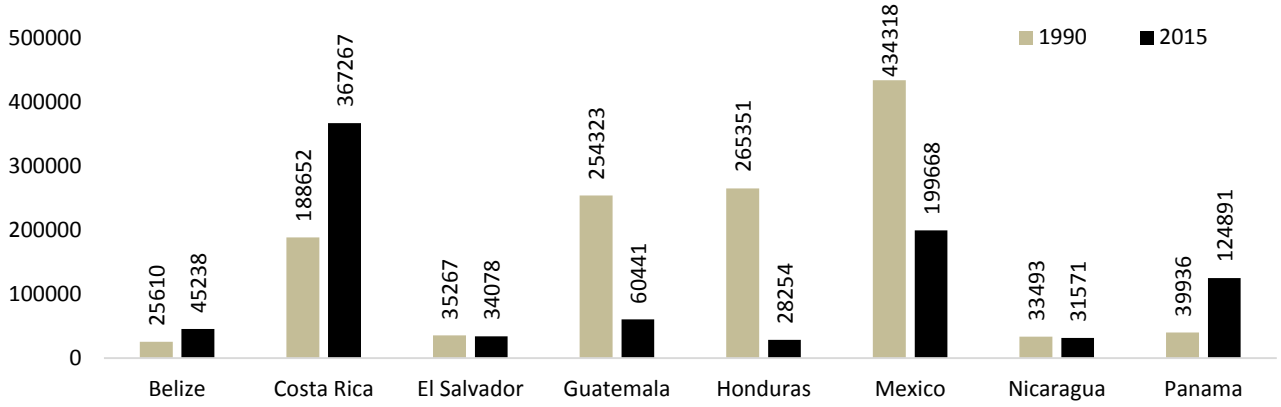
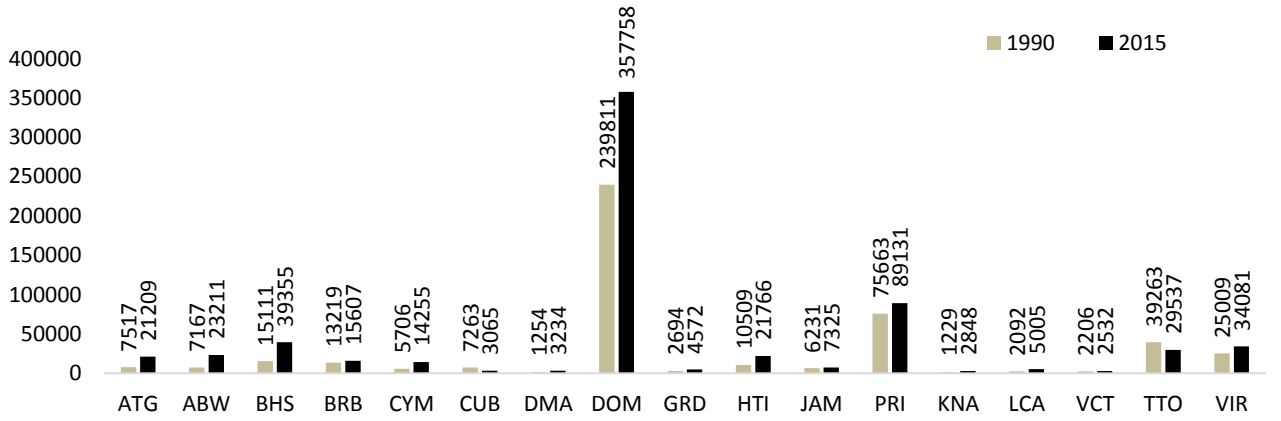


Figure 4. Stock of immigrants of LAC descent in Central America.
Source: Author's calculations based on Trends in International Migrant Stock: the 2017 Revision, United Nations Population Division (2018).

In Central America, Belize and Costa Rica present very different absolute immigrant magnitudes, but similar relative trends and effects on the demographic, social and economic areas. Costa Rica nearly doubled its immigrant population while Belize achieved a 77% growth in the 25-year gap. In Belize, foreigners – mainly from El Salvador and Guatemala –amount to 15% of the country's population and this number does not include temporary workers or migrants in transit (SIEMCA, 2002). From the end of the civil conflict in Nicaragua in 1990 until the late 2000s, Nicaraguan immigration to Costa Rica grew from nearly 2% of the population to approximately 7% (MARQUETTE, 2006). Mostly attracted by the demand of labor in the agricultural and service sectors, the contingent of Nicaraguan immigrants in Costa Rica accounted for 83% of regional immigrants in 2000 (PIZARRO & VILLA, 2005).

Honduras shows the largest reduction in the 25-year timeframe, followed by Guatemala and Mexico with a negative percentage change of 89%, 76% and 54%, respectively. Such a decrease could potentially be related to social and economic inequalities in both Honduras and Guatemala. When it comes to Mexico, González-Murphy & Koslowski (2011) highlight that the Mexican government not only tends to limit the rights of foreigners but immigrants are often subject to human rights violations by the Mexican police and immigration officials. Therefore, immigrants' decisions towards pursuing residency in Mexico might be largely affected by the host country's harsh migration policies.

Lastly, Figure 5 presents the amount of immigrants of Latin descent residing in the Caribbean (shown on the horizontal axis) in 1990 and 2015.



[8] The United Nations Population Division dataset includes Mexico in the Central America grouping.

Figure 5. Stock of immigrants of Latin American descent in the Caribbean.
Note: ATG: Antigua and Barbuda; ABW: Aruba; BHS: Bahamas; BRB: Barbados; CYM: Cayman Islands; CUB: Cuba; DMA: Dominica; DOM: Dominican Republic; GRD: Grenada; HTI: Haiti; JAM: Jamaica; PRI: Puerto Rico; KNA: St. Kitts and Nevis; LCA: St. Lucia; VCT: St. Vincent and the Grenadines; TTO: Trinidad & Tobago.
Source: Own calculations based on Trends in Intl. Migrant Stock: the 2017 Revision, UN Population Division (2018).

Migration within the Caribbean community has escalated to new peaks because of the rise in the standard of living and the increase in the demand for labor in some countries – mostly geared by the expansion of tourist activity and the lack of employment opportunities in others. Aruba, for instance, showed a considerable growth over the period; its immigrants more than tripled from 1990 to 2015, an increase of approximately 224%. The Dominican Republic stands out as the country in the Caribbean that has the largest stock of immigrants coming from Latin America in both years; as Haitians mostly common destination country. According to Ferguson (2003), for Dominican employers Haitians represent a reservoir of cheap labor, which is non-unionized and sadly considered easy to exploit. Like the Haitians who cross the border, many Dominicans also aspire to a better life by braving a journey to a new country. Significant numbers of immigrants head for the neighboring island of Puerto Rico. There, Dominicans hope to find work and money in order to achieve better living standards or send home (FERGUSON, 2003). Information presented in Fig. 5 for Puerto Rico confirms such an influx of immigrants – the island has the second largest stock of immigrants of Latin descent in the Caribbean community.

5.2. RTAs and international migration in Latin America and the Caribbean

Table 3 presents the estimations of the gravity equation in order to examine the indirect impact of trade agreements on bilateral migration stocks. Pooled data are used with the PPML estimator, which properly accounts for the zero migration problem and heteroscedasticity. Columns 1 and 2 show results for the OLS and PPML simple specifications of equation (1). These results do not include fixed effects. Columns 3 and 4 show results for the OLS and Poisson estimations with country and year specific effects. Columns 5 and 6 present the results for the OLS and PPML estimations with country-by-year fixed effects. Finally, column 7 presents additional results for the PPML estimation with country and year specific effects including one more control variable: origin country's relative inequality. We use the PPML regression models with fixed effects as our preferred specifications, shown in columns 4 and 6. Results obtained through the OLS estimates are a benchmark; therefore, only their level of significance and coefficient signs are considered.

In the gravity specification, the RTA dummy is equal to one if origin and destination countries share a trade agreement in the current year. Therefore, a positive coefficient on the RTA dummy means that RTA membership increases migration settlement among member countries. In all specifications (shown in Table 3), the variable RTA has a strong positive and significant coefficient; meaning that, all else equal, having an RTA in common stimulates bilateral migration stocks. According to the PPML estimator with country and year fixed effects (column 4), it is possible to note that signing an RTA stimulates the bilateral settlement of migrants indirectly by nearly 16.2%. The coefficient for the RTA variable using PPML estimator with country-by-year effects also indicates that having an RTA in common increases bilateral migration stocks by 14.1%. These results align with the fact that at times provisions regarding labor and visa regulations are included by the signatory countries of an RTA. These provisions facilitate the movement of workers between these countries and boost the migration stocks (FIGUEIREDO *et al*., 2016; OREFICE, 2015). As we may observe by now, though not meant to affect migration policies directly, RTAs do have an effect on migration among LAC countries. Primarily, RTAs are meant to stimulate international trade via tariffs reduction and commerce associations, but secondarily and perhaps unintentionally, they end up 'spilling over' migration policies. Therefore, RTAs appear to have an effect not only on south-north migration, as found by Figueiredo *et al*. (2016), but also on south-south migratory movements, in

LAC countries. In their PPML specification, using country-by-year effects, Figueiredo *et al.* (2016) also find a positive coefficient for the RTA variable at a reasonable level of statistical significance.

Results for the Mercosur dummy showed a positive correlation with the dependent variable. In particular, results in column 6 suggest that the being a Mercosur member stimulates bilateral migration stocks by nearly 12.6%. All specifications in Table 3 indicate a positive correlation between Mercosur and migration. Mercosur is a trade association that aims to encourage international commerce and reduce import tariffs among member countries.

Table 3: Bilateral migration stocks and RTAs estimations.

	OLS (1)	PPML (2)	OLS (3)	PPML (4)	OLS (5)	PPML (6)	PPML (7)
RTA	**0.471*** **	**0.079*** **	**0.911*** **	**0.150*** **	**0.798*** **	**0.132*** **	**0.105*** **
	(0.056)	(0.01)	(0.054)	(0.01)	(0.062)	(0.012)	(0.008)
Contiguity	**2.507*** **	**0.319*** **	**1.684*** **	**0.185*** **	**2.415*** **	**0.307*** **	**0.138*** **
	(0.083)	(0.012)	(0.074)	(0.014)	(0.083)	(0.016)	(0.015)
Common Language	**0.641*** **	**0.106*** **	**0.919*** **	**0.199*** **	**0.895*** **	**0.173*** **	**0.131*** **
	(0.066)	(0.014)	(0.075)	(0.017)	(0.082)	(0.019)	(0.041)
Mercosur	**2.261*** **	**0.268*** **	**0.956*** **	**0.058** **	**1.396*** **	**0.119** **	**0.058***
	(0.199)	(0.025)	(0.17)	(0.024)	(0.226)	(0.025)	(0.032)
Distance	**-0.471*** **	**-0.072*** **	**-1.169*** **	**-0.186*** **	**-0.701*** **	**-0.109*** **	**-0.208*** **
	(0.03)	(0.005)	(0.034)	(0.009)	(0.035)	(0.008)	(0.01)
Per capita GDP (origin)	**-0.357*** **	**-0.06*** **	**-0.006**	**-0.003**	-	-	**-0.02**
	(0.032)	(0.007)	(0.113)	(0.022)	-	-	(0.023)
Per capita GDP (destination)	**0.300*** **	**0.047*** **	**-0.04**	**-0.007**	-	-	**-0.003**
	(0.031)	(0.006)	(0.112)	(0.021)	-	-	(0.026)
Natural disaster	**0.103*** **	**0.015*** **	**-0.005**	**-0.001**	-	-	**-0.0003**
	(0.004)	(0.001)	(0.006)	(0.001)	-	-	(0.001)
Inflation	**0.020** **	**0.003*** **	**0.009**	**0.001**	-	-	**0.0002**
	(0.008)	(0.001)	(0.006)	(0.001)	-	-	(0.002)
Origin country's relative inequality	-	-	-	-	-	-	**0.024**
	-	-	-	-	-	-	(0.051)
Constant	**8.222*** **	**2.145*** **	**10.631*** **	**2.440*** **	**9.807*** **	**2.345*** **	**3.412*** **
	(0.403)	(0.083)	(1.322)	(0.251)	(0.285)	(0.061)	(0.232)
Country Effects	No	No	Yes	Yes	No	No	Yes
Year Effects	No	No	Yes	Yes	No	No	Yes
Country-by-year FE	No	No	No	No	Yes	Yes	No
Observations	4,078	4,078	4,078	4,078	4,078	4,078	1,520
R-squared	0.455	0.383	0.751	0.719	0.648	0.621	0.809

Note: Standard errors in parentheses. ***p<0,01; **p<0,05; *p<0,1. *Per capita* GDP in origin and destination country (in ln); bilateral migration stocks (in ln) and geographic distance (in ln).
Source: Own calculations.

This trade bloc reserves its citizens the right to obtain legal residency not only intra-bloc, but also in some other South American countries such as Bolivia, Chile, Colombia, Ecuador and Peru, under facilitated conditions. Upon legal residency in a partner country, the bloc also provides its immigrants with the same labor settings and social security benefits as its nationals (MERCOSUR, 2018). Orefice (2015) also concludes that the content of RTAs plays an important role in increasing the chances of having positive migratory movements. Therefore, migrants originating from Mercosur country members are highly likely to be drawn to partner countries when migrating. The provisions included

in this trade agreement reduce the migrants' assimilation time towards finding a job and settling for longer periods and thus rises intra-bloc migration.

Results in column 4 show that the coefficients on the *per capita* GDP variable (for both origin and destination countries) are not different from zero at any reasonable significance level. This indicates that the average *per capita* income does not affect the decision towards international migration in LAC economies. Thus, there exists no evidence that this variable influences the migratory movements amongst these countries. This result may possibly be explained due to the fact that the economies of LAC countries do not vary enormously between one another. Had there been, for instance, a more diverse set of countries such as developing and advanced economies, it is believed that this variable would have been of great relevance to explain the variations in the migration stocks. In such a case, the variations of the *per capita* GDP between the sampled countries would be much wider. Results in column 6 show that country-by-year fixed effects capture the characteristics that diverge among countries through time. Therefore, estimations that included this type of fixed effects should not include country specific and time-varying variables, such as *per capita* GDP. Previous studies have also found similar results; however, due to the diversity of data and purpose of investigation, the reasons for such a finding vary slightly. For instance, Mayda (2010) and Llull (2016) find no evidence that a fall in the *per capita* GDP (origin) contributes to a statistically significant rise in the migratory movements among their sampled countries. Mayda (2010) notes that *per capita* GDP might not be a direct measure of wages of a potential migrant, i.e. a higher *per capita* GDP does not necessarily mean better income opportunities on average for an immigrant worker. Consequently, this variable might not fully capture the influence of earnings on migration settlements.

Column 4 presents estimation results for the environmental variable natural disasters. The coefficient for this control variable is significantly equal to zero at any reasonable significance level. This regression captures the average impact of the explanatory factors on international migration stocks over time and across countries. On the face of it, in line with previous findings such as Beine and Parsons (2015), we might expect that natural disasters provide an additional motivation for residents to become migrants. The insignificance of the response to environmental factors gives rise to thinkable alternative explanations. One possibility could be that residents might indeed choose to become international migrants upon natural catastrophes; however, they might not have the resources to actually move. As a result, internal migration to less affected areas within the same country could be thought of as a valuable option. Another possible interpretation of the results is that our estimation combines cases that are very different from one another. The magnitude of each isolated event is not captured by this variable; therefore, if there is some impact of climatic factors, international migration will depend upon other aspects shaping the sensitivity of prospective migrants to the climatic events. The non-significance of this environmental variable is in line with Beine and Parsons (2015). They also find little support for any direct relationship between either short- or long-term climatic factors and international migration.

In column 4, we find that the control variable inflation has no influence on bilateral migration stocks across LAC countries. We consider that this variable might not affect the migrants' decisions towards moving abroad in the short-term. On the contrary, we assume that longer periods of economic instability, with oscillating inflation rates year by year, for example, could potentially encourage migrants to seek residence elsewhere. In such a case, we would then expect a larger impact of inflation on the dependent variable. When we analyze our estimations for the inflation variable, we note that results in column 7 are remarkably similar to previous findings. Beaton *et al.* (2017), when analyzing migration in Latin America and the Caribbean, also encounter very small non-significant coefficients for this control. The magnitude of our estimates are also in line with those found by the same authors in all our remaining specifications.

Column 7 presents some additional results. In this specification, we investigate the impact of income distribution on migration settlements. We note, however, no statistically significant relationship between the origin country's relative inequality and the bilateral migration stocks. This confirms our previous assumption made in subsection 5.1 (mean value nearly equal to one). Since the

sampled countries exhibit similar relative income inequality levels, such a variable does not seem to represent any influence on migrants' decisions towards moving internationally. Our variable of interest – common RTA - did maintain its level of significance and expected signal in all specifications, including column 7 in which the number of observations was drastically reduced due to missing values.

Turning now to the remaining control variables, the results yield the expected signs and significance levels. Distance negatively affects migration stocks, meaning that migrants opt for destination countries that are more closely located to their origin countries. Therefore, the further a country is the less attractive it becomes for potential international migrants. These results are similar to Mayda (2010), Grogger & Hanson (2011), Ortega & Peri (2013), Llull (2016), Orefice (2015) and Figueiredo *et al*. (2016). Results for the variables contiguity and common language show in all specifications a positive and strong correlation with the bilateral migration stock. Estimates in columns 4 and 6 suggest that having a language in common, for instance, represents an increase of 22% and 18.9% in the migratory stocks, respectively. In addition to that, a common language accelerates job allocation in the host country and softens the adaptation process, contributing to the migrants' full assimilation. These findings are, again, qualitatively similar to Mayda (2010), Orefice (2010), Llull (2016), Orefice (2015), Figueiredo *et al.* (2016).

A significant econometric issue in estimating the gravity model for trade is endogeneity caused by omitted variables. This problem also holds true in a migration based gravity model. The omitted variable problem relates to the absence of a variable to control for both inward and outward migration resistance terms. By overlooking these terms, estimates yield biased results. We account for the mentioned problem including country-year fixed effects. Fixed effects to control for resistance terms to migration have been vastly used in the literature on the determinants of bilateral migration (BEINE & PARSONS, 2015; ORTEGA & PERI, 2012) and denote a suitable way to control for resistance terms. We also note that in our estimations we do not directly address the possible reverse causality problem related to the possibility that RTAs are signed in response to migration pressure.

6. Concluding remarks

A great deal of those who emigrate from a developing country move to another developing country. Despite the relevance of this type of migration, little is still known about its determinants. Therefore, in an attempt to fill this gap, we investigate the role of regional trade agreements as an indirect determinant of international bilateral migration stocks in Latin American and Caribbean countries. This paper establishes a positive contribution to the literature on the determinants of migration stocks, and represents a useful suggestion for researchers on south-south migration related topics. The results for all specifications in the econometric model show clear evidence of a pro-migration indirect effect of RTAs. After controlling for Mercosur membership, the estimations also indicate a positive and statistically significant relationship between this trade association and the stocks of migrants among its signatory countries.

We find no evidence that *per capita* GDP has any sort of influence on migration movements in Latin America and the Caribbean. Given that this paper deals solely with developing countries that have broadly similar economies, it is slightly predictable that such a variable may not exhibit statistically significant results. We uncover no evidence to support the idea that natural disasters result in additional international migration. We believe this outcome might relate to the fact that varied types of natural disasters included in the data, such as volcanic eruptions and earthquakes are country specific, and limited to certain number of countries, meaning that many of them might never have experienced such events. We note that inflation does not affect international migration in LAC, possibly due to occasional inflation peaks that might not influence the movement of migrants in the short-run. Relative income distribution seems to have no effect whatsoever upon bilateral migration stocks. Such a result possibly lies in the fact that the sampled countries present relatively similar levels of social inequality leading this variable to statistical insignificance.

Contiguity, common language and distance present results in accordance with previous studies. Common border and common language show a positive correlation with the dependent variable, which suggests that having a mutual frontier and sharing the same official language stimulate the migration stocks in the destination country. Additionally, the coefficients of the variable distance imply, in all specifications, that migrants are inclined to move to closer countries rather than to those located further away.

One limitation of this study is that the dataset used for bilateral migration stocks presents information in five-year intervals. Such a timeframe might not capture year specific migration shifts as precisely as it would, had it been annually distributed. Unfortunately, data on migrants by home and destination countries and over time are not available yearly. However, the results of this paper can perfectly relate to the descriptive evidence gathered in section 2 as well as previous studies' findings, confirming that such a restriction did not compromise the relevance of the baseline estimations. The inclusion of other macroeconomic variables, such as unemployment rate, was compromised in this paper due to the lack of accurate data for the set of countries under analysis. Nonetheless, further studies ought to consider other specific variables that may influence importantly the bilateral migration stocks.

Although the main aim of this paper is to provide a clear understanding of the relationship between RTAs and international migration stocks in LAC, this paper also suggests interesting policy implications. Given that RTAs represent a key indirect determinant of bilateral migration stocks, policymakers could make use of them in order to increase migration inflows in the case of labor market shortages. RTAs represent for developing countries not only an opportunity to boost international trade, but also a way to ease migration towards member countries. It is commonly known that people are normally supportive of trade rather than migration and that the former is believed to bring economic benefits to all participating parties, yet the latter, on the other hand, supposedly involves social and economic negative effects on the host country. This implies that governments could use RTAs rather than migration agreements to increase the inflows of foreign workers. Hence, it is reasonable, in case of negative attitudes towards migration, to attempt to stimulate trade through RTAs and indirectly soften eventual policies that might hinder migratory settlements.

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