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RECent: c/o Dipartimento di Economia Politica, Viale Berengario 51, I-41100 Modena, ITALY
Phone +39 059 2056856, Fax +39 059 2056947, E-mail: RECent@unimore.it

The education networks of Latin America. Effects on trade during and after the cold war.

Marina Murat[*]
María Luisa Recalde[§]
Pedro Gabriel Degiovanni[#]

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Abstract. The friendship and social networks international students tend to build during their university studies can boost trade between the home country and that of the alma mater. This paper tests the effects of Latin American students on bilateral trade between eleven home economies and nine OECD countries during 1971-2012. We find education networks to positively and significantly affect both exports and imports. Also, the democratization and liberalization of Latin American political regimes following the end of the cold war slightly weaken the influence of networks, but directly and positively affect trade. Results are robust to different specifications and regressors.

Keywords: bilateral trade, education networks, international students, Latin America.
JEL: F14, F29, F59, I20

[*] Corresponding author. Department of Economics, University of Modena and Reggio Emilia, Italy.
[§] Instituto de Economía y Finanzas, Universidad Nacional de Córdoba, Argentina.
[#] Instituto de Economía y Finanzas, Universidad Nacional de Córdoba, Argentina.

1. Introduction

An article published in 2005 by the Magazine of the University of California Davis states that "[m]ore than 50 Chileans who studied agricultural sciences at UC Davis in the 1960s and 1970s – the 'Davis boys' – are widely credited with helping to transform their country into one of the world's leading fresh-fruit exporters", so that "[n]early all the table grapes you eat during the winter come from Chile, but you could also say they are the fruit of UC Davis. The same goes for the Chilean-grown apples, peaches, nectarines, pears and avocados that you find out of season in your grocery store" (Holder, 2005).

Facts like these are seldom acknowledged, but are not unusual. They concern an education network that is only one among a vast number of similar ones – concerning other students and universities – existing worldwide. International students are individuals who move abroad with the explicit aim of improving their education and, while at university, tend also to build social ties and develop an attachment for the country of the alma mater that may last for a lifetime. As with social and business networks (Rauch, 2001), their knowledge of the host country's people, institutions, norms and markets, together with that of their home country, can lower the fixed and invisible costs of international transactions, and trigger bilateral exchanges between them (Murat, 2014).

This study aims to test the influence of Latin American education networks on trade flows between Latin American and Western countries. Specifically, it focuses on the eleven founding members of the Latin American International Association (LAIA), and nine Western OECD economies during the period going from 1971 to 2012. We use data on international students enrolled at the tertiary level provided, in print, by the UNESCO Statistical Yearbook until 1997 and since 1998, on-line, by UNESCO Statistics; we also utilize data on trade bilateral flows provided by WITS, as well as data on several other variables and cofounding factors.

In discontinuous waves, and since colonial times, Latin American students have moved abroad for their tertiary studies. The scant available evidence suggests that after independence – i.e. after the beginning of the nineteenth century – relatively less people from the elite classes were educated abroad than before[1]. For a long time, including the first half of the twentieth century, moving to study outside Latin America and even outside the home country was rather unusual. Later, with the cold war, outward movements started again to grow. Partly they were triggered by symmetric fears of the United States and the Soviet Union that Third World countries might choose to ally with the competing nation. Both superpowers tried to attract them into their own spheres of influence, and both made use of an effective and well-known way of influencing preferences and

[1] At the beginning of the nineteenth century, leaders of independence, such as Simon Bolivar (leader of Venezuela, Bolivia, Colombia, Panama, Ecuador and Peru) and Manuel Belgrano (leader of Argentina), studied in Spain. Bernardo O'Higgins, leader of Chile, studied in the United Kingdom.

people's choices: education of the elite classes (Nye, 2005). To this aim, United States and Soviet Union supplied scholarships and provided practical support to Third World students willing to study in their universities. Also, the USSR designed specific curricula and founded in Moscow a dedicated institution– the Peoples' Friendship University of Russia – for students from the Third World, while the United States actively encouraged the formation of new research and teaching departments in universities of foreign countries. They were supported by American private institutions and foundations, such as Ford, Rockefeller and Carnegie, which provided academic personnel, skills and funds. With time, these departments – mostly in technological, scientific and economic fields – became the natural workplace for academically oriented returning students (McCarthy, 1987). Several of them were in Latin American universities.[2] During those years, political dictatorship and economic closeness characterized most Latin American countries.

Outward movements also grew because of push factors. Since independence and well until the first decades of the twentieth century, Latin American economies grew rapidly, in some cases reaching standards of living that even outpaced those of Europe. This lead to mass immigration from Europe and the emergence in Latin America of new elite and upper middle classes composed by people who, again since colonial times, became used to travel abroad. They went to Europe and, now, also to the United States. They travelled because of tourism and business reasons and, especially since the sixties and seventies, also to complete their education. The preferred destination for studying was the United States, followed by a few other advanced Western economies and, at a distance, by some countries under Soviet influence, especially Cuba. With the end of the cold war, countries shifted from dictatorship and closeness to democracy and more liberal civic and economic policies. The interest of the two superpowers on Third World students faded, but the outward movements from Latin America lasted and even grew more rapidly than before. Students still preferred the United States, but gradually started to move more to Europe, Australia and Canada. This was because, on the one hand, after the terrorist attacks of September 2001 the weak American interest on Third World students was replaced by restrictive measures of entry into the country and, on the other, because European universities were becoming more attractive.

Our main results are that Latin American students positively and significantly affect the region bilateral trade. The liberalization of political and civic institutions of Latin American countries following the end of the cold war positively influence trade, but do not substantially

[2] Well-known returning students are the 'Chicago boys', students of the Catholic University of Chile who also attended the University of Chicago and influenced their country's economic policies during the seventies and eighties. However, though less known, American funded university departments and centres of research existed also in several other Latin American countries. While the Chicago boys held strong pro free market positions, departments and centres of research – such as ECLAC – with different views on the economy were also financed.

modify the incidence of education links on imports and exports, which are strong, positive and significant along all the period considered. Also, education networks have a stronger impact on the exchanges of differentiated goods. The rest of the paper is structured as follows: Section 2 briefly presents the related literature and describes international students movements, trade flows and data; Section 3 explains the empirical strategy; results are presented in Section 4, and Section 5 concludes.

2. Literature, descriptive statistics and data

2.a. Literature

The base theoretical hypothesis of this study is that education networks, with their social and business ties, can lower the invisible barriers that deter economic exchanges between countries. Since the seminal paper by Gould (1994), a growing empirical literature on transnational social ties has provided support to the base hypothesis, showing that network links can promote the bilateral trade of countries. Among others, Head & Ries (1998) focus on Canada; Rauch and Trindade (2002) on the Chinese diaspora; Combes, Lafourcade and Mayer (2005) on France; Bandyopadhyay et al. (2008) on the United States; Buch, Kleinert and Toubal (2006) on Germany; Peri and Requena (2010) on Spain. It has also been found that migrant networks, especially if composed by skilled individuals, can promote foreign direct investments: Tong (2005) considers the Chinese diaspora; Javorcik et al. (2011), the United States; Docquier and Lodigiani (2010), developed and developing countries; Flisi and Murat (2011), five European countries; De Simone and Manchin (2012), East and West Europe. Networks of skilled migrants often are also business networks: Sangita (2013). Reviews are in Egger et al. (2012) and Felbermayr & Toubal (2012). Education networks have been less studied, Murat (2014) finds a positive influence of international students on the bilateral trade of the United Kingdom with a large number of countries. The novelty of the present paper is its focus on Latin American education networks, and their influence on the region imports and exports during the last four decades.

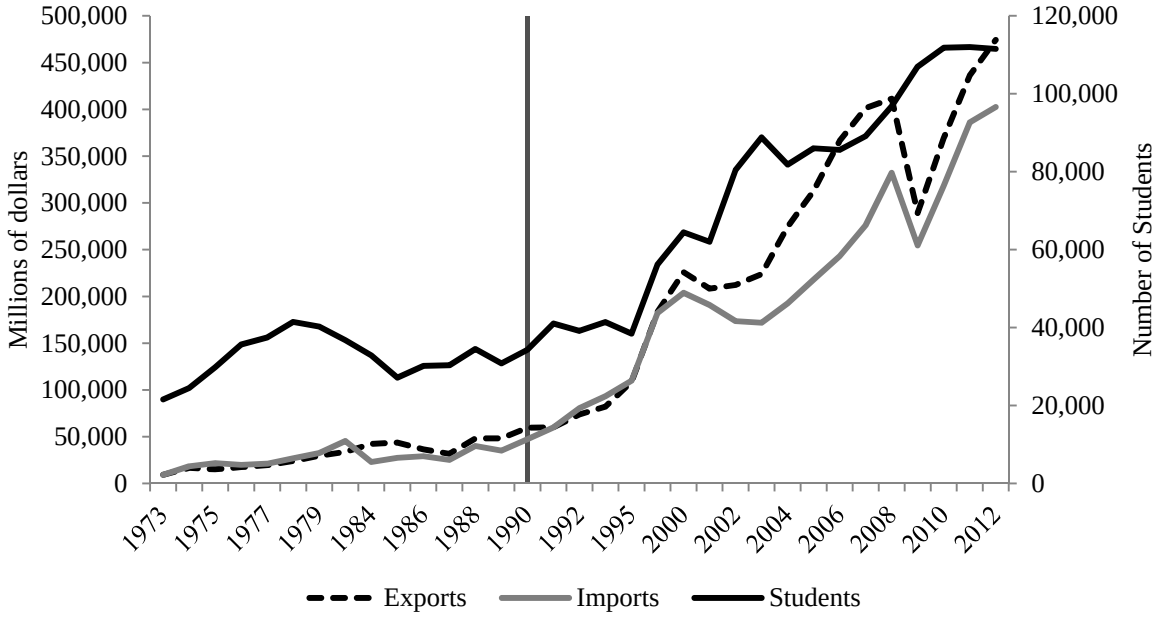
2.b. Descriptive statistics

We focus on trade flows and students movements between the eleven members of LAIA – Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru, Uruguay and Venezuela[3] – and the nine Western OECD economies more important in terms of GDP and former colonial status – Australia, Canada, France, Germany, Italy, Portugal, Spain, the United Kingdom and the United States –.

[3] Despite Cuba has been a LAIA member since 1999, it is not included in our dataset because data on country's trade are only available for some years.

During the last 40 years, the number of Latin American students in the nine receiving countries grew substantially: they were nearly 22.000 in 1973 and well above 100.000 in 2012. More specifically, in 2011 there were more than 140.000 students from the eleven LAIA countries in universities of 62 countries around the world, but 83% of them were in the nine OECD countries of our sample. At the same time, trade between LAIA and the nine OECD partner economies was about 51% of the total LAIA trade in the same year. Interestingly, Figure 1 shows that the number of students in, and trade with the nine OECD countries follow similar paths. They both remain relatively stable until the eighties and grow rapidly afterwards (Figure 1). With the end of the cold war most Latin American countries shifted from dictatorship (which during the seventies and eighties characterized most of the eleven LAIA countries) to democratic governments. This also implied higher levels of polity rights and civil liberties. More liberal economic policies were also adopted: barriers on imports as well as the state control of domestic markets fell.

Figure 1. - Students and trade

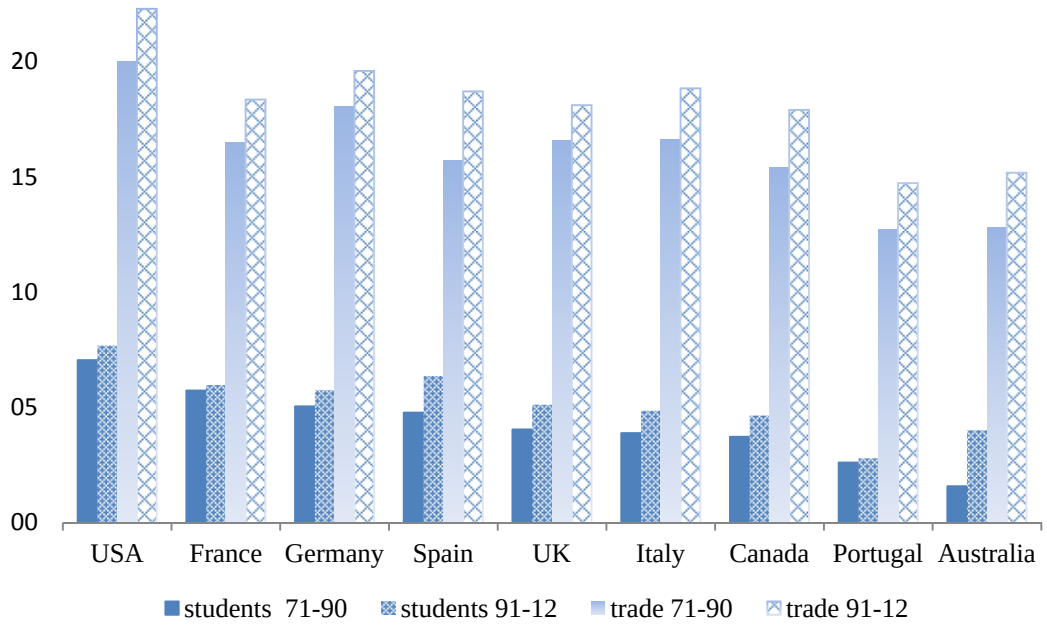


A more detailed look at the two periods of time, during and after the cold war, shows that the rapid increase in the number of international students and trade flows during the second period corresponds to a partial shift in destinations. During the cold war, preferred destinations for students were the United States, France, Germany and Spain (Figure 2). The United States was also the preferred destination for trade, followed by Germany, Italy and the United Kingdom. However, since the end of the cold war, the yearly growth rates of LAIA students in Australia and Italy was 14%, in Spain 13%, in Portugal 8%, and in all the OECD countries of the dataset except the United

States was 8%, while in the United States it was just 3% (Table A3.) and, after the terrorist attacks of 2001, a still lower 1%. The average growth rates of bilateral trade (mean of exports and imports) of the eight OECD countries diminish from 10% during the cold war, to 9% afterwards, while with the United States it falls from 13% to 9%. Also in this case, the contraction in growth is stronger for the United States.[4]

The partial shift in student destinations may be related to several factors. One is the strong competition of students from South East Asia for education in American universities; another is the weaker interest of the United States in attracting students from traditional Third World countries during the nineties, which turns into a restrictive attitude after the terrorist attacks of September 2001. Another is university fees, which are higher in the United States than in Europe, Australia and Canada and have grown in real terms by about five times during the period considered (OECD, 2011).

Figure 2. – LAIA international students and trade. Destination countries.
Mean values, in logs.



Note: trade flows are the mean log values of exports and imports.

However, not just lower university fees enhanced the attractiveness of universities in Europe, Australia and Canada. In 1997, the *Bologna Process* established the harmonization of higher education curricula in European countries, which facilitated students' international mobility

[4] The generalized lower growth rates of trade between Latin American and Western developed countries of the last two decades coincide with an increase in regional trade, partly due to the creation of the free trade area denominated Mercosur, and partly to an increase in trade with countries in South-East Asia (Dosch and Jacob, 2010).

(Erasmus programs) and ensured the validity of degrees obtained in one of the participating countries in the whole area. A further reason for preferring specifically Spain, Portugal and Italy are these countries' citizenship laws, based on *Jus sanguinis*, which allow the descendants of former emigrants to hold their ancestors' citizenships. With them, prospective students can automatically enter the country and stay in the European Union after graduation. At the same time, Australia (which participates in the Bologna process) and Canada are English-speaking countries providing tertiary education at levels that, according to world standards on universities ranking, are not much lower than those of the United States and the United Kingdom.

2.c. Data

Trade data for the period 1971-2000 are from the NBER- United Nations trade data set, available at http://cid.econ.ucdavis.edu/data/undata/undata.html and documented in Feenstra *et al.* (2005), whereas WITS (COMTRADE) is used for the period 2001-2012. Bilateral data concern the *Exports* from each of the eleven LAIA countries to each of the nine OECD countries and the *Imports* of each LAIA economy from each of the OECD countries. Up to 1997, data on *International students* are provided by the UNESCO Statistical Yearbook and, since 1998, by UNESCO Statistics online: http://data.uis.unesco.org/.

Data on countries' *GDP* and *Population*, are from the United Nations Statistics Division: http://unstats.un.org/unsd/default.htm. Values for the variable *Distance* are from CEPII: http://www.cepii.fr/CEPII/en/bdd_modele/presentation.asp?id=6. The variable indicating the level of *Trade integration* between country pairs is a polychotomous index (i.e. a categorical variable with several categories) built by Baier *et al.* (2007) and available at www.nd.edu/~jbergstr/, until 2005. Following the same procedure, we completed the values for the period 2006-2012. Specifically, the index takes value 0 when there is no economic integration, 1 when an agreement is asymmetrical or one-way, 2 when a treaty corresponds to a two-way preferential trade agreement, 3 when it defines a free trade agreement, and 4 when an agreement refers to a customs union.

Polity Rights is an index constructed by Freedom House Organization (FHO) that ranges from 1 to 7, with the highest value corresponding to free and fair elections, competitive parties, the opposition playing an important role and minority groups having reasonable self-government, and the lowest value corresponding to lack of political rights and an extremely oppressive nature of the regime, sometimes in combination with civil war. *Civil liberties* ranges from 1 to 6, with the lowest level of civil liberties corresponding to one and the highest to six, and was also obtained from FHO. The variable *Democracy*, constructed by Marshall and Jaggers (2002), ranges from -9 to 10; also in this case, higher numbers imply higher levels of democracy. Data on *Tertiary education*, regarding the stock of tertiary students in sending and destination countries, are from UNESCO Statistics.

Figures on the stocks of *Immigrants* in OECD countries originating from the LAIA countries during the years 1970, 1980, 1990, 2000 and 2010 have been collected from the World Bank's *Global Bilateral Migration Database*.

3. Empirical strategy

The basic question we seek to examine is whether the exports and imports of the eleven Latin American countries with the nine OECD economies are influenced by the number of Latin American students in the OECD economies, after controlling for several characteristics of both sets of countries. To do so we use theory-based gravity-type estimations (Feenstra, 2004):

$$\ln Y_{sdt} = \alpha_0 + \alpha_1 \ln \textit{International students}_{sdt} + \alpha_2 \ln \textit{GDP}_{st} + \alpha_3 \ln \textit{Population}_{st} + \alpha_4 \ln \textit{GDP}_{dt} + \alpha_5 \ln \textit{Population}_{dt} + \alpha_6 \ln \textit{Distance}_{sd} + \alpha_7 \textit{Trade integration}_{sdt} + \alpha_8 \textit{Polity rights}_{st} + \alpha_9 \ln \textit{Tertiary}_{st} + \alpha_{10} \ln \textit{Tertiary}_{dt} + sd_{sd} + t_t + u_{sdt} \quad (1)$$

In specification (1), the variable $\ln(Y_{sdt})$ measures the logarithm of either the value of exports or imports between sending (s) and destination (d) countries at time t. The variable providing the proxy for education networks is $\ln(\textit{International students}_{sdt})$, which is the log of the number of students from country s in country d at time t. The rest of the equation includes some standard gravity control variables as well as other potentially significant regressors. Among the standard gravity controls, we include the log of the *GDP*, *Population* and *Distance* of sending and destination countries, and the level of trade agreements between them, *Trade integration*. Among the other factors, we include the level of *Polity rights* in the sending country, higher levels are expected to be related to freer markets and higher trade flows; and the number of students attending tertiary education in sending and destination economies – *Tertiary sending/destination countries* –, higher human capital stocks in the country should positively affect trade. We also include a set of sending-destination countries fixed effects to control for the bilateral resistance terms (sd_{sd}), and time dummies (t_t), to control for macroeconomic common shocks. After estimating equation (1) with pooled OLS models, we control for potential endogeneity.

Our database extends along two periods of time – before and after the fall of the Berlin wall – that differ markedly, especially in Latin American countries. In the second half of the eighties and beginning of the nineties the region experienced a generalized shift from dictatorship to more democratic and open societies: in LAIA countries the average level of *Democracy* rose from 0.34 to 7.46 (democracy levels increased in all countries except Venezuela, where they decreased), *Polity rights* improved by about 30%, *Civil liberties* rose from 4.35 to 5.18 (Table A1). While the base

model of equation (1) includes *Polity rights*, alternative specifications will be based on *Civil liberties* and *Democracy* respectively. Following Rauch (2001) and Tadesse & White (2008), individual links and network ties can be expected to be less valuable and important in more open and free societies, where trade opportunities are more easily known and readily available for a more extended number of people.

While these issues concern the political and institutional features of countries, the impact of networks on trade can also change in relation to the characteristics of the goods exchanged. On this regard, it has been assumed that the knowledge and information on foreign markets channeled by networks is more valuable when the goods traded are differentiated. The base hypothesis in this case is that the price mechanism provides sufficient information on the characteristics of homogeneous goods, but not enough on differentiated products, on which the knowledge of networks turns out to be economically valuable (Gould, 1994). Table A.1 shows that during the whole period considered, LAIA exports' are composed more by homogenous than by differentiated goods and the opposite happens with imports, but in both cases the level and proportion of differentiated goods increase in the second period.

To test these hypotheses, we first interact *International students* with the political and institutional variables of countries and, second, split imports and exports into homogeneous and differentiated goods. According to Rauch's (2001) hypothesis on better social and market institutions, coefficients on the interacted variables are expected to be negative: higher levels of polity rights, civil liberties and democracy in sending countries can weaken the importance of education networks in facilitating trade. According to Gould's (1994)[5] hypothesis, education networks effects should especially concern differentiated goods.

As a further check of the robustness and sensitivity of overall results, we add to the base specification of equation (1) the regressor ln($Immigrants_{sdt}$), the log of the stocks of immigrants from the sending to the destination country at time *t*. Not only several empirical studies have shown that migrant networks can affect the bilateral trade between origin and residence countries (a review is in Felbermayr & Toubal, 2012) but, in our investigation, the variable *Immigrants* might also be correlated with our variable of interest, *International students*. For example, students might prefer to move to destination countries where they can rely on the support of communities of nationals. In this case the estimates of specification (1) would be affected by omitted variable bias.

4. Results

[5] We follow Broda and Weinstein (2004). Specifically, we use four digit trade elasticities and consider goods as differentiated when their elasticity is above four, and homogenous when it is below.

4.a. Baseline model

The results of the basic specification are in Models 1-10 of Table 1. As expected, international students have a positive, strong and significant impact on both exports and imports between LAIA and the nine OECD countries. More specifically, values and significance of the coefficients on *International students* in the exports' regressions vary little across OLS Models 1-4: they are 0.25 in Model 1, which includes time dummies, 0.29 in Model 2, with country pair's fixed effects, 0.20 in Model 3, including a five-year lag of the variable of interest (in order to capture the influence of former students on trade), and 0.28 in Model 4,[6] which includes the lagged dependent variable to control for potential autoregressive processes. Hence, in the base specification, a one percent increase in the number of LAIA students in the OECD countries considered increases the bilateral exports of LAIA economies by an amount that ranges from 0.20% to 0.29%, with significance always at 1%. Results in Models 6-9, concerning imports, show that coefficients range from a minimum value of 0.14 in Model 7, to a maximum of 0.21 in Model 8, with significance in all cases at 1%. On average, therefore, the influence of education networks appears to be slightly higher on exports than on imports.

We control for the potential endogeneity of the above relations by using the System Generalized Method of Moments estimator (Blundell and Bond, 1998). Results in Models 5 and 10 show that also with this specification, coefficient values vary only slightly and significance is always at 1%, both in the imports and exports regressions. This supports the robustness of previous findings. Specifically, a one percent increase of LAIA *International students* in the destination country leads to a 0.23% increase in the exports to that country (Model 5) and to a 0.15% increase in imports (Model 10). The results of these more complete models can be used to make clear the magnitude of the impact of international students on bilateral trade. Consider a 10 per cent increase in the average country-pair stock of international students: it would amount to an increase from 689 to 758 students, or 69 individuals per country pair. This increase would lead to a 2.3 per cent rise in total exports (coefficient on *International students* from Model 5). Given that the average value of exports in the sample is $1,716.4 million (Table A.1.), such an increase would equal $39.48 million. This means that one additional average student generates an extra $572,174 value of exports. In turn, the same 10% increase in the average country-pair number of students, would lead to a 1.52% increase in imports (coefficient on *International students* from Model 10). Given that the average

[6] This is a long run value = 0.091/(1-0.681), determined by the short run coefficient on *International students* and 1 – the coefficient on the lagged endogenous variable. Including the lagged dependent variable can give rise to dynamic panel or 'Nickel' bias as it can be correlated with the error term in the fixed effects specification (Nickel, 1981). However, the bias diminishes with the length of time considered, which in our case is high – 42 years –, relatively to the number of country-pairs, which are 99.

value of imports is $1,427 million (Table A.1), such an increase would equal $21.7 million. Hence, one additional average student generates an extra $314,353 value of imports. These numbers are

Table 1. - Education networks and bilateral trade

Dependent variable:	EXPORTS					IMPORTS				
	OLS	OLS_FE	FE_LSt	FE_LDV	SYS_GMM	OLS	OLS_FE	FE_LSt	FE_LDV	SYS_GMM
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$Exports_{t-1}$				0.681***	0.793***					
				(0.037)	(0.039)					
$Imports_{t-1}$									0.662***	0.756***
									(0.045)	(0.044)
International students	0.246***	0.291***		0.091***	**0.230*** **	0.204***	0.143***		0.060***	**0.152*** **
	(0.065)	(0.057)		(0.025)	(0.057)	(0.041)	(0.045)		(0.018)	**(0.044)**
$International\ students_{t-5}$			0.200***					0.210***		
			(0.057)					(0.040)		
GDP sending country	0.853***	0.023	0.036	0.037	-0.036	0.938***	0.653***	0.531***	0.377***	0.190***
	(0.160)	(0.127)	(0.146)	(0.071)	(0.071)	(0.073)	(0.076)	(0.093)	(0.042)	(0.045)
Population sending country	-0.522**	-1.198	-0.072	-0.067	0.020	-0.253*	-1.182**	-0.787	-0.418**	-0.034
	(0.225)	(0.822)	(1.036)	(0.363)	(0.083)	(0.135)	(0.494)	(0.610)	(0.202)	(0.042)
GDP destination country	-0.631**	0.064	0.750**	0.036	-0.190	0.480***	0.064	0.211	-0.056	-0.092
	(0.306)	(0.260)	(0.360)	(0.121)	(0.167)	(0.179)	(0.160)	(0.205)	(0.079)	(0.080)
Population destination country	2.338***	3.677***	2.536*	1.227***	0.274	1.025***	1.560***	-0.001	0.557*	0.355***
	(0.402)	(1.016)	(1.299)	(0.444)	(0.185)	(0.236)	(0.593)	(0.688)	(0.291)	(0.101)
Distance	-1.074***				-0.279**	-0.916***				-0.224***
	(0.297)				(0.136)	(0.161)				(0.067)
Trade integration	0.145	0.110	0.017	0.002	0.045	0.377***	0.298***	0.268***	0.070**	0.084**
	(0.120)	(0.077)	(0.099)	(0.031)	(0.032)	(0.063)	(0.058)	(0.062)	(0.028)	(0.033)
Polity rights sending country	0.088**	0.084***	0.158***	0.034**	0.105***	0.019	0.02	0.039	0.004	0.025*
	(0.039)	(0.032)	(0.049)	(0.015)	(0.034)	(0.022)	(0.018)	(0.025)	(0.009)	(0.015)
Tertiary students sending country	0.495***	0.411***	0.421***	0.153***	0.051	0.049	0.081	0.083	0.006	-0.068*
	(0.150)	(0.124)	(0.142)	(0.057)	(0.055)	(0.117)	(0.092)	(0.094)	(0.039)	(0.041)
Tertiary students destination country	-0.339**	0.010	-0.169	-0.048	-0.076	-0.311***	0.312**	-0.272	0.127*	-0.076*
	(0.167)	(0.196)	(0.306)	(0.097)	(0.082)	(0.089)	(0.152)	(0.165)	(0.069)	(0.039)
Constant	8.221				8.136**	-17.105***				1.053
	(8.643)				(3.775)	(3.991)				(2.143)
Time effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
AR (2) test					0.127					0.112
Hansen J test (P-value)					0.213					0.103
Hansen diff. J test (P-value)					0.586					0.835
Number of instruments					78					78
Number of country_pair		99	99	99	99		99	99	99	99
Observations	2,784	2,784	1,741	2,300	965	2,785	2,785	1,742	2,302	965
R-squared	0.790	0.590	0.524	0.791		0.910	0.780	0.766	0.878	

Notes. All variables except Polity rights and Trade integration are in logs. Robust standard errors clustered by country-pair in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The sample is an unbalanced panel, comprising data from 1971 to 2012. In Models (5) and (10), students abroad and all other control variables are treated as predetermined and are instrumented for using their own first to third lags in level and differences, AR (2) is Arellano-Bond test for serial correlation.

similar to those found in Murat (2014), concerning the effects of international students in the United Kingdom bilateral trade with a wide set of countries, and in Aleksynska and Peri (2014), regarding the impact of business networks on bilateral trade of OECD countries.

In sum, results are robust to different specifications. They show that the influence of students on bilateral trade is positive, strong and higher on exports than on imports. The latter implies that the links and knowledge of Latin American education networks have been more effective in supporting the expansion of home firms' products into OECD countries than in allowing OECD multinationals to export theirs into the home markets. A reason for this disparity can be the high barriers to imports and the strong market rigidities that existed in Latin American countries, especially during the seventies and eighties.

The coefficients on control variables in our preferred Models 5 and 10 are as expected. *Distance* has negative and significant effects on both exports and imports. *Polity rights* positively and significantly influence exports (Model 5), while *GDP* and destination country's *Population* positively and significantly influence imports. Interestingly and supporting the above interpretation, *Trade integration* between sending and destination economies, which increased after the cold war, has a positive and significant impact on imports (Model 10), but not on exports.

4.b. Cold war and globalization.

The global economic and geo-political landscape changes significantly during the time covered by our data, but while many factors change gradually, one major and relatively rapid modification takes place with the end of the cold war in almost all Latin American countries: a shift from dictatorship to democracy. To control whether this leads to heterogeneity on coefficients, especially on the variable of interest, we run the above regressions on two separate samples, one for the period 1971-1990, the other for 1991-2012, and interact the variable *International students* with the political and institutional variables, *Polity rights*, *Civil liberties* and *Democracy*.

Results in Table 2 show that coefficients on the interactions of *International students* with each of the political and institutional variables are all negative and in some cases significant. This was expected and provides support to the hypothesis that the economic value of individual and network links, be they social, education or business, decreases in more open and freer societies, where access to the market is open to all and transactions are backed by reliable institutions. The aggregate coefficients on *International students* are all positive and significant, both on imports and on exports, during the cold war and afterwards. This provides support to the aggregate findings of Table 1, they do not present a marked heterogeneity between periods, suggesting that education networks have been active both during dictatorship and democracy. Coefficients on exports tend to be higher than on imports (as in the aggregate results of Table 1), especially during the cold war, but this, as has already been said, may be due to the closeness to international markets and domestic economic rigidities of Latin American countries during the seventies and eighties. To save space, Table 2 presents coefficients only on the variable of interest and interacted variables, but complete

results (available from the authors upon request) show that trade agreements affect only imports (as in Table 1) and only in the second period: higher economic integration enhances import flows. It can be observed that coefficients on students in the second period in the exports and imports equations are more similar between them than in the first period, this can be due to the combined effects of freer societies and markets.

Table 2 shows another interesting result: a marked heterogeneity of coefficients on the political and institutional variables. Coefficients on the total effect of *Polity rights, Civil liberties* and *Democracy* are non-significant or negative during the cold war and strongly positive and significant during the following decades. This suggests that being more democratic in Latin America during the cold war did not lead to more trade, while it did so afterwards.[7]

The separate regressions for homogenous and differentiated goods in Table 3, show that, as expected, coefficients on the exports and imports of heterogeneous goods are positive and significant both in the first and the second period, while they are not significant in the regressions concerning the homogenous goods. Also, the magnitude of coefficients is similar in the two periods, and higher for imports, where the proportion of differentiated goods is higher.

[7] The negative and significant coefficients on (the total effect of) *Civil liberties* and *Democracy* in Models 5 and 7 capture the low levels of social liberties and democracy of major trading economies during the cold war, such as Mexico, Brazil, Argentina, Chile and Peru. The only LAIA democratic country during the cold war was Venezuela, which is also the only one with lower democracy levels after the cold war.

Table 2. – Cold war and globalization: interactions of International students with political and institutional variables.

I. students interacted with:	*Polity rights*				*Civil liberties*				*Democracy*			
Period:	1971-1990		1991-2012		1971-1990		1991-2012		1971-1990		1991-2012	
Dependent variable:	EXPORTS	IMPORTS	EXPORTS	IMPORTS	EXPORTS	IMPORTS	EXPORTS	IMPORTS	EXPORTS	IMPORTS	EXPORTS	IMPORTS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$Exports_{t-1}$	0.758***		0.716***		0.742***		0.717***		0.758***		0.695***	
	(0.043)		(0.050)		(0.044)		(0.051)		(0.044)		(0.054)	
$Imports_{t-1}$		0.689***		0.636***		0.677***		0.596***		0.684***		0.690***
		(0.054)		(0.052)		(0.055)		(0.053)		(0.054)		(0.051)
International students	0.572***	0.362***	0.389**	0.288	0.517**	0.419**	0.634***	0.388***	0.416***	0.251**	0.427***	0.250**
	(0.157)	(0.126)	(0.188)	(0.182)	(0.206)	(0.173)	(0.174)	(0.116)	(0.101)	(0.108)	(0.124)	(0.096)
Int. students x interacted variable[1]	-0.037*	-0.031**	-0.026	-0.025	-0.008	-0.034	-0.090***	-0.043**	-0.004	-0.004	-0.012	-0.001
	(0.022)	(0.014)	(0.032)	(0.029)	(0.036)	(0.022)	(0.027)	(0.018)	(0.007)	(0.004)	(0.011)	(0.010)
Polity rights	0.138	0.125*	0.297*	0.211								
	(0.100)	(0.065)	(0.177)	(0.161)								
Civil liberties					-0.033	0.134	0.686***	0.358***				
					(0.161)	(0.090)	(0.177)	(0.111)				
Democracy									0.010	0.015	0.119*	0.006
									(0.031)	(0.020)	(0.069)	(0.052)
Total effect International students	0.415***	0.230**	0.246***	0.148**	0.483***	0.271**	0.166*	0.167***	0.415***	0.250**	0.340***	0.261***
	(0.097)	(0.100)	(0.068)	(0.043)	(0.112)	(0.119)	(0.090)	(0.044)	(0.100)	(0.107)	(0.086)	(0.060)
Total effect Polity rights	-0.032	-0.017	0.156**	0.074**								
	(0.020)	(0.018)	(0.051)	(0.021)								
Total effect Civil liberties					-0.068**	-0.023	0.201***	0.129***				
					(0.028)	(0.026)	(0.055)	(0.031)				
Total effect Democracy									-0.009*	-0.004	0.057**	0.014*
									(0.005)	(0.005)	(0.022)	(0.007)
Controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
AR (2) test	0.269	0.121	0.259	0.278	0.247	0.132	0.253	0.258	0.202	0.155	0.290	0.227
Hansen J test (P-v.)	0.319	0.144	0.110	0.103	0.149	0.140	0.204	0.079	0.302	0.167	0.076	0.203
Hansen diff. J test (P-v.)	0.869	0.995	0.282	0.637	0.637	0.997	0.572	0.279	0.734	0.996	0.526	0.892
Number of instruments	90	83	91	91	90	83	91	91	90	83	93	90
Observations	836	615	1,266	1,266	836	615	1,266	1,266	836	615	1,343	1,266
Number of country_pair	94	94	99	99	94	94	99	99	94	94	99	99

Notes. Robust standard errors clustered by country-pair in parentheses. *** p<0.01, ** p<0.05, * p<0.1. AR (2) is Arellano-Bond test for serial correlation. The sample is an unbalanced panel, comprising data from 1971 to 2012. International students and all other control variables are treated as predetermined and are instrumented for using their own first to third lags in level and differences . (1) Int. students x interacted variable: International students interacted with, respectively: Polity rights, Civil liberties and Democracy. The total effect of International students is calculated summing the coefficients on International students and on the interaction between International students and, respectively, Polity rights, Civil liberties and Democracy, evaluated at average level, in each case, of Polity rights, Civil liberties or Democracy. The total effect of Polity rights is calculated summing the coefficient on Polity rights and on the interaction term, evaluated at average level of International students. A similar procedure applies to the total effect of Civil liberties and Democracy.

Table 3. - Influence of international students on trade in homogenous and differentiated goods. SYS_GMM.

	1971-1990				1991-2012			
	Homogeneous		Heterogeneous		Homogeneous		Heterogeneous	
Dependent variable:	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Export homogenous goods$_{t-1}$	0.508***				0.675***			
	-0.072				-0.04			
Import homogenous goods$_{t-1}$		0.417***				0.508***		
		-0.098				-0.054		
Export differentiated goods$_{t-1}$			0.862***				0.867***	
			-0.031				-0.031	
Imports differentiated goods$_{t-1}$				0.697***				0.650***
				-0.049				-0.06
International students	0.206	-0.016	0.175**	0.281***	0.107	0.055	0.184**	0.252***
	-0.146	-0.132	-0.078	-0.088	-0.082	-0.084	-0.092	-0.056
Control variables	yes	yes	yes	yes	yes	yes	yes	yes
Time effects	yes	yes	yes	yes	yes	yes	yes	yes
AR (2) test	0.286	0.475	0.308	0.663	0.433	0.615	0.375	0.717
Hansen J test (P-v.)	0.203	0.263	0.201	0.151	0.232	0.222	0.078	0.269
Hansen diff. J test (P-v.)	0.239	0.298	0.998	0.739	0.436	0.648	0.99	0.891
Number of instruments	68	77	81	81	76	61	77	95
Observations	805	797	600	578	1,453	1,449	1,333	1,455
Number of country pairs	93	93	93	94	99	99	99	99

Notes. Robust standard errors clustered by country-pair in parentheses. *** p<0.01, ** p<0.05, * p<0.1. AR (2) is Arellano-Bond test for serial correlation. The sample is an unbalanced panel, comprising data from 1971 to 2012. Variables are in logs. Students abroad and all other control variables are treated as predetermined and are instrumented for using their own first to third lags in level and differences.

4.c. Robustness

A potentially omitted variable from the above regressions is the stock of *Immigrants* from LAIA countries in the nine OECD countries. Immigrant stocks can affect trade directly, through a social network mechanism, but could also be correlated with the variable *International students*, especially if students, when deciding on where to move for their studies, tend to prefer countries with communities from their homeland. To control for these possibilities, the variable *Immigrants*, has been included among the regressors. Table 4 shows that migrants have no influence on either exports or imports. Furthermore, the coefficients on international students are similar those found in the previous specifications of Table 1, further supporting the robustness of previous findings. Inflation, religion in receiving countries and other control variables have also been used as regressors, without finding any significant alteration in coefficients on students. These results are available from the authors upon request.

Table 4. - Robustness: *Immigrants.* SYS_GMM

Dependent variable:	EXPORTS 1971-2012	IMPORTS 1971-2012
$Exports_{t-1}$	0.806***	
	(0.031)	
$Imports_{t-1}$		0.622***
		(0.051)
International students	0.247***	0.160***
	(0.071)	(0.056)
Immigrants	-0.014	0.001
	(0.016)	(0.012)
Control variables	yes	yes
Time dummies	yes	yes
AR (2) test	0.178	0.343
Hansen J test (P-value)	0.104	0.096
Hansen diff. J test (P-value)	0.968	0.763
Number of instruments	98	80
Number of country_pair	99	99
Observations	1,684	1,686

Notes. Robust standard errors clustered by country-pair in parentheses. *** p<0.01, ** p<0.05, * p<0.1. AR (2) is Arellano-Bond test for serial correlation. The sample is an unbalanced panel, comprising data from 1971 to 2012. Variables are in logs. International students and all other control variables are treated as predetermined and are instrumented for using their own first to third lags in level and differences.

5. Concluding remarks

Students from different areas of the world have traditionally moved for their tertiary studies to advanced and rich economies. Spilimbergo (2009) finds that these movements can influence the political models adopted by sending countries. Focusing on eleven Latin American and nine OECD countries from 1971 to 2012, we find that international students can also improve the economic exchanges between sending and destination economies.

More specifically, our results show that Latin American education networks boost exports and imports and that these results are robust to different specifications and regressors. When the cold war years and last decades are considered separately, the effect of students is strong, positive and significant in both cases. However, in few years, the end of the cold war changed the Latin American political and institutional landscape: dictatorships were substituted by democracy. We find this change to negatively, albeit mildly, interact with the influence of education networks on

trade – with freer societies more knowledge, information and economic opportunities are available for all – but to have a direct and positive impact on imports and exports. More specifically, being more democratic during the cold war did not improve trade, while being more democratic afterwards boosted it. Interestingly, of the Latin American heads of government with a foreign education, most of those ruling during the cold war had a military training while, with one exception (Humala, in Peru) , all those ruling afterwards pursued academic studies (Table A.4). Both types of education appear to be consistent with each period's political determinants of trade.

The United States has been the preferred destination of Latin American students and trade flows during the last four decades, but after the cold war, and especially after the terrorist attacks of 2001, students inward movements have been significantly slowed by restrictive policies. Both the growth rates of Latin American students and of trade flows with the United States have been lower in the last two decades than during the cold war, while they have increased in some European countries, as well as in Australia and Canada. Our results show that restrictions in the inflows of international students may harm potential economic exchanges while, oppositely, students' international movements can substantially trigger bilateral exports and imports, which in turn can positively influence countries' income levels and growth. Governments should take into account the positive impact of international students on the international economic exchanges, and implement appropriate policies.

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Appendix

Table A.1. shows that the mean values of exports, imports and LAIA students in the destination country strongly increase from the first to the second period. Also, in both periods, LAIA countries export more homogenous than differentiated goods, with the proportion of differentiated goods exported being higher in the second period, and import more differentiated than homogenous goods. *Trade integration*, *Polity rights*, *Civil liberties* and *Democracy* significantly increase from the first to the second period. The mean number of students enrolled in tertiary education in the average Latin American country (*Education in sending/destination countries*) is lower than in the OECD economy, but increases more rapidly than in the OECD countries.

Table A.1. - Some descriptive statistics (LAIA - OECD country pairs).

	1971-1990			1991-2012			1971-2012		
Variable	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Mean	Min	Max
Exports: LAIA country to OECD country	1,360	379,765	1,406,075	1,704	2,783,197	18,100,000	1,716,399	0.70	283000000
Exports homogeneous goods	1,299	317,022	1,084,786	1,687	1,249,692	6,350,639	843,953	0.47	89800000
Export heterogeneous goods	1,324	175,054	914,198	1,691	1,184,659	8,337,025	741,303	1.00	117000000
Imports: LAIA country from OECD country	1,362	334,923	1,203,087	1,705	2,299,380	12,400,000	1,427,000	1.93	186000000
Imports homogeneous goods	1,279	99,623	362,453	1,682	503,488	2,631,752	329,039	1.00	41300000
Imports heterogeneous goods	1,306	192,327	767,110	1,696	1,354,315	7,317,475	848,800	4.00	105000000
International students	1,158	447	1,030	1,627	860	1,740	689	0	14853
Trade integration	1,362	0.80	0.40	1,705	1.22	0.63	1.03	0.00	3
Polity rights	1,362	4.27	1.89	1,705	5.51	1.03	4.96	1.00	7
Civil liberties	1,362	4.35	0.03	1,705	5.18	0.02	4.81	2.00	7
Democracy	1,362	0.34	0.20	1,705	7.46	0.06	4.30	-9.00	10
Tertiary education sending c.	1,362	903.23	994.70	1,705	2928.83	3015.91	2029.30	22.89	13586
Tertiary education destination c.	1,362	9145.49	18169.71	1,705	18414.45	32948.43	14298.27	87.45	134668

Note: Polity rights, Civil liberties and Democracy in sending countries.

Table A.2. – Students and Trade by destination country. 2011

Country	Students	Trade share
USA	44,613	22.5
Spain	29,002	3.7
France	13,074	0.8
Cuba	11,718	0.1
Germany	6,815	8.9
Italy	6,348	4.2
Portugal	5,414	0.6
UK	5,221	2.9
Brazil	4,015	3.2
Australia	3,899	0.5
Canada	3,003	1.5
Chile	2,694	1.1

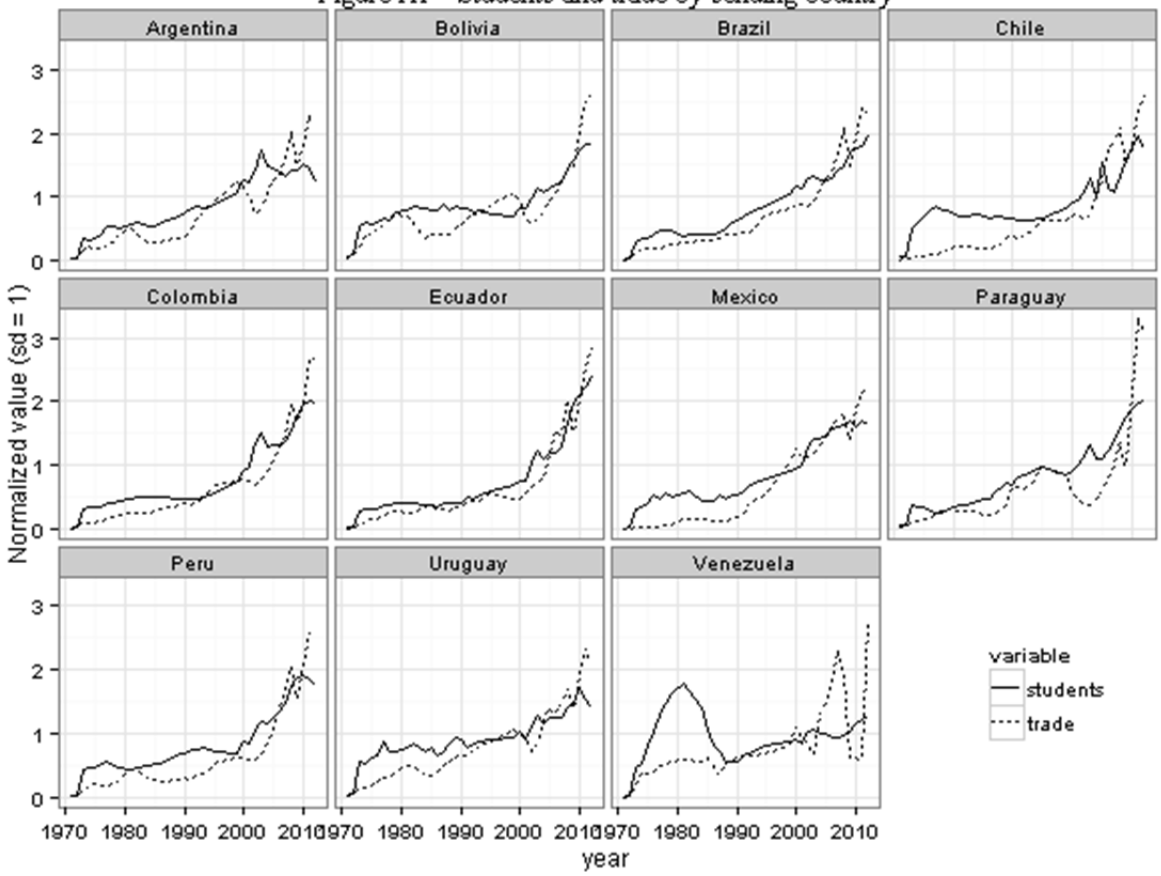
Note: Trade share: proportion on world trade -
Sources: WITS and UNESCO.

Table A3. – Percentage growth of LAIA countries trade and students abroad per country of destination.

	International students		Average trade	
	1971-1990	1991-2012	1971-1990	1991-2012
Australia	-0.04	0.14	0.10	0.12
Canada	0.03	0.05	0.05	0.09
France	0.07	0.06	0.12	0.07
Germany	0.03	0.02	0.05	0.09
Italy	0.06	0.14	0.12	0.09
Portugal	0.05	0.08	0.18	0.12
Spain	-0.08	0.13	0.13	0.11
UK	-0.01	0.04	0.08	0.07
no_USA	0.02	0.08	0.10	0.09
USA	0.04	0.03	0.13	0.09

Notes. Average trade: mean of Exports and Imports.
No_USA: all eight countries of the dataset, except USA
Sources: WITS and UNESCO.

Figure A1 - Students and trade by sending country



Notes: Student and trade patterns for each LAIA country are normalized to a standard deviation of one. All countries present similar paths except Venezuela. The latter's stock of International students first rapidly increases and then sharply decreases at the mid-eighties. From the beginning of the nineties it slowly starts increasing again, without, however, ever again reaching the levels of the mid-eighties. Additionally, during the last decade, the country's trade flows markedly fluctuate.

Table A.4 - Heads of State tertiary education, 1971-2012

Years		Head of State	Country(ies) of tertiary education			
			Undergraduate	Graduate		
Argentina (4 presidents with foreign education / 19 presidents)						
1976	1981	Videla	Argentina	Panama (Military)		
1981	1981	Viola	Argentina	Panama (Military)		
1981	1982	Galtieri	Argentina	Panama (Military)		
1982	1983	Bignone	Argentina	Spain (Military)		
Bolivia (12 presidents with foreign education / 20 presidents)						
1971	1978	Banzer Suárez	Bolivia	Panama (Military)		
1978	1978	Pereda Asbún	Bolivia	Italy (Military)	Argentina (Military)	
1978	1979	Padilla	Bolivia	Argentina (Military)	United States (Military)	
1979	1979	Natusch Busch	Bolivia	Germany (Military)	Argentina (Military)	
1982	1982	Vildoso Calderón	Bolivia	United States (Military)	Panama (Military)	Bazil (Military)
1989	1993	Paz Zamora	Argentina	Belgium		
1993	1997	Sánchez de Lozada	United States			
1997	2001	Banzer Suárez	Panama (Military)	Argentina (Military)	Brazil (Military)	
2001	2002	Quiroga Ramírez	United States			
2002	2003	Sánchez de Lozada	United States			
2003	2005	Mesa	Spain	Bolivia		
2005	2006	Rodríguez Veltzé	Bolivia	United States		
Brazil (no presidents with foreign education / 9 presidents)						
Chile (5 presidents with foreign education / 8 presidents)						
1994	2000	Frei Ruiz-Tagle	Chile	Italy		
2000	2006	Lagos Escobar	Chile	United States		
2006	2010	Bachelet	Chile	German Democratic Rep.		
2010	2014	Piñera	Chile	United States		
2014	-	Bachelet	Chile	German Democratic Rep.		
Colombia (7 presidents with foreign education / 10 presidents)						
1974	1978	López Michelsen	Colombia	Chile	United States	
1982	1986	Betancur	Colombia	United States		
1986	1990	Barco	Colombia	United States		
1994	1998	Samper	Colombia	Mexico		
1998	2002	Pastrana	Colombia	United States		
2002	2010	Uribe	Colombia	United States		
2010	-	Santos	United States	United Kingdom		

Years		Head of State	Country(ies) of tertiary education		
			Undergraduate	Graduate	
Ecuador (8 presidents with foreign education / 17 presidents)					
1968	1972	Velasco Ibarra	Ecuador	France	
1972	1976	Rodríguez Lara	Ecuador (Military)	Argentina (Military)	Panama (Military)
1984	1988	Febres-Cordero	Ecuador	United States	
1992	1996	Durán Ballén	United States		
1996	1997	Bucaram	Ecuador	Germany	
1998	2000	Mahuad	Ecuador	United States	
2005	2007	Palacio	Ecuador	United States	
2007	-	Correa	Ecuador	Belgium	United States
Mexico (5 presidents with foreign education / 8 presidents)					
1982	1988	de la Madrid	Mexico	United States	
1988	1994	Salinas de Gortari	Mexico	United States	
1994	2000	Zedillo	Mexico	United States	
2000	2006	Fox	United States		
2006	2012	Calderón	Mexico	United States	
Paraguay (1 president with foreign education / 9 presidents)					
2013	-	Cartes	Paraguay	United States	
Peru (7 presidents with foreign education / 9 presidents)					
1975	1980	Moralez Bermúdez	Peru (Military)	Argentina (Military)	United States (Military)
1980	1985	Belaúnde Terry	France	United States	
1985	1990	García	Peru	Spain	France
1990	2000	Fujimori	Peru	France	United States
2001	2006	Toledo	United States		
2006	2011	García	Peru	Spain	France
2011	-	Humala	Peru (Military)	Panama (Military)	
Uruguay (no presidents with foreign education / 13 presidents)					
Venezuela (1 president with foreign education / 10 presidents)					
1984	1989	Lusinchi	Venezuela	Argentina	Chile	United States

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