Foreign Direct Investment among Latin American Custom Union Economies: an Economic Integration Analysis

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Abstract:

The past few decades have been characterized by sustained growth in trade flows among countries and by transformations in their features and patterns. Processes of integration and Regional Integration Agreements (RIAs) have proliferated. To this date it is not clear whether these agreements increase or diminish the Foreign Direct Investment (FDI) flows within the members of the bloc.

This paper focuses on this issue for a sample of eight Latin American countries over the years 1996-2006. We design and estimate an augmented gravity model in order to analyse FDI patterns among countries, taking into account, in particular, the impact of regional trade agreements and the role of specific location advantages and country characteristics. Results show that the main forces behind intra bloc FDI are endowment differences, cost differentials and distance among economic centres. Other aspects, such as macroeconomic stability and political climate, are also relevant. The findings suggest that FDI flows, in the countries of our sample, respond to a vertical model, in which firms seek efficiency gains when deciding to operate abroad.

Key words: Foreign direct investment; Regional Integration Agreements, augmented gravity model.

1. Introduction.

During the past fifty years, the international economic framework in which countries, firms and consumers operate has experienced large transformations. World trade has increased dramatically, barriers to trade have diminished and substantive progress has been reached in main transport and communication systems. Meanwhile, the consensus over the beneficial impact of international trade on development and growth has spread from academia to policymakers in governments and to international organizations. This process has unveiled the existence of economies of scale in production and transportation, which in turn have changed trade patterns and fostered the apparition and consolidation of Regional Integration Agreements (RIAs) throughout the world. Presently the number of regional trade agreements exceeds 200 (WTO 2009a).

Latin American countries have also been part of this phenomenon, especially since the 1990s. Average tariffs in the region have been reduced from 40% in the 1980s to 10% in 2007 (WB 2009b). The need to reduce barriers to trade, increase international activity, and become more competitive urged these nations to build or become involved in different economic agreements, such as Asociacion Latino Americana de Integracion (ALADI), Mercosur, Caribbean Community and Common Market (CARICOM), and North American Free Trade Agreement (NAFTA), which not only affected trade but also helped introduce structural reforms in the economy. Although the process of regional integration in the area is not complete, advances have been made. According to data from the WTO, the number of trade agreements that have been signed and ratified since 1990 is 57, of which 31 are south-south and 26 north-south (WTO 2008).

Integration and its associated effects of larger markets and potentially more efficient reallocation of resources is expected to expand not only intra-regional trade but also foreign investment inflows (Motta and Norman, 1996). The formation of blocs generates positive externalities by sending signs of macroeconomic stabilization, establishing clear rules and law enforcement, and inducing political transformations that reduce political risk.

There are studies which focus on the links between RIAs and trade and suggest a beneficial effect of regional agreements on the volume of trade. Martinez (2003) evaluates the preferential agreements between several economic areas and suggests that regional blocs have important implications for trade among country members of RIAs. Baier and Bergstrand (2007) conclude that economic international agreements double trade of members after 10 years. Baier *et al* (2008) have shown that European Union state members’ trade increased by 127-146% after 10 years.

Work on the impact of RIAs on FDI flows, however, is sparser. At this point there are several questions that lack clear, specific answers: does a substantial degree of regional integration affect FDI flows among the countries involved in the process? What are the different determinants that influence the FDI distribution among the members of the bloc? Are these factors different from the ones affecting the international FDI flows?

This paper contributes to the debate by focusing on the links between regional integration and FDI flows in a sample of Latin American countries. Traditionally, the empirical literature has mainly studied the effects of regional agreements on FDI flows originated from third countries. Our approach here is different; it concentrates on the determinants of investment flows among countries that belong to the same bloc.

We employ a computable general equilibrium model, commonly known as an augmented gravity model, for FDI flows. This set up provides an appropriate framework to analyse the influence of preferential agreements among bloc members, together with the role of localization advantages and the potential relevance of geographical proximity.

The structure of this paper is as follows: Section 2 discusses the connection between FDI and RIAs. Section 3 summarizes some empirical evidence regarding this issue. Section 4 and Section 5 describe the data and the empirical methodology employed, respectively. Results are presented in Section 6. Section 7 concludes.

2. Effects of Regional Integration Agreements on FDI Flows.

The determinants of FDI have been become a relevant issue for discussion since the late 60s. Later on, in the 90s, increasing regional and international linkages among countries have seemed to encourage the foreign investment process; in parallel alternative explanations for the development of multinational firms have been prompted. The traditional motivations inducing a firm to enter new markets have been extended from many different perspectives. Dunning (1994) summarized the reasons whereby firms could be motivated to invest in foreign countries in four categories. When firms make their investment decisions, they are looking for four different types of outcome. This means that firms may be: a) efficiency- seeking; b) strategic asset seeking (increasing competitive capacities in regional or global markets), c) market-seeking, and d) natural resource-seeking. Ultimately, we can speak of two main groups of considerations that shape the firms' decisions: FDI flows may be driven by the search of either a more efficient business model (that entails lower costs or is capable of benefiting from key assets) or a larger market.

Other theories prefer to classify FDI into horizontal or vertical. In horizontal FDI models companies decide to carry out the same production activity in different countries, with the aim to have easier access to those markets. In other words, firms choose to produce part of their output abroad, and sell it directly from abroad. In vertical FDI, instead, firms may split up their production processes (usually consisting of more than a single stage) across national boundaries, producing intermediate goods in a country, and assembling and/or selling them in another. It follows that important determinants for vertical FDI are the differentials in resource endowments or in labour costs.

In vertical FDI the key question is where to locate production in order to minimize costs and to serve the domestic market best. In horizontal patterns, instead, the crucial issue is how to serve the host market best. It turns out that the horizontal FDI framework is more suitable, on a priori grounds, to explain activity in a pair of developed countries, whereas the vertical FDI framework is appropriate to describe operations between a developed country and a host developing nation (although this claim should be made with caution since we can find nowadays multinationals that have settled some key processes, like production, in developed nations as well).

The literature also suggests the possibility of coexistence of vertical and horizontal motivations (Markusen 1997). Markusen and Venables (2000) developed a model known as Knowledge-Capital model that includes horizontal and vertical FDI. The model was inspired by the phenomenon whereby reductions in trade costs, due to trade agreements, occurred at the same time as substantial growth in FDI. It was tested to find evidence in support of horizontal FDI *versus* vertical, but results regarding the prevalence of one type versus the other were unclear. and .. Furthermore, theoretical studies highlight the difficulty in measuring the size and impact of each separate effect (Motta and Norman, 1996; Dunning, 1997; Balasubramanyam, Sapsford and Griffiths, 2002; Neary, 2009).

This classification makes it easier to relate FDI and RIAs since in this framework it is rather straightforward to think of FDI as substitute or complement for trade: if the investment process is driven by endowment differences (vertical), FDI can be considered as a complement for trade (Helpman, 1984; Zhang and Markusen, 1999). If foreign investment is horizontal, FDI and trade can be considered as substitutes (Markusen, 1984; Horstmann and Markusen, 1987, 1992; Markusen and Venables, 1998, 2000).

Economic integration, thus, may have either positive or negative effects on FDI because of cost and market considerations. On the one hand, and in the cases where horizontal FDI prevails, the elimination of tariffs that result from an RAI may favour that foreign firms export products from their own countries, hence reducing the intra bloc flows of FDI. However, when FDI is driven by vertical considerations, the reduction of trade barriers could increase the FDI flows among the partners by enabling transnational corporations to operate more efficiently across borders. The formation of a new bloc, then, might provoke the division of the production chain throughout the regional economies in order to explore the location advantages of each partner[1], and increase FDI directed to one member while reducing the flows to other members.

Furthermore, the he larger degree of macroeconomic and political stability conceivably brought about by a RIA, however, will have a positive impact on FDI[2]. In effect, many papers have already pointed out that macroeconomic and political stability and lack of distortions are crucial for attracting FDI to developing economies (Blomström, Lipsey, and Zejan, 1992; De Haan and Sturm, 2000; Bengoa and Sánchez-Robles, 2003; Acemoglu *et al*, 2005.). Integrated economies tend to share some common goals and they normally rely on some degree of supranational coordination. The existence of some common legislations and business practices also has positive effects and affect the investor's perception of a particular country. Daude, Stein and Yeyati (2003) consider these issues while writing about the possible effects of RIAs on

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[1] Low labour costs, abundance of a specific natural resource or infrastructure facilities can be good examples of these advantages.

[2] It is generally accepted that improvements in technology, efficiency and productivity tend to foster economic growth. This is the channel that relates FDI inflows with economic growth according to the recent developments on growth theory. The arrival of new firms to the domestic market faccilitates the transfer of new technologies from the home country, enhancing efficiency through knowledge diffusion. Hejazi and Safarian (1999), Aitken *et al* (1997) found some empirical evidence suggesting that FDI is a more important determinant of efficiency gains than international trade. I 'd remove this footnote. Hasn't much relationship with the main text

FDI, and conclude that RIAS indeed had a positive expected impact[3]. Blomstrom and Kokko (1997) suggest that these effects are more important in agreements involving developing countries.

With these ideas, we can conclude that RIAs may affect member countries in different ways. The implicit reduction of trade barriers within the region may have direct effects on intra-regional FDI flows, individually, the effects can be ambiguous, as the regional production structure may change and the possibility of clustering in more favoured production locations may generate positive effects for some member economies in detriment of others.

As far as FDI from outside the bloc is concerned, the effects on particular countries are also ambiguous. It is plausible, though, that the extended market size and the location advantages in the bloc might increase the net flows to the region as a whole; however the integration can foster the formation of niches in specific countries or regions within the bloc.

3. Empirical findings: Regional integration and FDI

After considering the possible effects of regional integration on FDI flows, we outline the main contributions that have examined this relationship. The previous empirical findings diverge and it seems that each study reports a different outcome. Table 1 summarizes the empirical findings that are going to be discussed. As seen in the Table, there is no consensus in the literature on the sign of the impact of RAIs on FDI. This is not a surprise since we stated above that, on theoretical grounds, RAIs may impact foreign investment flows positively or negatively.

Motta and Norman (1996) find that an improved market access within a trade bloc leads to export-platform FDI. As an additional benefit, FDI into the bloc becomes more attractive to outside firms, allowing them to reach the majority of markets within the block. Instead of considering only the market size of a potential host country, firms now consider the broader, regional market that can be easily served from the country. The analysis is developed considering the integration and FDI dynamics in the North American Free Trade Agreement (NAFTA), European Union (EU) and the Association of South East Asian Nations (ASEAN).

A number of papers focus on Latin America. Blomstrom and Kokko (1997) describe three cases of economic integration and their effect on FDI inflows. The results suggest that the Canadian participation in the Canada-US Free Trade Agreement (CUSFTA) did not cause a significant change in the FDI that this country received while the Mexican FDI inflows, after the integration into NAFTA, were indeed significant The MERCOSUR establishment seemed to present a positive impact on FDI until 1994, with different effects among countries. The two biggest economies of the bloc were certainly the greater beneficiaries of the FDI inflows after integration[4].

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[3] The opposite is also true; considering Latin American countries, with a recent past of authoritarian governments, this issue represents a permanent concern. The upsurge of nationalists' left-hand side governments in the Venezuela (the new MERCOUSUR member) and Bolivia have discouraged potential foreign investors to these countries. In Bolivia, since the president Evo Morales was elected in 2005, the nationalization of the oil and energy sector has affected directly some transnational corporations operating in the country. Henisz (2000) is another example for studying the role of institutional environment, political hazard and multinational investment relationship.

[4] The authors showed the positive effect of the MERCOSUR integration for Brazil and Argentina, although it is

Karp and Sanchez (1999) showed that the accession of Mexico to NAFTA, in 1994, increased the Mexican FDI growth rate by 25 percent per year. Waldkirch (2003) concluded similarly, arguing that NAFTA had raised the American and Canadian FDI flows to Mexico, while not changing the flows from the rest of the world. MacDermott (2007), using a fixed effects gravity model, also showed that NAFTA trade integration encouraged FDI flows towards the bloc, but contrarily to Waldkirch (2003) suggested that the increase in the flows did not seem to be stemmed by the regional partners. Castilho and Zignago (2000) used a gravity model to estimate the determinants of the FDI flows from OECD members to the MERCOSUR economies, taking into account the economic integration process. They concluded that the integration did not play an important role in FDI attraction; instead, macroeconomic stability, liberal economic reforms and privatization processes were the relevant explanatory variables for these economies. Daude, Stein and Yeyati (2003) pointed out that the formation of RIAs implied gains for the member countries in terms of FDI inflows, although the share of FDI among the economies was not expected to be evenly distributed. Bittencourt, Domingo and Reig (2006) argued that the development of the FTAA (Free Trade Area of Americas) or EU-MERCOSUR agreements could bring about different results within MERCOSUR economies with respect to the attraction of FDI inflows. Frenkel *et al*. (2004) examined the determinants of FDI flows to emerging economies by analyzing a recently compiled data set of bilateral FDI flows. They showed that home and host country factors played an important role in determining the level and the destination of FDI flows.

Several papers focus in other economic areas, mainly Central and Eastern Europe. Bevan and Estrin (2004) found evidence in favour of labour cost and market size as determinants of FDI in Eastern Europe. They specified that the announcements of EU accessions proposals have had an impact on future FDI for the European transitional economies; however, they did not conduct any empirical analysis. Abilava (2006) examined the nature and determinants of FDI in nine economies from Eastern Europe, finding that countries with stable and floating exchange rates attracted more FDI. Egger and Pfaffermayr (2004a) analyzed the effects of European economic integration on FDI during the 1990s using a gravity model approach. They found out that recent economic integration has had substantial effects on FDI inflows, but these effects disappeared after the formal completion of the integration programs. Finally, Carstensen and Toubal (2004) studied the determinants of OECD´s FDI in seven Central Eastern Countries from 1993 to 1999. They concluded that both traditional determinants and transition-specific variables have had significant and plausible effects on FDI[5].

In sum, it seems from the existing literature that economic liberalization and stability are crucial in attracting foreign investment.

4. The econometric background

The empirical analysis here is based on an extended gravity model, commonly used to test trade flows among regions or countries. Tinbergen (1962), Pöyhönen (1963) and Anderson (1979) were the pioneers in applying the gravity equation to study

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stressed that the macroeconomic stabilization achieved by these economies in the beginning of the 90´s represented a more important determinant to the FDI attraction.

[5] Daniels (2005) has published an excellent revision of the empirical studies of foreign direct investment.

international flows[6]. According to the gravity model for international trade, the amount of trade between two countries is explained by their economic size (GDP), population, geographical distance and a set of variables that capture common institutional characteristics such as languages, culture, trade agreements, and law systems. Recent applications have improved the performance of the gravity equation. Piani and Kume (2000) studied bilateral trade flows between 44 countries and Anderson and Wincoop (2003) derived a gravity model to solve the border puzzle. Bergstrand (1985) derived a gravity model by exploring the theoretical determination of bilateral trade associates in gravity equations using monopolistic competition models. Helpman and Krugman (1985) use a differentiated product framework with increasing returns to scale.

The gravity model has also been used to model the international pattern of foreign direct investment. A recent paper in this regard is Kleinert and Toubal (2010). The authors provide theoretical support for the FDI gravity model by estimating a gravity equation from three different models of multinational firms.

Empirically, several studies contribute to the refinement of the gravity equation. Cheng and Wall (1999) assume that the gravity equation for a country pair may have a unique intercept, and that it may be different for each direction. Mátyás (1997) proposes an alternative specification to the gravity model where each country has two fixed effects, one as a host country (receiving country) and one as a home country (parent country). In this specification, however, all country- specific time- invariant effects drop out of the estimation.

Egger (2000) argued that panel data methods are the most appropriate for disentangling time-invariant and country specific effects. Egger and Pfaffermayr (2003) underlined that the omission of specific effects for country pairs can bias the estimated coefficients. In this study, we face a related difficulty: there are some variables in our databasisthat have little variability over time, such as location-specific advantages,institutional aspects and inclusion in RIAs., In this framework an ordinary least square estimation would lead to biased and inconsistent estimators.

While the pooled model is appropriate if the regressor and the error term are uncorrelated, and there is not perfect collinearity, it does not assume the existence of unobserved individual heterogeneity. An alternative solution is to use an estimator to control for bilateral specific effects as in a fixed effect model (FEM) or in a random effect model (REM) The fixed effects model (FEM) treats individual effects as a variable that is partially correlated with the observed regressors. The random effects model (REM) treats the unit effects as independently distributed of the regressors.. There exists, though, a trade off between bias and precision, if individual effects are uncorrelated with x_i, the RE estimator will be more efficient. If individual effects are correlated with x_i, then the RE estimator will be biased, but FE model will provide consistent estimators. The Hausman test will allow us to choose the most appropriate method..

Hausman and Taylor (HT) considered a model that preserves the advantages of both estimators: It allows for correlation between individual effects and regressors (FE) and it identifies the effects of time invariant regressors (RE).

[6] Anderson (1979) and Deardorff (1998) offer a theoretical background of the gravity model approach.

The baseline specification is of the form:

(1) $$y_{it} = \alpha + \sum_{k=1}^{K} \beta_k x_{kit} + \sum_{j=1}^{J} \gamma_j Z_{ji} + u_i + \varepsilon_{it}$$

where χ_{kit} is a set of K time varying variables, Z_{mi} represents the M time invariant variables, u_i is a set of N-1 unit specific effects and ε_{it} is the normal distributed error component. There are ***N*** cross sections units observed for *T* periods.

To estimate time invariant or rarely changing variables in panel data models with unit effects, Hausman and Taylor (1981) proposed a method with different steps. First, use FE to obtain consistent estimators of betas, then, regress the γ_j using instruments on the group means of the residuals (assuming that x_1 and z_1 are uncorrelated with u_i and employing them as instruments of x_2 and z_2 respectively). Finally, use the residual variances to obtain the FGLS weight and perform GLS transformation for all variables. The use of weighted instrumental variable estimators will allow to get the coefficients of interest by instrumental variables regression[7].

This method does not allow to distinguish between endogenous and exogenous variables. As Plumper and Troeger (2003) suggest, instruments may not be adequate. They developed an alternative to the estimation of time-invariant variables in the presence of unit effects (FEVD). Equation (1) can be re-written as:

(2) $$y_{it} = \alpha + \beta X_{it} + \gamma Z_i + \mu_i + \varepsilon_{it}$$

The first stage of the proposed estimator runs a fixed-effects model to obtain the unit effects ($\hat{\mu}_i$):

(3) $$\hat{\mu}_i = \bar{y}_i - \sum_{k=1}^{K} \beta_k^{FE} \bar{x}_{kit} = \hat{\alpha} + \gamma_j \sum_{j=1}^{J} z_{ji} + \eta_i + \bar{\hat{\varepsilon}}_i$$

where β_k^{FE} is the pooled-OLS estimate of the model in equation (1), η_i is the unexplained part of the unit effects and $\bar{\varepsilon}_i$ are the average unit means of the Fixed Effect estimation (with panel heteroskedsticity if $\bar{\varepsilon}_i \neq 0$).

The second stage breaks down the unit effects into a part explained by the time-invariant and/or rarely changing variables and an error term. Given the equation (3), the unit effects are regressed on the *z* variables to obtain an estimator of γ.

(4) $$\hat{\mu}_i = \omega + \gamma_j \sum_{j=1}^{J} z_{ji} + \eta_i \hat{\eta}_i = \hat{\mu}_i - \varpi - \gamma_j \sum_{j=1}^{J} z_{ji}$$

[7] An excellent revision of the Hausman-Taylor estimation in Heterogeneous panels with time-specific factors applied to gravity trade models can be find in Serlenga and Shin (2007).

where ω is the intercept and η_i is the unexplained part of the unit effects in equation (3). It is shown that the exclusion of variables correlated with the unit-effects and the no-time variant variables could lead to biased estimates.

The third stage reestimates the first stage by pooled OLS (with or without autocorrelation correction and with or without panel-corrected SEs) including the time-invariant variables plus the error term of stage 2, which then accounts for the unexplained part of the unit effects.

(5) $$y_{it} = \alpha + \beta_k \sum_{k=1}^{K} x_{kit} + \gamma_j \sum_{j=1}^{J} Z_{ji} + \hat{\eta}_i + \varepsilon_{it}$$

Essentially FEVD produces unbiased estimates of time-varying variables, regardless of whether they are correlated with unit effects or not, and unbiased estimates of time invariant variables that are not correlated ($\hat{\eta}_i$ is not correlated with z_{ij}). The main advantages of FEVD come from its lack of bias in estimating the coefficients of time-variant variables that are correlated with unit-effects.

This method has received some criticisms. Greene (2010) expressed that the FEVD estimator simply reproduces (identically) the linear fixed effects (dummy variable) estimator. The consistency result follows from the “estimator” relying upon turning the fixed effects model into a random effects model, in which case simple GLS estimation of all parameters would be efficient among all estimators. Breusch et al (2010) suggest that the estimator is inconsistent when the time-invariant variables are endogenous and they recommend an alternative estimator that has superior risk properties to the decomposition estimator, unless the endogeneity problem is known to be small or no relevant instruments exist.

From the above discussion, it is apparent that the issue of the correct specification is still a matter of debate among econometricians. However, this debate also suggests that in small samples, as the one in our study, the FEVD offers consistent and efficient estimators. Furthermore, we think that the endogeneity of variables is not significant in our sample. Consequently, we use this technique for the empirical analysis, although we will present the results using also the FE model, the RE model, and the Hausman-Taylor formulation.

5. Empirical Application to the Intra-FDI flows in Latin America.

We propose an augmented gravity model to analyse FDI patterns among several Latin American countries. Our main goal is to analyse the impact of regional trade agreements between partners and the role of specific location advantages and country characteristics. This approach allows us also to take into account the heterogeneous nature of the FDI patterns, which may be related to the idiosyncrasy of the country or to country-specific traditional gravity variables. We follow the contributions by Markusen and Maskus (2002) and Blömstrom and Kokko (1997).

We use this approach for a panel data of 11 Latin American economies, over the years 1996 - 2006. This is a lightly unbalanced panel, as data are not available for all the economies every year[8]. Consequently, the panel comprises 1147 observations, hence the sample is relatively small for the quantity of countries included in the econometric study; this is a compelling reason to consider the FEVD method as the one that offers more consistent and efficient estimators. The composition and sources of the dataset can be found in Table 1 of the Appendix.

We design an FDI non-restricted model with different specifications: vertical, horizontal and a hybrid "Knowledge Capital". The model includes dummy variables for partners sharing a common border or having preferential trading agreements, and other variables, like sharing a common language and distance, which are time-invariant. The basic equation is:

$$FDI_{ij,t} = \beta_0 Y_{i,t}^{\beta_1} Y_{j,t}^{\beta_2} N_{i,t}^{\beta_3} N_{j,t}^{\beta_4} D_{ij}^{\beta_5} A_{ij,t}^{\beta 6} \varepsilon_{ij,t} \tag{6}$$

where country pairs are denoted by *ij*= Argentina-Brazil, Argentina-Bolivia…, and time *t*=1996,1995….2006. $FDI_{ij,t}$ is the real bilateral FDI in the year t, from country *i* to country *j*. *Yi(Yj)* indicates the GDPs of the home (source country) and host country (receiving the FDI flows), *Ni(Nj)* are home-host country populations and *Dij* measures the distance between the two countries capitals (or economic centres). *Aij* accounts for other factors such as belonging to same RIAs, resource endowments and proxies to capture the idiosyncrasy of the economies in terms of macroeconomic stability or political risk (budget differences between pairs of countries, debt differences, country risk) among others . εij is the error term.

In order to estimate model (6), we can transform the equation in a log-linear specification (an augmented gravity model), expressed as:

(7a)
$$\begin{aligned}\ln\left(FDI_{ij,t}\right) &= u_{ij} + \beta_1 \ln\left(Y_{i,t}\right) + \beta_2 \ln\left(Y_{j,t}\right) + \beta_3 \ln(POP_{i,t}) + \beta_4 \ln\left(POP_{j,t}\right) + \beta_5 Dis\tan ce_{ij} \\ &\beta_6 Adjacency_{ij} + \beta_7 TradeFree_{ij,t} + \beta_8 MERCOSUR_{ij} + \beta_9 ALADI_{ij} + \\ &\beta_{10} FactEndow_{ij,t} + \beta_{11} LaborCost_{ij,t} + \beta_{12} DebtDif_{ij,t} + \beta_{13} PolitRisk_{ij,t} + \nu_t + \varepsilon_{ij,t}\end{aligned}$$

(7b)
$$\begin{aligned}\ln\left(FDI_{ij,t}\right) &= u_{ij} + \beta_1 \ln(\Delta GDP_{ij,t}^{RIA}) + \beta_2 Dis\tan ce_{ij} + \beta_4 Adjacency_{ij} + \beta_5 TradeFree_{ij,t} + \\ &\beta_6 MERCOSUR_{ij} + \beta_7 ALADI_{ij} + \beta_8 FactEndow_{ij,t} + \beta_9 LaborCost_{ij,t} + \beta_{10} DebtDif_{ij,t} + \\ &\beta_{11} PolitRisk_{ij,t} + \nu_t + \varepsilon_{ij,t}\end{aligned}$$

Being
$$FactEndow_{ij,t} = \left| \ln\left(\frac{K_{it}}{L_{it}}\right) - \ln\left(\frac{K_{jt}}{L_{jt}}\right) \right|$$

$$LaborCost_{ij,t} = \left| \ln\left(\frac{GDP_{i,t}}{L_{i,t}}\right) - \ln\left(\frac{GDP_{j,t}}{L_{j,t}}\right) \right|$$

[8] Economies included: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, México, Paraguay, Peru and Uruguay. As the dependent variable is in log form, we have included only positive investment. Moreover, and following Chen *et al* (1999) to avoid ln (0), a value of 1 replaces disinvestments, in these cases ln (FDI+1)=0. The large number of zeros tends to reduce the variance of the sample. Time dummies have been included.

$$Debtdif_{ij,t} = \left| \ln(debt/Y)_{it-} \ln(debt/Y)_{jt} \right|$$

where K, L are capital and labour and debt is external debt.

A high level of income in the host country indicates a larger potential market share, which may attract FDI for market-expansions reasons. We also include population as a variable in our specification, as in equation (6). Its sign is unclear on a priori ground. It may be positive if it acts as a proxy for the number of consumers and market size considerations dominate; however, it may be negative if more populated countries may afford to keep higher tariffs, and import-substitution strategies drive FDI between the pair of countries.

The variables related to the effects of RIAs are:

1. $\left(\Delta GDP_{ij,t}^{RIA}\right)$ captures the extended market effect. This variable accounts for the joint GDP of all countries to which the host country has tariff-free access due to the common membership in a RIA.

2. Trade Freedom Index by the Heritage Foundation. This refers to import and export bans and controls, restrictions on trade in services, tariff escalation, import and export taxes and fees, minimum and reference pricing, regulations and licensing provisions, sanitary rules, subsidies, restrictions on ports of entry, domestic preference in government procurement, and issues involving enforcement of intellectual property rights. More trade freedom implies less restrictions to trade, and its effect on FDI will depend of whether foreign investment acts as a complement to trade (as in vertical models) or as a substitute (horizontal models). In the first case the expected sign is positive, whereas in the second scenario the sign is supposed to be negative. We have also tried with alternative indexes, as the Terms of Trade index published by the UNCTAD, available for the 12 economies and years.

3. MERCOSUR and ALADI dummy variables try to capture the effect of the most important RIAs among the Latin American nations. They take the value 1 when the home and host country belong to MERCOSUR or ALADI. These are similar to those used by Frankel et al (2004) to analyse trade patterns, and to those used by by Yeyati *et al* (2003) to study FDI among developed countries.

4. Distance is measured by the bilateral distance between the main economic centres in the two countries. Data are obtained from the Centre d´Etudes Prospectives et d´Informations Internationals (CEPII). CEPII provides different measures of bilateral distances for most countries across the world. Basically, these data compute the distance between two countries based on bilateral distances between their biggest cities, those inter-city distances being weighted by the share of the city in the country’s overall population. Studies suggest that distance is a good proxy for transportation costs; larger distance involves higher transportation cost. The distance coefficient might be positive in the case that FDI be driven by horizontal motivations as a substitute for exports, and negative for vertical FDI models. Adjacency relates to sharing a common border.

The variables included in the model that specifically refer to country endowments and other characteristics are: *FactorEndow*, *laborCost* and *DebtDif* measures. Theory suggests that among developing economies, factor endowments differences may have a large influence in the process of investing abroad. Markusen and Maskus (2002) noted that the choice between vertical and horizontal production structures depends on country characteristics, such as relative size and relative endowment differences, as well as trade and investment costs. The variable factor endowments measure the difference between the two countries in terms of gross fixed capital formation as a percentage of the labour force, following Janicki *et al*. (2005). Equality in factor endowments represents a value of 0; a value of 1 represents the maximum difference between the two countries. Along the same lines, the difference between labour costs (ratio of GDP in ppp over the number of workers) in the pair of countries may account for differences in productivity [9]. The ratio debt/GDP tries to capture the differences between the two countries regarding their governments' fiscal responsibility and the long term stability of their public finances. A reduction in the debt difference distance should lead to an increase in FDI .

The *Political Risk* variable accounts for the role of institutions, government stability and law enforcement, which may be very relevant. Stein and Daude (2001) applied a gravity model to study the effects of institutions on FDI among OECD countries. They found that the quality of institutions has positive effects on FDI and the impact of institutional variables is statistically significant and economically relevant. More generally, countries that provide reliable and predictable legal systems and efficient public administration may receive more investment and profit more from it than countries with poor governance. We have used different indexes to measure this aspect. The World Bank provides an aggregate governance indicator for 1996-2006, which includes six dimensions of governance: voice and accountability; political stability and absence of violence; government effectiveness; regulatory quality; rule of law and control of corruption. Other studies use the International Country Risk Index published by Princeton University, which offers data since 1987.

Finally, a time trend (v_t) has been included to control for a positive FDI trend in recent years that may affect all countries in a similar way. The disturbance is expressed by $\varepsilon_{ij,t}$.

6. Empirical Results.

In this section we discuss the results we have obtained when estimating the model (7) using the different techniques that have been described above.

There are a few particular issues we had to deal with in this regard. First, and as individual effects are part of the model, we have to decide whether they are treated as Random effects (RE) or Fixed effects (FE). Egger (2000) points out that the FE specification fits better if the selection of nations corresponds to an ex-ante predetermined sample[10]. In any event, we present the results obtained when estimating both models.

[9] Other measures of labor cost are not available for all the countries and years in the sample. We have adopted the methodology used by the International Labor Organization, i.e., measuring differences in productivity as a proxy for the labor cost and assuming that productivity is equal to real wages.
[10] We also report the results fromthe Hausman test, useful to discriminate among FE and RE models.

We may also face the problem of misspecification in the gravity model if we do not include variables such as distance, adjacency, or being part of a RIA. These variables will be treated as part of the individual effects. We consider this aspect important for our analysis, this being the reason why we decided to employ the Hausman-Taylor formulation and the new FEVD model. The advantage of the former is that it allows for unobserved or misspecified factors that simultaneously explain the FDI activity between two countries, and leads to unbiased and efficient results in small samples.

Table 1 displays the results obtained from the Pooled OLS model for the overall group of countries. The first part of the table refers to the basic model, the second to the augmented model with additional variables. The GDPs of both the parent country and the host country are positive. The significance of the GDP of the host country is more in accord with horizontal FDI models than with vertical modes. In vertical models the size of the market of the host country should not matter much since products are not necessarily intended for that market.

Coefficients of the population of the source and host countries are also positive and significant, this last fact implying that a large number of potential consumers may attract FDI. Distance is negative and significant; this result is reasonable since distance can be thought of as a proxy for transportation costs. Model 3 considers adjacency, which is also positive. Finally, dummy variables for Mercosur and Aladi are also positive and significant, although only marginally in the case of the second.

The overall fit of the estimation is sound, around 0.6-0.75%.

The second part of Table 1 summarizes the results of an augmented model, which includes other variables related to the nature of trade and the role of factor endowment and costs differences. The proxy for free trade is positive and significant, and differences in both factor endowments and labour costs are also positive and significant. This result is relevant, since it suggests that FDI flows within the countries of the sample may be driven by vertical, rather than horizontal, considerations. Finally, coefficients of debt differentials and political risk have a negative sign, as expected, showing that fiscal and political instability harm FDI. These results, though, should be taken with caution, since the OLS model ignores valuable information captured in the time dimension of the data and provides results that are neither consistent nor efficient.

The magnitude of the coefficients is basically stable across models.

Table 2 summarizes the result of a classical panel estimation, in its two versions of fixed and random effects. Model 1a and 1b comprise variables already considered in the pooled OLS. The main difference with the pooled OLS is that now population of the host country appears as negative and significant, that might be reflecting colinearity problesm. The significance of the dummy variable for Mercosur has decreased in these estimations. The other variables display the same sign as before: positive for adjacency, trade freedom, RAIs, factor endowment, and labour cost differentials, and negative for distance, debt differential and political risk.

The overall fit of the estimation has increased to 0.8; It should be noticed that the results of the fixed and random model are quite similar.

The FE mode does not allow for the estimation of time invariant variables. A second drawback of the FE model is its inefficiency in estimating the effect of variables that have very little variance within. One standard approach to this problem, as stated above, is to use the instrumental variables technique developed by Hausman and Taylor.

Thus, the next step was to run a Hausman-Taylor estimation (Table 3) in which the endogenous variables are the GDP of the source and host countries. In the basic model, results are similar to the fixed-random effects models, except for the population of the source country: its coefficient is larger than before, but the point estimate is no longer significant. In the case of the augmented model the extended market effect is again positive but not significant.

In order to increase the robustness of the specification and explore the role of RIAs and other time invariant variables more accurately, we have applied the Fixed Vector Decomposition Method to different versions of the augmented gravity model. Results are shown in Table 4. They do not differ substantially of those provided by other techniques as far as the sign of the point estimates are concerned. There are some differences, though, regarding the size of the coefficients of factor endowment and labor cost differences; they are now substantially larger, in the neighbourhood of 2 or even 3. Neither the extended market effect nor the dummy variable for Mercosur are significant.

These results suggest that the model that fits better the pattern of intra regional investment flows among Latin American countries is the vertical FDI. Mercosur and Aladi regional agreement are only marginally significant in some specifications. These findings fit well the FDI pattern of intra-regional investment flows, where the FDI concentrates in Argentina, Brazil and Chile, while Mexico FDI flows mainly come from the other NAFTA partners.

Summing up, the results provided by all the techniques suggest that bilateral FDI flows within the sample countries over the period 1996 to 2006 are mainly driven by vertical considerations. Variables such as distance, endowment differences and labour cost differences have a remarkable impact on the decision to invest in other countries. The horizontal approach does not appear as important in the sample considered: the GDP of the host country has the expected sign, but the size of the population in the host country seems to affect FDI inflows negatively. Finally, firms do not seem to be affected by the fact of the source and host country belonging to RIAs.

7. Conclusions.

The proliferation of regional integration agreements is a prominent phenomenon in the world economy in general and in the Latin America area in particular. On a theoretical basis, RIAs are thought to affect FDI flows within a bloc, but there is not much evidence available on the issue.

Hence, the objective of this study was to find out the most important intra-regional investment determinants for the Latin American economies, taking into account the last regional integration efforts and the members´ idiosyncrasy.

Our main results, robust to alternative specifications and estimation methodologies, support the hypothesis of a FDI driven by endowment rather than by commercial agreements. This points out to a vertical model of FDI in the countries that make up the sample, in which firms are mainly concerned with cost reductions. Variables such as distance, endowment differences and labour cost differences have a remarkable impact in the decisions to invest in other countries. The horizontal approach, whereby firms choices are driven by market size considerations, does not appear as important in the sample, although the existence of a hybrid model cannot be dismissed.

The policy recommendations are straighforward: all measures intended to improve macroeconomic and political stability, on the macro side, and increase efficiency, on the micro side, maybe useful in order to attract FDI inflows.

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Table 1. Pooled OLS Results for the Basic and Augmented Gravity Equation

Dependent Variable: ln(FDIij,t)						
Independent Variables	**Basic Model**			**Augmented Model**		
	Model 1	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**
Const	0.291 (0.004)	0.652 (0.002)	-1.653 (0.004)	-0.736 (0.001)	-1.541 (0.002)	-1.378 (0.001)
$\left(\Delta GDP_{ij,t}^{RIA}\right)$					0.127 (0.000)	0.157 (0.001)
GDPi	0.649 (0.003)	0.663 (0.001)	0.531 (0.000)	0.319 (0.002)		
GDPj	1.201 (0.001)	1.332 (0.000)	1.297 (0.000)	0.743 (0.002)		
POPi	1.012 (0.026)	1.027 (0.087)	1.036 (0.086)	0.034 (0.072)		
POPj	0.537 (0.042)	0.672 (0.000)	0.659 (0.000)	0.463 (0.014)		
Distance	-0.934 (0.000)	-1.037 (0.000)	-1.041 (0.000)	-0.894 (0.000)	-1.072 (0.000)	-1.091 (0.000)
Adjacency			0.586 (0.032)		0.328 (0.043)	0.264 (0.025)
TradeFreej				0.129 (0.004)	0.145 (0.000)	
Mercorsur		0.2942 (0.013)	0.218 (0.022)	0.341 (0.021)	0.3756 (0.026)	0.4432 (0.016)
Aladi			0.187 (0.097)			0.108 (0.076)
Factor Endow dif					0.901 (0.000)	0.739 (0.000)
Labor Cost dif				0.32 (0.000)		
DebtDif						-0.0134 (0.032)
Political Risk				-0.100 (0.031)	-0.077 (0.044)	
Adjusted R-squared	0.5732	0.608	0.753	0.851	0.850	0.852
F test (n-1, nT-n-K) (critical values 1.696 and 1.521 at the 1% and 5% level respectively)	1.72	1.68	1.54	1.57	1.53	1.62
White test for heteroskedasticity	62.452	61.345	64.987	62.006	65.324	65.012

Note: Time dummies are included but not reported. All variables are expressed in LN. White´s heroskedasticity covariance matrix estimator applied. P-value>t in parenthesis. F (n-1, nT, n-K), where n represents the flow pairs (36), T represents the time (11 years) and K the number of regressors.

Table 2. Results for the Fixed Effect Model versus Ramdom Effects Model (GLS)

Dependent Variable: ln(FDIij,t)								
Independent Variables	**Fixed Effects Model**				**Random Effects Model**			
	Model 1a	**Model 1b**	**Model 2a**	**Model 2b**	**Model 1a**	**Model 1b**	**Model 2a**	**Model 2b**
Const					-1.672 (0.074)	-1.576 (0.063)	-1.326 (0.042)	-1.539 (0.0542)
$(\Delta GDP_{ij,t}^{RIA})$			0.134 (0.239)	0.127 (0.248)			0.223 (0.259)	0.112 (0.301)
GDPi	0.513 (0.012)	0.539 (0.036)			0.823 (0.001)	0.487 (0.006)		
GDPj	0.893 (0.000)	1.106 (0.000)			0.767 (0.000)	1.006 (0.000)		
POPi	1.040 (0.012)	0.911 (0.000)			1.017 (0.000)	0.928 (0.000)		
POPj	-0.491 (0.000)	-0.405 (0.000)			-0.457 (0.003)	-0.437 (0.000)		
Distance					-0.884 (0.000)	-0.930 (0.000)	-1.002 (0.000)	-0.960 (0.000)
Adjacency							0.314 (0.031)	0.296 (0.028)
TradeFreej			0.105 (0.000)	0.189 (0.002)			0.134 (0.000)	0.191 (0.000)
Mercorsur	0.252 (0.141)	0.397 (0.135)	0.298 (0.198)	0.4048 (0.141)	0.415 (0.053)	0.387 (0.047)	0.424 (0.146)	0.371 (0.102)
Aladi	0.094 (0.096)	0.096 (0.097)			0.023 (0.153)	0.088 (0.074)		
Factor Endow dif			1.027 (0.000)	0.982 (0.000)			1.014 (0.000)	0.786 (0.000)
Labor Cost dif		0.365 (0.002)				0.372 (0.000)		
DebtDif		-0.0204 (0.039)	-0.0287 (0.001)	-0.0197 (0.000)			-0.0172 (0.012)	-0.250 (0.032)
Political Risk		-0.103 (0.008)		-0.107 (0.012)		-0.124 (0.013)		-0.077 (0.003)
Adjusted R-squared	0.8130	0.8186	0.8129	0.8128	0.8129	0.8182	0.8127	0.8112
Hausman Test (P-value)	0.00417	0.000	0.000	0.000				
Wald Chi2. Prob>chi2					0.000	0.000	0.000	0.000

Note: Time dummies are included but not reported. Estimations use White´s heteroskedasticity consistent covariance matrix. P value>t in parentheses. Hausman test null hypothesis: difference in coefficients not systematic (prob>chi2).

Table 3. Regression Results for the Hauman-Taylor Estimation. Basic and Augmented Gravity Model for FDI in Latin America

Dependent Variable: ln(FDIij,t)								
Independent Variables	**Basic Model**			**Augmented Model**				
	Model 1	**Model 1a**	**Model 1b**	**Model 1a**	**Model 1b**	**Model 1c**	**Model 2a**	**Model 2b**
Const	-3.285 (0.000)	-3.536 (0.000)	-3.601 (0.000)	-3.724 (0.000)	-3.859 (0.000)	-3.762 (0.000)	-3.443 (0.000)	-2.378 (0.000)
$(\Delta GDP_{ij,t}^{RIA})$							0.340 (0.278)	0.533 (0.300)
GDPi	.6122 (0.000)	0.763 (0.001)	0.731 (0.000)	0.797 (0.000)	0.805 (0.000)	0.910 (0.000)		
GDPj	1.431 (0.000)	1.451 (0.000)	1.502 (0.000)	1.537 (0.000)	1.627 (0.000)	1.668 (0.000)		
POPi	2.322 (0.326)	2.171 (0.307)	2.006 (0.186)	1.929 (0.252)	2.024 (0.201)	1.961 (0.237)		
POPj	-0.640 (0.000)	-0.759 (0.000)	-0.807 (0.000)	-1.002 (0.000)	-1.195 (0.000)	-1.203 (0.000)		
Distance	-1.291 (0.000)	-1.338 (0.000)	-1.491 (0.000)	-1.364 (0.000)	-1.369 (0.000)	-1.448 (0.000)	-1.482 (0.000)	-1.504 (0.000)
Adjacency			1.081 (0.000)			0.969 (0.000)	1.098 (0.000)	1.114 (0.000)
TradeFreej				0.060 (0.000)			0.105 (0.000)	
Mercorsur		0.079 (0.078)	0.113 (0.089)	0.145 (0.087)	0.120 (0.141)	0.133 (0.096)	0.1522 (0.106)	0.1472 (0.102)
Aladi			0.095 (0.2622)					0.081 (0.467)
Factor Endow dif						1.948 (0.000)	1.846 (0.000)	1.937 (0.000)
Labor Cost dif				1.006 (0.000)	1.096 (0.000)			
DebtDif							-0.630 (0.000)	-0.5137 (0.000)
Political Risk				-0.271 (0.001)	-0.183 (0.000)	-0.1006 (0.000)		
Wald chi2. Prob>chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sargan Overid. (P-Value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Endogenous Variables	GDPi, GDPj	GDPi, GDPj	GDPi, GDPj	GDPi, GDPj	GDPi, GDPj	GDPi, GDPj	GDPi, GDPj	GDPi, GDPj

Note: Time dummies are included but not reported. All variables are expressed in LN. White´s heroskedasticity covariance matrix estimator applied. P value>t

Table 4. Results for the Fixed Effects Vector Descomposition Model. Basic and Augmented Gravity Model for FDI in Latin America

Dependent Variable: ln(FDIij,t)								
Independent Variables	Basic Model			Augmented Model				
	Model 1	Model 1a	Model 1b	Model 1a	Model 1b	Model 1c	Model 2a	Model 2b
Const	-7.328 (0.000)	-8.729 (0.000)	-8.001 (0.000)	-7.264 (0.000)	-7.814 (0.000)	-7.801 (0.000)	-8.336 (0.000)	-8.332 (0.000)
$\left(\Delta GDP_{ij,t}^{RIA}\right)$							0.420 (0.300)	0.538 (0.313)
GDPi	.6011 (0.000)	0.608 (0.000)	0.654 (0.000)	0.702 (0.000)	0.712 (0.000)	0.724 (0.000)		
GDPj	1.037 (0.000)	1.060 (0.000)	1.074 (0.000)	1.127 (0.000)	1.133 (0.000)	1.169 (0.000)		
POPi	0.847 (0.465)	1.016 (0.462)	1.174 (0.405)	1.037 (0.694)	1.074 (0.672)	1.106 (0.592)		
POPj	-0.532 (0.000)	-0.558 (0.000)	-0.637 (0.000)	-0.893 (0.000)	-0.923 (0.000)	-0.961 (0.000)		
Distance	-1.059 (0.000)	-1.106 (0.000)	-1.174 (0.000)	-1.196 (0.000)	-1.204 (0.000)	-1.225 (0.000)	-1.301 (0.000)	-1.368 (0.000)
Adjacency			0.796 (0.000)			0.851 (0.000)	0.900 (0.000)	0.918 (0.000)
TradeFreej				0.153 (0.000)			0.172 (0.000)	
Mercorsur		0.196 (0.187)	0.147 (0.165)	0.1286 (0.179)	0.135 (0.146)	0.1518 (0.151)	0.1964 (0.196)	0.238 (0.193)
Factor Endow dif						2.7245 (0.000)	2.958 (0.000)	3.007 (0.000)
Labor Cost dif				2.104 (0.000)	2.083 (0.000)			
DebtDif							-0.401 (0.000)	-0.412 (0.000)
Political Risk				-0.305 (0.001)	-0.295 (0.000)	-0.286 (0.000)		
Residuals	1 (0.000)	1 (0.000)	1 (0.000)	1 (0.000)	1 (0.000)	1 (0.000)	1 (0.000)	1 (0.000)
Adj. R-squared	0.9003	0.9017	0.9104	0.937	0.938	0.938	0.812	0.804

Note: Time dummies are included but not reported. All variables are expressed in logarithms. White´s heroskedasticity covariance matrix estimator applied. P value>t in parentheses