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On foreign direct investments and the balance of payments constrained growth model in Latin America, 1990-2014

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Abstract:

The aim of this work is to identify whether there was a relationship between foreign direct investment (FDI) and long-term growth in Latin America from 1990 to 2014. Some authors have questioned whether FDI and other capital flows, besides current account results, could constrain economic growth. If FDI and other capital flows are staunched and this is accompanied by capital outflows originated from FDI in previous periods, then it would be possible to experience a balance of payments constraint to economic growth. To test this hypothesis, we slightly amend the Thirlwall and Hussain model and employ the McCombie test for the cases of Brazil, Mexico, and Argentina. We find that the negative effect of primary income remittances on FDI, and even capital inflows through FDI, may curbs growth in the long run.

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In the 1990s there was an expansion of international liquidity and a reintegration of Latin America into the international financial system, especially after the Brady Plan was enacted. Several countries in the region resorted to external financing. Following the Mexican crisis of 1995, capital flows to Latin America consisted mainly of foreign direct investment (FDI). Some authors (Laplane, and Sarti, 1999; Kregel, 2014) began to question whether these FDI flows could limit economic growth due to their impact on the balance of payments (BP).

Latin America's main sources of capital inflows are, historically, FDI and remittances. FDI flows have traditionally been the largest component of financial flows; in absolute terms, net

FDI flows to the region averaged US$ 6.2 billion in the 1980s, US$ 37 billion in the 1990s, and US$ 65 billion in the 2000s (ECLAC, 2014)

In 2013, FDI reached an all-time high of US$ 155 billion. In relation to total flows, FDI increased from 36% in the 1980s to 44% in the 1990s and 54% in the 2000s (see table 1). In 2013, FDI represented 63% of all flows.

Table 1 – *Latin America and the Caribbean: foreign direct investment and other financial flows* (*% of total flows*)

	1980-1989	2000-2007	1990-1999	2008-2009	2010-2013	2000-2013
Foreign direct investment (net)	36	44.3	58.2	49.8	47.7	54
Private portfolio flows (net)	2.1	11.7	-4.2	4.1	20.5	4
Official development assistance	19.5	12.3	6.4	5.3	4.3	5.7
Other official flows	26	12.2	-0.4	6.6	4.2	1.9
Remittances (received)	16.4	19.6	39.9	34.2	23.3	34.4

Source: calculation based on data from the Economic Commission for Latin America and the Caribbean (ECLAC, 2014).

The purpose of this paper is to analyze whether economic growth in Latin America has been hampered by external constraints, especially through the BP. Using the model created by Anthony P. Thirlwall (1979), this constraint can be expressed as follows: $y = x / \pi$, where y is the economic growth compatible with the BP equilibrium, x is the export growth rate, and π is the income elasticity of the demand for imports. In the long run, the real rate of domestic income growth equals the volume of export growth divided by the income elasticity of the demand for imports.

However, this approach may not explain satisfactorily the experience of developing countries, so that other economists, some working with Thirlwall himself, have enriched it by including other components of the BP. Among them are capital flows (Thirlwall and Hussain, 1982), external debt constraint (Moreno-Brid, 1998), and external debt constraint plus interest payments (Moreno-Brid, 2003), as well as an approach without external debt constraint (Carvalho and Lima, 2009). In this paper, we modified slightly the model proposed by Elliot and Rhodd (1999) and by Carvalho and Lima (2009) to create a new specification that is particularly suitable for the analysis of FDI. By doing so, we investigated whether there was a relationship between FDI and long-term growth in the period between 1990 and 2014 in Latin America. This region was chosen because it is one of the largest in the world and one of the most frequently and strongly stricken by BP crises.

The data required for the empirical analysis are from the World Development Indicators (WDI) of the World Bank. The data extracted from this source include: imports and exports of

goods and services, both in constant 2010 US dollars; FDI and income from FDI, which were deflated by the US consumer price index; and GDP in constant local currency.

The econometric approach used in this work is the panel data methodology. Unlike time-series techniques, panel estimators allow for focusing directly on the average performance of the model for the panel as a whole, rather than on individual countries, thus providing estimates that are more efficient. We applied the autoregressive distributed lag (ARDL) approach to panel cointegration and exploited the long-run coefficients for implementing McCombie's test.

After we compiled the data, the first step was to estimate the income and price import elasticities using panel data estimation. Next, we performed the McCombie (1989) test, which determines whether the estimated income elasticity (π) differs from a hypothetical value, consistent with the equilibrium of the BP given by the modified Thirlwall's Law. We refuted that the elasticities are significantly different. Our results confirm the hypothesis of some authors (Laplane and Sarti, 1999; Kregel, 2014) that FDI flows could be impairing economic growth, due to their impact on the BP.

The rest of this article is organized as follows. The first section consists of the theoretical framework, in which we show the relationship between FDI and constraints on economic growth. In the second section, we adapt the approach present in Alencar and Strachman (2014), by incorporating FDI as a limiting factor on economic growth. Subsequently, in the third section, we explain briefly the methodology used for data processing and present the empirical analysis. Finally, in the last section, we make closing remarks.

1. Some theoretical remarks

In open economies, for countries that do not issue the international currency, the ultimate constraint on growth is the shortage of foreign exchange rather than supply factors (as in the neoclassical growth theory). This is the case of developing/peripheral economies, where there is a need, repeatedly in many cases, to use up some resources of the international financial system, private or official, to finance their growth. Therefore, they tend to accept risky finance for projects, in terms of interests and exchange rates, which can even lead to foreign exchange shortages (Resende and Amado, 2007).

In this context, FDI is claimed to be the best source of financing for these countries, since its volatility is relatively lower and it is directed to productive investments. The impact of FDI on growth is manifold in a conventional perspective. Briefly, it encourages the incorporation of new inputs and technologies in the production function of the recipient economy, favoring technological change, and provides specific productivity-increasing labor training and skill acquisition, augmenting human capital. Therefore, it leads to increasing returns in domestic production due to productivity spillovers (de Mello, 1997; de Mello Jr, 1999).

Nevertheless, Kregel (2014) argues that conventional theory does not take into consideration that developing countries' openness to FDI could lead to the denationalization of local industries, increasing pressure on exchange rates and on the domestic money market. Primary income on FDI, which covers payments of direct investment income – i.e., income on equity (dividends, branch profits, and reinvested earnings) and income on the intercompany debt (interest) – is paid with foreign exchange currency. Moreover, even when profits are reinvested in the form of FDI via capital accounts, they may be used to import capital goods

and inputs. As a result, this reinvestment may decrease foreign currency availability and cause negative impacts on the sector producing these goods, if there is a bias toward importation.

For Kregel (2014), when FDI exceeds a certain amount in relation to national income, investors can increase their expected returns, due to foreign reserves and exchange rate risks. In this case, transnational companies (TNCs) will no longer reinvest their profits and may interrupt new FDI. Therefore, without these new capital inflows, in addition to new remittances related to capital already invested, imbalances in the BP may again be generated. Furthermore, Dunning (1994) argues that FDI can cause internal changes in the recipient countries by changing the population's consumption pattern, such that imports are increased and economic growth restrictions are generated.

The internationalization of an economy and its opening to foreign firms is not necessarily compatible with the required BP behavior or adjustments. In a world with both floating exchange rates and interest rates, such equilibrium depends on a complex interaction between exports and imports of goods and services, and remitted incomes, earnings, and capital sent and received from abroad. International investors create ways to protect themselves against possible exchange or interest risks by hedging their positions in different markets. Hence, Kregel (2014) argues that FDI is one of the most expensive sources of investment, since its required return is generally higher than the interest rates of other types of finance. Note that, in empirical terms, FDI can consist of portfolio investments to a greater or lesser degree, and it is difficult to differentiate between productive (greenfield) or unproductive (brownfield or portfolio) investments. Moreover, greenfield investments can be overstated, since they are often partially directed to functions other than new investments.

In Brazil, during the 1990s, FDI contributed little to the growth of industry because investments were directed to the purchase of existing assets in Brazil, i.e., to brownfield investments. Thus, there was a low ratio between foreign investments (FDI) and the growth rate of the gross fixed capital formation. Although Brazil absorbed a relatively large amount of FDI, this had no major effect on economic growth. Furthermore, much of this FDI was directed to investments in the service and non-tradable goods sectors. This provided virtually no gains in exports, despite the huge increase in pressure on the BP, because of remittance of profits, interests, royalties, capitals, etc.

The denationalization of many Brazilian firms has not contributed to Brazilian exports, contrary to what was expected by some economists, since many of these firms were transformed into affiliates of foreign companies, expanding their import coefficients. This augmented the pressure on external imbalances. According to Aurelio (1997), the uptake of external resources as a strategy for development should be temporary. Even when this strategy initially works, it may lower domestic savings, i.e., reduce the liquid outcome of the current account (foreign savings), which compensates for the decrease in domestic savings (public and mainly private), with no impact on total savings because of its zero or negative impact on domestic investment.

This observation can be extended to Latin America in general, since countries such as Mexico and Argentina also received large amounts of FDI without these capital flows resulting in higher investment and economic growth rates. Since 1990, the rate of gross fixed capital to GDP in Brazil, Mexico, and Argentina has been around 20%. It is evident that, with the end of the privatization process in the three largest Latin American economies, FDI flow would diminish, with the aggravating factor of dividend payments increasing deficits in the balance of services (Laplane and Sarti, 1999).

One way to assess whether these imbalances cause adverse impacts, i.e., whether they limit economic growth, is by investigating if economic growth is (or was) restricted by the BP, following the seminal work of Thirlwall (1979). Based on the proposition that current account deficits cannot be financed indefinitely, the author argues that the shortage of foreign currency sets a limit on the rate of expansion of aggregate demand and, consequently, on the rate of income growth. Grounded on the simplifying assumption that foreign capital flows and terms of trade are constant, many authors claim that the long-term income growth rate of a country is strongly connected to the exports growth rate, with due regard also to import income elasticity. More complex models also consider net inflows of capital (Thirlwall and Hussain, 1982; Moreno-Brid, 1998 and 2003; Elliot and Rhodd, 1999; Barbosa-Filho, 2001; Carvalho and Lima, 2009). Next, we will detail briefly these theoretical developments and present our modified version.

2. Balance of payments constrained growth and FDI

Thirlwall (1979) first elaborated the theory associated with BP constrained growth. Its main idea is that economic growth can be constrained by the external sector if the income elasticity of imports is higher than the income elasticity of exports. Actually, trade elasticities are not the cause of the external constraint; rather, it is the shortage of foreign exchange as previously mentioned. In this paper, we follow several developments derived from Thirlwall's original model.

The BP constrained growth model, which defines the rate of growth consistent with the sustainability of each country's BP, shows a direct relationship between the income elasticity of foreign demand for a country's exports and the income elasticity for imports of that same country. Beginning from the following equation:

$$P_d X_t = P_f M_t E_t \tag{1}$$

where X and M are the volume of exports and imports, respectively; P_d is the domestic price of exports in local currency; P_f is the foreign price of imports; and E is the nominal exchange rate. Both external demand for exports and domestic demand for imports depend on the price and income elasticities as well as on domestic income (Y) and foreign income (Z), so that:

$$M = a\left(\frac{P_f E}{P_d}\right)^{\psi} Y^{\pi} \tag{2}$$

$$X = b\left(\frac{P_d}{P_f E}\right)^{\eta} Z^{\varepsilon} \tag{3}$$

In equations (2) and (3), a and b are constants, ψ is the price elasticity of imports, π is the income elasticity of imports, η is the price elasticity of exports, and ε is the foreign income elasticity of demand for exports. Equations (2) and (3) expressed in terms of growth rates are as follows:

$$x = \eta\,(p_d - e - p_f) + \varepsilon z \tag{4}$$

$$m = \psi\,(p_f + e - p_d) + \pi y \tag{5}$$

Substituting (4) and (5) into (1) and solving for Y gives the solution for the economic growth rate consistent with balance of payments growth y_{BP}:

$$y_{\mathrm{BP}} = \frac{(1+\eta+\psi)\,(p_d - p_f - e) + \varepsilon z}{\pi} \tag{6}$$

Thus, an improvement in the real terms of trade (or real exchange rate) rises the economic growth compatible with a sustainable BP. On the other hand, a worsening in the real terms of trade also brings about a decrease in the economic growth compatible with the BP "equilibrium". This is important because developing countries can use devaluations of the exchange rate to increase their net exports. Also, if there is an increase in the external income or a reduction in the domestic income elasticity of imports, the compatible y_{BP} will rise. Furthermore, if the real exchange rate is constant ($p_d - p_f - e = 0$), we can simplify equation (6). In fact, the proponents of the model state that, in the long run, price-competitiveness effects on exports and imports in oligopolistic markets are negligible; hence, domestic income must adjust in order to correct current account imbalances. This expression represents Thirlwall's Law:

$$Y_{TH} = \frac{x}{\pi} \tag{7}$$

In this work, as suggested by Alencar and Strachman (2016), in order to capture the effect of FDI on long-term BP constraints, we use the real value of FDI flows (FFDI) and, instead of using the real value of the services of capital, we use the real value of incomes derived from FDI (RFDI):

$$P_d X + P_d(FFDI) - P_d(RFDI) = P_f ME \tag{8}$$

Rephrasing equation (8) in terms of growth rate yields:

$$e + pf + m = \theta_1(p_d + x) - \theta_2\,(p_d + (rfdi)) + (1 - \theta_1 + \theta_2)(p_d + (ffdi)) \tag{9}$$

where

$$\theta_1 = \frac{P_d X}{P_f EM} \tag{10}$$

$$\theta_2 = \frac{P_d R}{P_f ME} \tag{11}$$

Solving the system of equations (6), (7), (9), (10), and (11) for y, yields:

$$y_{M-TH} = \frac{\theta_1 x + (1+\psi)(p_d - p_f - e) - \theta_2(rfdi) + (1 - \theta_1 + \theta_2)(ffdi)}{\pi} \tag{12}$$

or

$$\pi_{M-TH} = \frac{\theta_1 x + (1+\psi)(p_d - p_f - e) - \theta_2(rfdi) + (1 - \theta_1 + \theta_2)(ffdi)}{y} \tag{13}$$

Through this modified version, we assess the impact of FDI on the constraint of long-term economic growth represented by BP, i.e., whether FDI may hinder or facilitate long-term economic growth. The assumptions of no savings and investment, and no government spending and taxation are unrealistic. Nevertheless, the same results stand, assuming that each

investment generates its own flow of savings and any surplus/deficit in the private sector is offset exactly by a corresponding deficit/surplus in the public sector (Thirlwall, 2011a; 2011b).

Thirlwall's Law has been criticized on its theoretical basis and on its empirical testing (Ros Bosch and Clavijo Cortes, 2015). In relation to the former, it assumes that: i) there is a strong positive correlation between the domestic growth rate and foreign growth, which is not observed in the data; ii) relative prices are constant, as in equation (7), neglecting the importance of the level of the real exchange rate for growth; and iii) exports are not constrained by supply factors, although developing nations usually do not have the industrial capacity to export large amounts of goods with constant costs. In relation to the latter, it can be claimed that testing if the actual growth rate corresponds to the growth rate predicted by equation (7) is the same as testing a near-identity. Since econometric estimates of import and export elasticities are approximate to the growth rates of each variable, then this test is similar to testing if the quantities of exports and imports grow at approximately the same rate in the long run (Blecker, 2016). Being aware of these caveats, our focus is on testing the augmented version of Thirlwall's Law, including FDI and real exchange rate, so as to partially handle these issues.

3. Methodology and data analysis

3.1. Panel data analysis

In order to test empirically this modified version, we applied the autoregressive distributed lag (ARDL) methodology and exploited the long-run coefficients. Next, we implemented the McCombie test.

This methodology works well in a panel data framework. Often, the usual practice is to estimate N (the number of groups) separate regressions, and calculate the coefficient means, which is known as the Mean Group (MG) estimator. Rather, one may pool the data and assume that the slope coefficients and error variances are identical (random effects estimator), although the intercepts may differ across groups (fixed effect estimator). Nonetheless, there is an intermediary process in which the long-run coefficients are constrained to be identical, but the short-run coefficients and error variances can differ across groups. It is named the Pooled Mean Group (PMG) estimator.

There are often good reasons to expect the long-run equilibrium relationships between variables to be similar across groups. Here, we assume that Latin American countries share the same income elasticity coefficient of imports. Since there is strong evidence that the BP restricted their growth, this assumption is sensible.

The general ARDL $(pq_1, \dots, q_k)$ can be formalized as follows:

$$Y_{it} = \sum_{j=1}^{p} \lambda_{ij} y_{i,t-j} + \sum_{j=0}^{q} \xi'_{ij} X_{i,t-j} + \mu_i + e_{it} \quad (14)$$

where i stands for the i-th cross-sectional unit and t for the t-th time period; $X_{i,t}$ is a $K \times 1$ vector of explanatory variables for group i; ξ_{ij} are the $K \times 1$ coefficients vector; the coefficients of the lagged dependent variables, λ_{ij}, are scalars; and μ_i represents the (group-specific) fixed effect. T must be large enough so that we can estimate the model for each group separately.

If the variables are integrated of order (1) and cointegrated,[1] the short-run dynamics of the model will be influenced by any deviation from equilibrium. It is common to express the following error correction model (ECM):

$$\Delta y_{it} = \phi_1\left(y_{i,t-1} - \beta' X_{i,t}\right) + \sum_{j=1}^{p-1} \lambda_{ij}^{*} \Delta y_{i,t-j} + \sum_{j=0}^{q-1} \xi_{ij}^{*\prime} \Delta X_{i,t-j} + \mu_i + e_{it} \quad (15)$$

where

$\phi_i = -(1 - \sum_{j=1}^{p} \lambda_{ij})$, $\beta_i = \sum_{j=0}^{q} \xi_{ij} / (1 - \sum_k \lambda_{ik})$, $\lambda_{ij}^{*} = -\sum_{m=j+1}^{p} \lambda_{im}$, with $j = 1,2, \dots, p-1$, $\xi_{ij}^{*} = -\sum_{m=j+1}^{p} \xi_{im}$, with $j = 1,2, \dots, q-1$.

The parameter ϕ_i is the speed of adjustment of the ECM process, which is significantly negative when the variables display reversion to a long-run equilibrium. The vector β' and $\xi_{ij}^{*\prime}$ contain the long-run and short-run, respectively, parameters of the model.

The main requirements for the validity of this methodology are that, first, there exists a long-run relationship among the variables of interest and, second, the dynamic specification of the model is sufficiently augmented so that the regressors are strictly exogenous and the resulting residuals are serially uncorrelated. However, when estimating the long-run coefficients, the exogeneity assumption can be relaxed (Pesaran et al., 1999).

Both PMG and MG estimators within an ARDL approach provide consistent estimates in a dynamical panel context even if in the presence of potentially non-stationary regressors (Pesaran et al., 1999). Considering that in this case panel cointegration tests can lead to potentially misleading results (Karlsson and Lothgren, 2000; Gutierrez, 2003), this methodology is more robust. In addition, it is not necessary to pre-test for unit root.[2]

The long-run homogeneity restrictions can be tested using Hausman or likelihood ratio tests to compare the PMG and MG estimates of the long-run coefficients. Both estimators are usually employed when both *N* and *T* are large, although the aforementioned literature does not identify a bias being introduced when *N* is small. Though we selected a small *N*, the PMG approach is still appealing, as the selected countries may share a similar long-run pattern.

The choice between MG and PMG estimators depends on a trade-off between consistency and efficiency. If the long-run coefficients are in fact equal across countries, then the PMG estimators will be consistent and efficient. If, however, such a hypothesis is invalid, the PMG estimators will be inconsistent while the MG estimators remain consistent.

3.2. Data methodology

The geographic scope of our research was restricted to Latin American countries. We selected the three main countries of Latin America, i.e., Brazil, Mexico, and Argentina. Summed up together, these countries account for more than half of the Latin American area and population. Further, altogether they correspond to more than 70% of the GDP in the region.

Nonetheless, it is important to stress that Latin American countries are a heterogeneous group in which some countries are much smaller than the selected ones, such as countries from

[1] The order of integration of a times series reports the minimum number of differences required to obtain a covariance-stationary series.

[2] None of the variables are I(2). If they were, ARDL methodology could not be applied. The order of the integration of the variables of the import function equation are available in table A.1 in the appendix.

Central America. Hence, considered individually, they may display different trade patterns, including the import elasticity coefficient. In addition, for some Latin American countries, there are some missing data, especially in relation to FDI and income from FDI. In order to keep a balanced panel data, it is necessary to restrain the sample.

Therefore, we chose to select the major Latin American countries. Although they may not be representative of the others, they are a good approximation of the region's economy dynamics. Moreover, they may display similar long-run patterns, so that the PMG estimates are more suitable.

We collected the following data: imports and exports of goods and services, both in constant 2010 US dollars; FDI and income on FDI, which were deflated by the US consumer price index; GDP in constant local currency (LCU); and the real exchange rate (RER). They were compiled from the WDI of the World Bank. We provide some descriptive statistics in table 2.

Table 2 – *Descriptive statistics*

		FDI (millions - 2010 US dollars)	**Income on FDI (millions - 2010 US dollars)**	**Exports (millions - 2010 US dollars)**	**Imports (millions - 2010 US dollars)**	**GDP (millions - constant LCU)**	**RER (2010 = 100)**
Argentina	Mean	8,100	5,088	54,880	44,036	519,600	141.03
	Median	6,800	3,70	52,000	43,000	480,000	100.00
	Std. dev.	5,953	3,439.	19,940	20,968	121,191	57.03
	Min	2,000	1,000	25,000	7,900	310,000	68.41
	Max	31,000	12,000	84,000	83,000	720,000	218.44
Brazil	Mean	34,288	15,336	161,560	150,640	1,331,600	81.33
	Median	27,000	7,900	150,000	120,000	1,300,000	85.07
	Std. dev.	29,772	16,805	68,089	80,837	314,479	14.72
	Min	1,700	1,300	64,000	43,000	930,000	55.40
	Max	98,000	62,000	260,000	310,000	1,900,000	103.49
Mexico	Mean	21,372	8,928	227,920	223,000	10,360,000	102.35
	Median	22,000	7,000	230,000	220,000	10,000,000	103.52
	Std. dev.	9,895	5,685	94,925	106,961	1,978,004	10.58
	Min	4,300	3,600	66,000	65,000	7,200,000	73.72
	Max	44,000	27,000	390,000	400,000	14,000,000	120.12

From table 2, it is important to note that financial variables, even FDI and income from FDI, are far more volatile than real ones (the standard deviation is closer to the mean); Mexico's economy seems to be more open to trade than Brazil's (summing up imports and exports, Mexico overcomes Brazil, which is the biggest economy of the region); and on average Argentina's peso appreciated more (a lower RER stands for an appreciation).

In terms of their evolution, from 1990 to 2014, FDI increased dramatically in the 1990s in Argentina, Brazil and Mexico. This trend became more consistent after the Mexican crisis and the inflation stabilization in Brazil in 1994. In the beginning of the 2000s, FDI plummeted

following the crash of internet-based economies in the US stock market. This was especially the case in Argentina due to its economic crisis in 2001-2002. From then on, FDI recovered until the financial crisis of 2008 (Mexico presents a more volatile pattern). After a quick dip, it rose in the next years, slowing down (or even declining) by the end of the period.

The income remittances on FDI remained stable until 2003. Its upward trend is linked to the GDP growth. Between 2003 and 2008, most developing economies experienced a rapid growth associated with the commodity boom cycle. Again, in the ending years, when the economic growth shrank, income on FDI fell.

Exports and imports tended to move together, except in some cases. Remarkably, when commodity prices soared, Brazil and Argentina recorded current account surpluses. The economy of Mexico presented a similar pattern from the mid-1990s to 2000, coinciding with the North American Free Trade Agreement (NAFTA).

Last, in relation to RER, each country presents a singular trajectory. In Argentina, the peso kept appreciating until the currency board collapsed in 2002. Then it depreciated, holding relatively stable. In Brazil, the strategy to stabilize inflation consisted of pegging the real to the dollar. Yet, this did not last for long. In 1998, the government abandoned this exchange rate regime, letting the real float. It appreciated during the commodity boom and depreciated afterwards. In Mexico, the central bank devaluated the peso in 1994, during its crisis. It recovered and gained value until 2000, when the economy of Mexico grew considerably. From then on, it depreciated.

In order to test the modified version of Thirlwall's Law, the first step was to calculate price and income elasticities of imports. Therefore, we estimated a standard import function:

$$ln\,(M) = a + \pi ln\,(Y) + \psi ln\left(\frac{p_d}{p_{f*E}}\right) \tag{16}$$

where: a = intercept; $\pi\, ln(Y)$ = level of log of income elasticity; and $\psi ln\left(\frac{p_d}{p_{f*E}}\right)$ = level of log of real exchange rate (RER).[3]

The second step was to calculate the hypothetical income elasticity. We used the average growth rates of each variable from equation (13). Due to variation of θ_1 and θ_2 over the years of interest, we calculated it as an average value, considering each country individually. Then, we calculated the hypothetical elasticity using the original specification of Thirlwall's Law (π_{TH}) – equation (7) – and its modified version expressed by equation (13) (π_{M-TH}).

The final step was to test whether the estimated income elasticity (π) differed from the hypothetical value consistent with the equilibrium of the BP given by Thirlwall's Law, following McCombie (1989). If the tests showed that the elasticities were not different from each other, then Thirlwall's Law was warranted.

3.3. Discussion of the results

Following standard practice (Loayza and Rancière, 2005), we imposed a common lag-structure on all the panel cross-sections, estimating the model with one lag. For convenience,

[3] Real exchange rates are typically expressed as $\frac{E*p_f}{p_d}$, i.e., whenever the real exchange rate rises, domestic goods become more competitive. Nevertheless, in the WDI database, the real exchange rate behaves the other way around.

we assumed here that all of the variables were I(1) and cointegrated, making e_{it} an (0) process for all *i*. Thus, the ARDL (1, 1, 1) equation for the long-run import function is:

$$m_{it} = \mu_i + \delta_{10} y_{it} + \delta_{11} y_{i,t-1} + \delta_{20} rer_{it} + \delta_{20} rer_{i,t-1} + \lambda_i m_{i,t-1} + \varepsilon_{it}, \quad (17)$$

where m_{it} is the logarithm of real imports, y_{it} is the logarithm of real GDP, and rer is the logarithm of real exchange rate.

The error equation is:

$$\Delta m_{it} = \phi_i (m_{i,t-1} - \theta_{0i} - \theta_{1i} y_{it} - \theta_{2i} rer_{it}) - \delta_{11i} \Delta y_{it} + \delta_{21i} \Delta rer_{i,t} + \varepsilon_{it} \quad (18)$$

where

$$\theta_{0i} = \frac{\mu_i}{1-\lambda_i}, \theta_{1i} = \frac{\delta_{10i}+\delta_{11i}}{1-\lambda_i}, \theta_{2i} = \frac{\delta_{20i}+\delta_{21i}}{1-\lambda_i}, \phi_i = -(1 - \lambda_i) \quad (19)$$

These error correction model equations are written in terms of current, rather than lagged, levels of the exogenous regressors, since this allows an ARDL (1, 0, 0) as a special case.

Then, we estimated the MG model, which imposes no restriction, and the PMG model, which imposes common long-run effects. The results are reported in table 3.

Table 3 – *Panel ARDL estimation of import function*

		MG	**PMG**
LR coefficient			
	Y	2.1151***	1.6574***
		(0.2914)	(0.2223)
	RER	0.3107	0.8909***
		(0.4923)	(0.2556)
SR coefficient			
	EC	–0.3163**	–0.1331*
		(0.1372)	(0.0729)
	Δ*Y*	2.2525***	2.8294***
		(0.4387)	(0.1473)
	Δ*RER*	0.1371*	0.1714**
		(0.1371)	(0.0817)
	Constant	–12.2218*	–3.3476*
		(0.0757)	(1.7624)
Hausman statistic		2.09	
p-value		0.35	

Notes: * p<0.10, ** p<0.05, *** p<0.01.

Both estimations returned significantly negative error-correction coefficients, providing support for the hypothesis that the variables share a significant long-run relation. The Hausman statistic indicates the PMG method as the appropriate estimator, since it does not

reject the hypothesis that the long-run coefficients are equal across countries. The resulting residuals from the PMG estimation are not serially correlated for Brazil and Argentina.[4]

The estimated income elasticity from PMG is well inside the range of previous estimations for Brazil (Alencar and Strachman, 2014) and Mexico (Moreno-Brid, 2003), though for Argentina it seems to be significantly smaller (Duarte et al., 2007). The RER coefficient is significant and has the right sign, i.e., whenever it appreciates, imports grow.

Next, we tested whether the estimated import elasticity was equal to the hypothetical ones. In no case does the McCombie test reject the null hypothesis that, for the panel as a whole, the equilibrium income elasticity of imports is not statistically different from the estimated, as reported in table 4. Therefore, we concluded that the economic growth was effectively constrained by the balance of payments.

Table 4 – *Test of empirical relevance of Thirlwall's Law* (*original and extended versions*) *for Latin America* (*Brazil, Mexico and Argentina*), *1990-2014* (*based on the McCombie test*)

	Estimated elasticities (π^*)	**Hypothetical elasticities**
π_{TH}	1.65	1.99
π_{M-TH}	1.65	1.55
Wald test of:	*chi²*	*Prob.*
$\pi = \pi_{TH}$	2.24	0.13
$\pi = \pi_{M-TH}$	0.23	0.62

From equation (12), we can decompose the economic growth among BP components, as reported in table 5. This can be done by accounting for each component of this equation separately, i.e., $\frac{\theta_1 x}{\pi}$ corresponds to the growth associated with trade, $\frac{(1+\psi)(p_d - p_f - e)}{\pi}$ with terms of trade, $\frac{\theta_2(rfdi)}{\pi}$ with FDI, and $\frac{(1-\theta_1+\theta_2)(ffdi)}{\pi}$ with RFDI. The result confirms the hypothesis of Kregel (2014), Laplane and Sarti (1999), as well as Dunning (1994), showing that FDI can be a source of restriction to economic growth, suggesting that the capital inflow into the host country may not have been constant and/or directed to the production of tradable goods.

Table 5 – GDP growth average according to components of the balance of payments

GDP growth equation (12)	**Trade**	**Terms of trade (RER)**	**Foreign direct investment (FDI)**	**Incomes derived from FDI (RFDI)**	**Effective GDP growth**
2.96%	4.15%	0.02%	–0.87%	–0.34%	3.16%

[4] The Breusch-Godfrey test for each country individually points out the presence of autocorrelation only for Mexico. We provide further diagnostic tests for the PMG estimate in table A2 of the appendix.

4. Concluding remarks

In this research, we address the following puzzle: Was the recent Latin America economic growth constrained by the BP, particularly by FDI? Using a theoretical approach, we show that FDI may curb growth through balance of payments pressures caused by income remittances, interests, royalties, capitals, etc. Furthermore, FDI may consist of acquiring existing producing facilities (brownfield investments), which does not prompt export growth and may expand imports.

In order to analyze whether the economic growth in Latin America has been hampered by external constraints, especially through the BP, we adapted the BP constraint approach, incorporating FDI and its revenues as a limiting factor of economic growth. The results suggest that the hypothesis stressed by Kregel (2014) and Laplane and Sarti (1999) is correct, i.e., that FDI inflows could be limiting economic growth from their impact on BP.

Consequently, this casts some doubts on the validity of policy guidelines that emphasize the importance of FDI for growth in developing countries. Although FDI is less volatile than other kinds of capital flow, it may constrain economic growth. In this sense, it may be necessary to select some sectors that could benefit from external investment and generate productivity spillovers on the economy as a whole. By doing so, the recipient country can avoid brownfield investments and at the same time boost some sectors.

Appendix

Table A1 – *Unit root test for the variables of the import function equation* (*16*): *period 1990-2014*

		ADF test	**Philips-Perron test**
Argentina	$\ln(M)$	–2.91	–3.27*
	$d\,[\ln(M)]$	–4.01***	–3.99***
	$\ln(Y)$	–2.55	–2.47
	$d\,[\ln(Y)]$	–3.49***	–3.43***
	$\ln(p_f E/p_d)$	–2.63	–3.06
	$d\,[\ln(p_f E/p_d)]$	–5.01***	–5.03***
Brazil	$\ln(M)$	–1.98	–2.07
	$d\,[\ln(M)]$	–4.10***	–4.12***
	$\ln(Y)$	–1.88	–2.13
	$d\,[\ln(Y)]$	–4.68***	–4.67***
	$\ln(p_f E/p_d)$	–1.92	–2.08
	$d\,[\ln(p_f E/p_d)]$	–4.24***	–4.26***
Mexico	$\ln(M)$	–1.45	–2.00
	$d\,[\ln(M)]$	–6.69***	–6.86***
	$\ln(Y)$	–2.76	–2.97
	$d\,[\ln(Y)]$	–4.07***	–5.04***
	$\ln(p_f E/p_d)$	–3.07	–2.83
	$d\,[\ln(p_f E/p_d)]$	–4.508***	–4.521***

	Critical values		
	1% Critical	5% Critical	10% Critical
z(*rho*)	–22.500	–17.900	–15.600
z(*t*)	–4.380	–3.600	–3.240

Notes: * p<0.10, ** p<0.05, *** p<0.01. The number of lags included for the ADF test is based on Akaike Information Criteria (AIC); the number of lags for the Philips-Perron test is the default *int* {4(T /100) 2/9}. *d*(*Z*) stands for the first-time difference of the variable *Z*.

Table A2 – *Diagnostic tests ARDL estimation of import function*

	Coefficient of determination		**Normality test**		**Homoscedasticity test**	
	a		**Jacque-Bera (JB)**		**Goldfeld-Quandt (GC)**	
	R^2	**Adjusted R^2**	**Stat.**	**Prob.**	**Stat.**	**Prob.**
Argentina	0.9424	0.9338	0.8523	0.6530	1.7060	0.2333
Brazil	0.8395	0.8154	2.6785	0.2620	4.8214	0.0196
Mexico	0.8424	0.8188	9.2706	0.0097	8.2238	0.0037
	Homoscedasticity test		**Autocorrelation tests**			
	Conovert (COM)		**Breush-Pagan (BP)**			
	Stat.	**Prob.**	**Stat. (*F*)**	**Prob.**	**Stat. (*Chi2*)**	**Prob.**
Argentina	1.270	0.530	0.258	0.896	1.031	0.905
Brazil	3.892	0.143	0.539	0.713	2.155	0.707
Mexico	4.364	0.113	4.026	0.053	16.103	0.003

Notes: JB test – H_0: Normal distribution; GC test – H_0: Homoscedasticity; COM test: H_0: Homoscedasticity; BP test: H_0: no autocorrelation.

References

Alencar D.A. and Strachman E. (2014), "Balance-of-Payments-Constrained Growth in Brazil: 1951-2008", *Journal of Post Keynesian Economics*, 36 (4), pp. 673-698.

Alencar D.A. and Strachman E. (2016), "Investimento direto estrangeiro e balanço de pagamentos, no Brasil: 1994 e 2008", *Revista De Economia Mackenzie*, 11 (3), pp. 209-235; available at: http://editorarevistas.mackenzie.br/index.php/rem/article/view/8982.

Aurelio M.M. (1997), "Poupança externa e o financiamento do desenvolvimento", *Texto para Discussao IPEA*, n. 496, available at: http://repositorio.ipea.gov.br/bitstream/11058/2204/1/td_0496.pdf.

Barbosa-Filho N.H. (2001), "The Balance of Payments Constraint: From Balanced Trade to Sustainable Debt", *PSL Quarterly Review*, 54 (219), pp. 381-400; available at: http://doi.org/10.4324/9780203495360.

Blecker R.A. (2016), "The Debate over 'Thirlwall's Law': Balance-of-Payments-Constrained Growth Reconsidered", *European Journal of Economics and Economic Policies: Intervention*, 13 (3), pp. 275-290.

Carvalho V.R. da S. and Lima G.T. (2009), "Estrutura produtiva, restrição externa e crescimento econômico – A experiência Brasileira", *Economia e Sociedade*, 18 (1), pp. 31-60.

de Mello Jr L.R. (1999), "Foreign Direct Investment-Led Growth: Evidence from Time Series and Panel Data", *Oxford Economic Papers*, 51 (1), pp. 133-151.

de Mello L.R. (1997), "Foreign Direct Investment in Developing Countries and Growth: A Selective Survey", *Journal of Development Studies*, 34 (1), pp. 1-34.

Duarte A., Nicolini-Llosa J.L. and Paya I. (2007), "Estimating Argentina's Imports Elasticities", *LUMS Working Paper*, n. 583372, Lancaster: Lancaster University Management School, available at https://www.lancaster.ac.uk/media/lancaster-university/content-assets/documents/lums/economics/working-papers/Argentina

Elasticities.pdf.
Dunning J.H. (1994), "Re-Evaluating the Benefits of Foreign Direct Investment", *Transnational Coporations*, 3 (1), pp. 23-52.
Economic Commission for Latin America and the Caribbean (ECLAC) (2014), *Foreign Direct Investment in Latin America and the Caribbean*, ed. 2013 (LC/G.2613-P), Santiago: ECLAC.
Elliot D.R. and Rhodd R. (1999), "Explaining Growth Rate Differences in Highly Indebted Countries: An Extension to Thirlwall and Hussain", *Applied Economics*, 31 (9), pp. 1145-1148.
Gutierrez L. (2003), "On the Power of Panel Cointegration Tests: A Monte Carlo Comparison", *Economics Letters*, 80 (1), pp. 105-111.
Karlsson S. and Lothgren M. (2000), "On The Power and Interpretation of Panel Unit Root Tests", *Economics Letters*, 66 (3), pp. 249-255.
Kregel J.A. (2014), "Some Risks and Implications of Financial Globalization for National Policy Autonomy", in (id.), *Economic Development and Financial Instability: Selected Essays* (pp. 63–74), London and New York: Anthem Press.
Laplane M. and Sarti F. (1999), "Investimento direto estrangeiro e o impacto na balança comercial nos anos 90", *Texto Para Discussao IPEA*, n. 629; available at: http://doi.org/10.1111/j.1537-2995.2011.03531.x.
Loayza N. and Rancière R.G. (2005), "Financial Development, Financial Fragility, and Growth", *IMF Working Paper*, n. 05/170, Washington (DC): International Monetary Fund.
McCombie J.S.L. (1989), "'Thirlwall's Law' and Balance of Payments Constrained Growth – A Comment on the Debate", *Applied Economics*, 21 (5), pp. 611-629.
Moreno-Brid J.C. (2003), "Capital Flows, Interest Payments and the Balance-of-Payments Constrained Growth Model: A Theoretical and Empirical Analysis", *Metroeconomica*, 54 (2/3), pp. 346–365.
Moreno-Brid J.C. (1998), "On Capital Flows and the Balance-of-Payments-Constrained Growth Model", *Journal of Post Keynesian Economics*, 21 (2), pp. 283-298.
Pesaran M.H., Shin Y. and Smith R.P. (1999), "Pooled Mean Group Estimation of Dynamic Heterogeneous Panels", *Journal of the American Statistical Association*, 94 (446), pp. 621-634.
Resende M.F.D.C. and Amado A.M. (2007), "Liquidez internacional e ciclo reflexo: algumas observações para a América Latina", *Revista De Economia Política*, 27 (105), pp. 41-59.
Ros Bosch J. and Clavijo Cortes P.H. (2015), "Discusión. Respuesta a Ibarra, Pérez y Vernengo", *Investigación Económica*, 74 (292), pp. 81-90; available at: http://www.revistas.unam.mx/index.php/rie/article/view/51843/46247.
Thirlwall A.P. (1979). "The Balance of Payments Constraint as an Explanation of International Growth Rate Differences", *BNL Quaterly Review,* 32 (128), pp. 45-53.
Thirlwall A.P. and Hussain M.N. (1982), "The Balance of Payments Constraint, Capital Flows and Growth Rate Differences between Developing Countries", *Oxford Economic Papers*, 34 (3), pp. 498–-510.
Thirlwall A.P. (2011a), "The Balance of Payments Constraint as an Explanation of International Growth Rate Differences", *PSL Quarterly Review*, 64 (259), pp. 429-438.
Thirlwall A.P. (2011b), "Balance of Payments Constrained Growth Models: History and Overview", *PSL Quarterly Review*, 64 (259), pp. 307-351.