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# The impact of trade liberalisation and exchange rate undervaluation on exports, imports, and trade balance of Latin American countries (1970-2019)

Marcos A. L. De Campos, Jose Luis Oreiro and Kalinka Martins Da Silva

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# The impact of trade liberalisation and exchange rate undervaluation on exports, imports, and trade balance of Latin American countries (1970-2019)

*Marcos A. L. de Campos*[*]

*José Luis Oreiro*[**]

*Kalinka Martins da Silva*[***]

**ABSTRACT:** This article aims to analyse the impact of exchange rate levels and trade liberalization that occurred in the 1980s and 1990s on the exports, imports, and trade balances of Latin American countries over the last five decades. The basic idea is to update the study conducted by A. Santos-Paulino and A. P. Thirlwall in 2004, which aimed to test the hypothesis that trade liberalizations in developing countries lead to a deterioration of the trade balance by boosting imports more than exports. Additionally, this analysis introduces the effect of the exchange rate on the trade balance through the currency undervaluation index created by Rodrik (2008). Data from seven Latin American countries between 1970 and 2019 were selected to estimate econometric models for exports, imports, and the trade balance. Although the inherent uniqueness of each Latin American economy makes it challenging to make general conclusions, the results show that currency undervaluation has a strong effect on export performance, and they also support the idea that trade liberalisation reforms generate imbalances in the trade balance in the long run. This negative effect of trade liberalization, however, can be offset by a proper exchange rate policy that aims to set an undervalued exchange rate. If trade liberalization is combined with a competitive exchange rate, then an increase in exports growth and in the trade balance as a ratio to GDP will be consequence of this smart combination of trade and exchange rate policies.

**Key-words**: Trade Liberalization, Real Exchange Rate and Trade Balance.

**JEL Code**: F1, F10, F15.

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[*] Economist, University of Brasília (UnB). E-mail: marcos.lacerda@aluno.unb.br.

[**] Associate Professor at Economics Department, University of Brasília (UnB, Brasília/Brazil)), Professor of the Graduate Program of Economic Integration of the University of Basque Country (UPV, Bilbao/Spain) and Level I Researcher of the National Council for Scientific and Technological Development (CNPq, Brazil). E-mail: joreiro@unb.br.

[***] Associate Professor at Federal Institute of Goais, campus Luziania. E-mail: kalinka.silva@ifg.edu.br.

## 1- INTRODUCTION

Latin America has a history marked by various periods of crisis linked to external imbalances. The relationship between growth and business cycles in the region is almost always tied to external financing cycles and the ability to service debt (Bertola and Ocampo, 2019). In this context, where the external sector of the economy is a determining factor for economic growth, the situation of external balance accounts becomes crucial for countries in the region to maintain a sustainable growth trajectory. Thus, policies related to foreign trade and exchange rates become central instruments for any strategy of economic development.

Since the 1970s, Latin America has undergone decades of significant changes in its development strategies and the underlying ideas supporting then. Essentially, the region witnessed a shift from a development model focused on the domestic market and a *state-led import substitution industrialization strategy* to a more open economy for both trade and capital inflows through market-oriented reforms (Frenkel, 2002). The idea behind this change in the development strategy of Latin America countries was that trade liberalization should improve the allocation of resources, stimulate competition and efficiency, encourage foreign direct investment and the flow of knowledge to the region and hence to improve its macroeconomic and growth performance which was severely damaged by the external debt crisis of the beginning of the 1980´s (Thirlwall, 2013, p. 132).

Despite the great expectations with trade liberalization, the macroeconomic performance of Latin American economies was disappointing in the 1990´s, as Rodrik (2004, p.3) recognizes:

> "Latin America [during the 1990´s] grew more slowly not only compared with other parts of the world – but also compared to its performance in the 1960s and 1970s. That is a striking empirical fact, the importance of which is hard to downplay. After all, Latin America in the 1960s and 1970s is a region of import substitution, macroeconomic populism, and protectionism, while Latin America of the 1990´s is a region of openness, privatization, and liberalization. The cold fact is that per-capita income growth performance has been abysmal during the 1990s by any standards".

One possible explanation for the failure of trade liberalization to improve Latin-America growth performance is that the supply-side benefits of liberalization were offset by the demand side losses of resource underutilization (Thirlwall, 2013, p. 132). If trade liberalization leads to a faster growth of imports than of exports, than sooner or later an unsustainable trade and current account deficit will arise which will demand an external

adjustment based on the adoption of contractionary monetary and fiscal policies if currency depreciation is ruled-out for whatever reason.

The analysis of demand-side effects of trade liberalization, that is the effects of trade-liberalization over exports, imports, and trade balance of developing countries was made by the seminal work of Santos-Paulino and Thirlwall (2004) for a sample of 22 developing countries for the period 1972-1997. For this purpose, they use a dummy variable for the years after liberalisation to capture the effect of these reforms over developing economies. The econometric results showed that trade-liberalization had increased imports growth raised by 5 to 6 pp. compared to a more modest increase of 2 pp. of export growth for the countries in the sample (Thirlwall, 2013, pp. 133-134). If trade liberalization raises the growth of imports more than exports, the balance of trade will worsen at a given growth of output, unless the exchange rate can be manipulated to raise the value of exports relative to imports.

The problem with Santos-Paulino and Thirlwall (2004) analysis is the treatment given to the real exchange rate. In the econometric model, the exchange rate variable considered is the rate of change of relative prices, which is the rate of growth of real exchange rate. Since it is not possible for relative prices to change in one or other direction in the long-term, econometric estimates of the rate of change of real exchange rate over the growth rates of imports or exports tend to be statistically insignificant and/or present very low numbers for the price elasticities of exports and imports, meaning that the so-called Marshall-Lerner condition will not be satisfied. In this case, a deterioration of trade account caused by trade liberalization cannot be solved by exchange rate devaluation.

Why Santos-Paulino and Thirlwall (2004) disregard the level of real exchange rate and use the rate of change of real exchange rate in their econometric model? One possible explanation is found in Thirlwall (2013, p.90) for whom "a once-and-for all depreciation (or devaluation) will not put a country on a permanently higher growth path. For this to happen, the depreciation would have to either be continuous, or affect the parameters of the model favourably".

Oreiro (2016, 2023) had argued that the level of real exchange rate can affect the "parameters of the model", mainly the income elasticity of exports and imports due to its effect on the share of manufacturing industry in GDP. That is because international competitiveness of manufacturing industry is highly dependent on the level of real exchange rate, more precisely

dependent on the difference of real exchange rate to the *industrial equilibrium exchange rate*[1], defined as the level of real exchange rate for which the manufacturing share in GDP ins constant in time (Oreiro, 2023).

The aim of the present article is to replicate the methodology of Santos-Paulino and Thirlwall (2004) for a sample of Latin-American countries in the period 1970-2019 but replacing the rate of change of real exchange rate for a variable not only capable to measure the level of real exchange rate but also measure the magnitude of exchange rate under/over-valuation. For that we will use the *currency undervaluation index* proposed by Rodrik (2008). Our basic assumption is that the effect of trade liberalization on growth rates of exports and imports and the ratio of trade balance to output depends on the level of exchange rate undervaluation, in the sense that a combination of trade liberalization with exchange rate undervaluation can boost export growth and trade balance, contributing to improve the demand-side effects of trade liberalization. This assumption is based on a growing body of research on the effects of the level of real exchange rate and economic growth started with Rodrik (2008) seminal paper, and included Rapetti, Skott and Razmi (2012), Missio et al (2015), among others.

Thus, current article will analyse, through econometric analysis, the effects of both trade liberalisation and currency undervaluation. Regarding liberalisation, the initial hypothesis, based on the work of Santos-Paulino and Thirlwall (2004), as well as the thinking of the Latin American structuralist school, is that these reforms will have a growth impact on both exports and imports, but the degree of impact on imports will be greater than its counterpart, thereby causing a deterioration of the trade balance.

Regarding currency undervaluation, the forecast is based on both Rodrik's work and the ideas of new-developmentalism economics (Bresser-Pereira, Oreiro and Marconi, 2015; Bresser-Pereira and Oreiro, 2024; Oreiro, 2023). The central hypothesis is that currency undervaluation, considering the Balassa-Samuelson effect, promotes a competitive exchange rate that boosts exports and improves the trade balance.

[1] An econometric estimation for the industrial equilibrium exchange rate for Brazil and its impact over the share of manufacturing output in GDP can be found at Oreiro, D´Agostini and Gala (2020).

## 2 - METHODOLOGY

This section will address the entire methodology and data set that will be used to make the econometric analysis of the paper. The objective is to dissect all the details of the econometric models' structure to ensure clarity and objectivity in the results analysis. To achieve this, the section will first outline the structure of the data used, including the countries present in the sample and the analysed period. Following that, the variables used in the models will be highlighted, with special attention to those grounded in theoretical foundations. Finally, the econometric models will be detailed, showing the regressions to be executed and their various iterations.

As mentioned in the introduction, the entire modelling is based on the article "The impact of trade liberalisation on exports, imports and the balance of payments of developing countries" by Amelia U. Santos-Paulino and A. P. Thirlwall from 2004. However, there are fundamental changes made to the structure proposed in this foundational article, and these modifications, as well as the parts that remain unchanged, will be explicitly explained, and justified throughout the article.

### 2.1 Data structure

2.2.1 Country Sample

In the 2004 article, Santos-Paulino and Thirlwall employed a dataset comprising 22 developing countries from the Africa, Latin America, East Asia, and South Asia regions. For the current study, the sample will be adapted to focus on Latin America, aiming to draw more specific conclusions about the region. Some Latin American countries from the original article's sample will be retained, while others will be excluded due to data inconsistencies, such as Ecuador and Paraguay.

Moreover, a significant change in the sample involves the addition of Brazil. Incorporating this country into the data structure was straightforward for most variables, except for the trade liberalisation variable (*lib*). An argumentation based on data will be presented in the following lines to justify the criteria used in adapting this variable for Brazil. The final list includes seven (7) countries, namely: Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, Mexico, and Uruguay.

2.1.2 Time Period

The chosen analysis period spans from 1970 to 2019, covering 50 years in the sample. This temporal scope enables the analysis to encompass years before, during, and after trade

liberalisation. From an exchange rate perspective, this period allows the incorporation of the effects of this variable in different states of appreciation or depreciation during the analysis. In comparison with Santos-Paulino and Thirlwall's original article, which used data from 1972 to 1999, the extended time frame in this study can complement the analysis to understand the long-term effects of trade liberalisation.

Furthermore, these 50 years in Latin America were marked by profound structural changes in the functioning and direction of their economies, significantly more than the preceding 50 years. Therefore, this time frame enables capturing the transition between different development models and the effects of reforms that occurred throughout the period.

## 2.2 Variables

To streamline the upcoming exposition of the utilised model, this section will first provide a description of the independent and dependent variables to be used in the econometric model. The focus here is to explain the construction and rationale behind the main variables: trade liberalisation (*lib*) and currency undervaluation (*subval*), as well as to present the sources and series used in constructing other variables.

### 2.2.1 *lib*: Trade Liberalisation Dummy Variable

An essential element of the proposed econometric analysis is the dummy variable indicating trade liberalisation. Santos-Paulino and Thirlwall (2004), in their analysis of trade liberalisation in developing economies, use this dummy variable as a tool to capture the effect of liberalisation. This variable takes a value of 0 for each observation until the year in which liberalisation reforms occur, switching to a value of 1 in that year and the following years. In other words, each country in the sample has a unique series of values that support its specific liberalisation timeline.

As a dummy variable, assuming only null or unit values, its effect is limited to binarity and does not represent a range of values like other variables that could be used as indicators or proxies for liberalisation. Some alternatives include the average level of trade tariffs or the ratio of the trade balance to GDP. However, since one of the objectives of this study is precisely to assess the effects on the trade balance, it is impossible to use it as an explanatory variable. Regarding tariffs, they are challenging to estimate and tend to have low reliability for such an extensive temporal reference and for the countries in question.

Following the approach used by Santos-Paulino and Thirlwall with the liberalisation dummy, there is still the issue of defining the year when its non-zero value begins. In all

countries present in the original 2004 article's sample, the year authors used as the start of liberalisation will be retained. The country-wise relation with the respective liberalisation start year, as presented by Santos-Paulino and Thirlwall (2004), is outlined in Table 1 below. However, for Brazil, included in this study, a justification will be provided in the next subsection to determine the criterion for the start year of Brazilian liberalisation.

Table 1 - Liberalisation Start Year by Santos-Paulino and Thirlwall

| **Countries** | **Liberalisation Start Year** |
|---|---|
| Chile | 1976 |
| Colombia | 1991 |
| Costa Rica | 1990 |
| Dominican Republic | 1992 |
| Mexico | 1986 |
| Uruguay | 1985 |

Source: Santos-Paulino; Thirlwall (2004)

*2.2.1.1 Definition of Start Year for lib in Brazil.*

For the specific of Brazil, as explained above, it is necessary to provide a rationale to justify the year adopted as the start of trade liberalisation. According to De Azevedo and Portugal (1998), it can be argued that in the wave of liberalisation in the 1990s in Latin America, Brazil began to adopt measures in this direction as early as 1988/89. However, it is only from 1990 onwards, with the Collor government, that the country truly deepens this process.

Table 2 - Evolution of Trade Tariffs in Brazil: 1988-1993

| | **Jul/88** | **Sept/89** | **Sept/90** | **Feb/91** | **Jan/92** | **Oct/92** | **Jul/93** |
|---|---|---|---|---|---|---|---|
| **Nominal Tariff** | | | | | | | |
| Simple Mean | 38,5% | 31,6% | 30% | 23,3% | 19,2% | 15,4% | 13,2% |
| Weighted Mean | 34,7% | 27,4% | 25,4% | 19,8% | 16,4% | 13,3% | 11,4% |
| **Effective Tariff** | | | | | | | |
| Simple Mean | 50,4% | 45% | 45,5% | 35,1% | 28,9% | 22,5% | 18,9% |
| Weighted Mean | 42,6% | 35,7% | 33,7% | 26,5% | 21,7% | 17,2% | 14,5% |

Source: Kume (1996)

Furthermore, regarding the specific start year of Brazilian liberalisation, it is reasonable to set it in 1990 with the beginning of the Collor government. However, considering a strong indicator of liberalisation as the reduction of import tariffs, according to data from Kume (1996) presented in Table 2 above, it is noticeable that the year with the most significant tariff decrease compared to the previous one is 1991. If we calculate the average variation from 1990 to 1991 among the displayed average tariffs, the result is approximately 22%, a sharp decline with a persistent decreasing trend. Therefore, based on these data, the initial period for the trade liberalisation dummy variable in Brazil will be set to the year 1991.

2.2.2 *subval*: Currency Undervaluation Variable

In the original 2004 article, authors Santos-Paulino and Thirlwall used the *Rate of Variation of Relative Prices* to capture the effect of exchange rates in regressions, using the Rate of Change of the Real Exchange Rate for this purpose. The problem with such specification, as realized by Thirlwall and Dixon (1979, p. 184), is that in the "long-run relative prices of foreign and domestic goods measured in a common currency are likely to remain unchanged". Kaldor (1971), instead, states the international competitiveness depends on "the level of industrial cost relatively to other industrial exporters" (p.7), which means that is the *level* of exchange rate, not its rate of change, that matters for the dynamics of exports, imports, and trade balance[2].

Once the rate of change of exchange rate is replaced by the level of real exchange rate as the variable representing international competitiveness in the econometric equations for exports, imports, and trade balance it is necessary to decide what is the best way to introduce such a variable in the empirical analysis. More specifically it is necessary to determine if what matters for international competitiveness is the level of real exchange rate or the deviation of real exchange rate regarding some long-term equilibrium value for such a variable like the *Purchasing Power Parity.*

Rodrik (2008) seminal paper on exchange rate and growth considers that what matters for explaining different growth performance between countries is the deviation of real exchange rate from a reference value given by the purchasing power parity adjusted by the

[2] Kaldor dismissed his previous thoughts on the importance of the level of real exchange rate for international competitiveness few years later after founding a positive correlation between the time changes of the main industrial countries' relative manufacturing export shares and that of their relative unit costs—a correlation that became known as the 'Kaldor paradox´ (Boggio and Barbieri, 2016). An explanation of Kaldor paradox that reaffirm Kaldor´s previous views on the subject can be found in Boggio and Barbieri (2016).

*Ballasa-Samuelson effect*[3]. In particular, Rodrik (2008) shows that, controlling for a set of other variables including the saving rate, exchange rate undervaluation had a positive and statistically significant effect over the growth rate of GDP per-capita of a sample of countries.

Rodrik built what he called the *undervaluation index* which can show of the exchange rate level is undervalued or overvalued, considering the country's productivity through a proxy of per capita GDP.

To do so, Rodrik starts by calculating the Real Exchange Rate (RER) by dividing the Nominal Exchange Rate (NER) by the Purchasing Power Parity (PPP) and applying a logarithm to capture the variation, as shown in equation (1) below. The second step proposed by the author is to regress the log of the calculated RER in equation (1) on the log of the country's per capita GDP (*GDPPC*), equation (2). This second step aims to incorporate the Balassa-Samuelson effect.

$$ln\ RER_{it} = ln\ (NER_{it}/PPP_{it})\ (1)$$
$$ln\ RER_{it} = \alpha + \beta\ ln\ GDPPC_{it} + f_t + u_{it}\ (2)$$
$$ln\ GDPPCC = ln\ RER - ln\ \widehat{RER_{it}} (3)$$

Finally, in the third step, the estimated value of the Real Exchange Rate (RER) from the regression with per capita GDP is subtracted from the original Real Exchange Rate value (RER), as shown in equation (3). Thus, the resulting *subval* variable from this calculation is a level index that indicates the difference between the observed RER and the RER that considers the "Balassa-Samuelson" effect. When *subval* is greater than 1, the index indicates that the Exchange Rate is at a level that makes domestic products cheap in terms of dollars, and when it is less than 1, it indicates that the exchange rate is overvalued (Rodrik, 2008, p.372).

By adopting this variable instead of the original, which only measured the variation of the RER, we bring a new perspective to the analysis by incorporating the *Balassa-Samuelson effect* and the level of the exchange rate. In Latin American history, the exchange rate has often been used as a policy tool to make external adjustments and face balance of payments crises,

[3] The Balassa-Samuelson effect states that a country's productivity level influences the behaviour of its prices. This is because in tradable goods sectors, the law of one price holds, but in non-tradable goods sectors, whose share in GDP increases with per-capita income after some threshold level, prices are not equalised. The result of this effect is that more higher income countries have a more appreciated currency in purchasing power developed countries (Asea and Corden, 1994).

especially in the period under consideration. Data from the Penn World Table 10.01 were used for constructing this variable, as recommended by Rodrik (2008).

### 2.2.3 Other Variables

The other variables used in the analysis are more straightforward and do not have a theoretical grounding; they are relevant real data to explain the desired variables. In addition to these objective variables collected by international organizations, two dummy variables are added to the list of explanatory variables to capture the effects of significant crises that impacted the region and significantly distort the data. The first dummy relates to the Mexican default of 1982 (c1982), which initiated the debt crisis in the region, and the second relates to the international financial crisis of 2008 (c2008), which led to a global recession of an unprecedented scale since the Great Depression of 1929.

A modification from the original article (Santos-Paulino and Thirlwall, 2004) regarding explanatory variables is the exclusion of export and import tax variables. This change is not made due to doubts about the relevance of the variables but rather because the data related to them are intermittent and non-existent in some countries in the sample. Below, in Table 3, all the variables that will be used in the model's regressions are listed.

Table 3 - Sources and time series used for the variables.

| **Variable** | **Source** |
|---|---|
| *X* | *Exports of goods and services* (*annual % growth*), WDI, World bank (2015 U$). |
| *M* | *Imports of goods and services (annual % growth)*, WDI, World bank (2015 U$). |
| *W* | *World GDP growth (annual %)*, WDI, World bank (2015 U$). |
| *Y* | *GDP growth (annual %)*, WDI, World bank (2015 U$). |
| *Tot* | *Commodity Net Export Index, Weighted by Ratio of Net Exports to GDP, Rolling weights* (06/2012=100), IMF Data. |
| *Tb* | (X-M)/PIB<br>X: Exports of goods and services, WDI, World bank (2015 U$).<br>Y: Imports of goods and services, WDI, World bank (2015 U$).<br>PIB: GDP, WDI, World bank (2015 U$). |
| *c1982* | Own elaboration |
| *c2008* | Own elaboration |

Source: World Bank and International Monetary Fund.

**2.3 The Structure of the Econometric Model.**

The presentation of the structure of the econometric model is divided into three sub-sections, each focused on a dependent variable and each with two iterations of regressions. As previously explained, the study aims to understand the impact of trade liberalisation and currency undervaluation on the trade balance of Latin American countries. Therefore, the first two sub-sections consist of regressions aiming to describe the growth of exports (*x*) and the growth of imports (*m*), respectively, with the third section addressing the effects on the trade balance (*tb*).

An element of the analysis that will be used in the three mentioned sub-sections is the comparison between two iterations of the regression. Each dependent variable will be presented in two regressions (i and ii), with the first being a simpler version and the second incorporating interactions with the liberalisation variable (*lib*). Santos-Paulino and Thirlwall (2004) explain that with trade liberalisation, there may be a change in the price and income elasticity of demand for exports and imports. Therefore, these interactions of *lib* variable with income variables (*w* and *y*) and with the price variable expressed by the exchange rate undervaluation index (*subval*), present in the second iterations of the regressions, capture this elasticity effect induced by liberalizations.

An important caveat regarding the model and the seminar article by Santos-Paulino and Thirlwall (2004) is about the use of the *Dynamic Panel Generalised Method of Moments* (GMM). The original 2004 article runs all regressions in both Fixed Effects (FE) and GMM, as this second method is recommended in cases where endogeneity is expected in the model. However, the GMM method requires that the panel data structure has a quantity N - in this case, the number of countries in the sample - greater than T, the number of years in the analysed period (Arellano and Bond, 1991).

The original 2004 work does not meet this methodological requirement of GMM with N of 22 countries and a T of 27 years. Although the present study has a more longitudinal time span, it is more focused on Latin American region, does not fit with an N of 7 countries and T of 50 years. Therefore, despite the method adding a higher degree of confidence to the results in the original article, this method cannot be incorporated into the analysis as it was in the original 2004 article. So, our analysis will be conducted only with Fixed Effects (FE) which can be used for such kind of panel data (Woldridge, 2006, p. 439).

2.3.1 Export Growth

For the estimations related to the export growth rate, the two equations below will be used, with equation (4) representing the simpler model and (5) introducing interactions with the liberalisation dummy to capture possible changes in price elasticity.

$$x_{it} = a_i + \alpha_1 x_{it-1} + \alpha_2 w_{it} + \alpha_3 subval + \alpha_4 c1982 + \alpha_5 c2008 + \alpha_6 lib_{it} + \varepsilon_{it} \quad (4)$$

$$x_{it} = a_i + \alpha_1 x_{it-1} + \alpha_2 w_{it} + \alpha_3 subval + \alpha_4 c1982 + \alpha_5 c2008 + \alpha_6 lib_{it} + a_6 (lib\ w)_{it} + a_7 (lib\ subval)_{it} + \varepsilon_{it} \quad (5)$$

The variables in these models are: *x*, representing the growth of exports; *a* country-specific dummies resulting from the Fixed Effects method; *x*(-1), indicating the growth of exports in the previous period; *w*, representing the increase in world income; *subval*, indicating currency undervaluation; *c1982*, a dummy for the 1982 crisis; *c2008*, a dummy for the 2008 crisis; and *lib*, a dummy for trade liberalisation. Additionally, there are interactions between these variables. The expectation for the focal variables in the analysis is that *lib* has a positive sign, and *subval* also has a positive sign.

2.3.2 Import Growth

For estimations related to the growth rate of imports, the same structure is followed, with a simple equation (6) and another with elasticity interactions (7), as can be observed below.

$$m_{it} = b_i + \beta_1 m_{it-1} + \beta_2 y_{it} + \beta_3 subval + \beta_4 c1982 + \beta_5 c2008 + \beta_6 lib_{it} + e_{it} \quad (6)$$

$$m_{it} = b_i + \beta_1 m_{it-1} + \beta_2 y_{it} + \beta_3 subval + \beta_4 c1982 + \beta_5 c2008 + \beta_6 lib_{it} + \beta_7 (lib\ y)_{it} + \beta (lib\ subval)_{it} \quad (7)$$

The new variables introduced in these models are: *m*, representing the growth of imports; *b* country-specific dummies resulting from the Fixed Effects method; *m(−1),* indicating the growth of imports in the previous period; and *y*, representing the increase in domestic income, with the rest of the variables already mentioned above or interactions between them. The expectation for the focal variables in the analysis is that *lib* has a positive sign, and *subval* has a negative sign.

2.3.3 Trade Balance

In the third exercise, the analysis shifts its focus from the growth of exports and imports to examining the relationship between these variables in nominal terms. The trade balance model uses as dependent variable *tb*, which is the ratio of the trade balance to GDP. In other words, it is not an indicator of change in the balance between periods but rather the ratio of the trade balance to GDP each year. It is worth recalling that trade balance is calculated by subtracting the value of exports from the value of imports (X−M).

For the trade balance of the countries in question, the equations to be used will be (8) and (9) below. Like previous sections, there is a simpler version and another with interactions involving *lib*.

$$tb = c_i + \gamma_1 tb + \gamma_2 w_{it} + \gamma_3 y_{it} + \gamma_5 subval_{it} + \gamma_6 tot_{it} + \gamma_7 c1982 + \gamma_8 2008 + \gamma_9 lib_{it} \quad (8)$$

$$tb = c_i + \gamma_1 tb_{it-1} + \gamma_2 w_{it} + \gamma_3 y_{it} + \gamma_5 subval_{it} + \gamma_6 tot_{it} + \gamma_7 c1982 + \gamma_8 2008 + \gamma_9 lib_{it} + \gamma_{10}(lib\ y)_{it} + \gamma_{11}(lib\ w)_{it} + \gamma_{12}(lib\ subval)_{it} \quad (9)$$

The variables for the trade balance model are: *tb*, trade balance as a share to GDP; *c* country-specific dummies resulting from the Fixed Effects method; and *tot*, terms of trade, with the rest of the variables already mentioned or interactions. A relevant addition to the trade balance model is the terms of trade (*tot*) variable, which captures nominal price differences that affect the value of trade balance since the analysis here is in nominal values rather than in terms of changes. The expectation for the focal variables in this case is that *subval* has a positive sign, and *lib* has a negative sign.

## 3 - RESULTS AND ANALYSIS

In this section, we will employ the methodology outlined previously to run econometric analyses to understand whether the data support hypotheses regarding the impact of trade liberalisation and currency undervaluation in Latin American countries. The aim is to present the results of the econometric regressions in detail and comprehend to what extent these results align or diverge from the formulated hypotheses.

### 3.1 Exports

As explained earlier, the impact of trade liberalisation will be observed through the variable *lib*, while the effect of currency undervaluation will occur through the variable *subval*. The analysis of export growth s will be conducted through two versions of the model (*i* and *ii*), as shown in Table 4 below:

Table 4 - Exports Growth in Latin America: 1971-2019

| | ***(i)*** | ***(ii)*** |
|---|---|---|
| Independent Variables | | |
| Intercept | 3,63 (2,3) ** | 5,22 (2,83) *** |
| *x(-1)* | 0,07 (1,42) | 0,08 (1,51) |
| *W* | 0,98 (2,68) *** | 0,52 (1,13) |
| *Subval* | 7,25 (2,64) *** | 1,74 (0,46) |
| *c1982* | -5,94 (-1,92) * | -6,88 (-2,2) ** |
| *c2008* | -7,03 (-2,13) ** | -4,02 (-1,04) |
| *Lib* | -1,35 (-1,48) | -5,10 (-1,99) ** |
| *lib*w* | | 1,11 (1,55) |
| *lib*subval* | | 11,65 (1,99) ** |
| $R^2$ | 0,14 | 0,16 |

Source: World Bank and Penn World Table 10.01
* Significant at 10%, ** significant at 5% and *** significant at 1%

#### 3.1.1 Trade Liberalisation Results

In the analysis regarding trade liberalisation, starting with model (*i*), it can be observed that the variable *lib* is not statistically significant. However, when interactions are added in model (*ii*), it becomes significant at a 5% level. The *lib* coefficient is negative in both iterations, contrary to what was expected, as one would assume that liberalisation would foster greater engagement with the international market and lead to an increase in exports.

Furthermore, in model (*ii*), the interaction of *lib* with the currency undervaluation variable (*subval*) is statistically significant at 5%. It is notable that in (*ii*), the *lib* coefficient is significantly larger than in (*i*), suggesting that when controlling for the combined positive effect of *lib* and *subval*, the pure effect of *lib* appears strongly negative. Therefore, *it can be understood that trade liberalisation alone has a negative effect on exports, but when combined with competitive exchange rate, it can have a powerful positive impact on export growth*.

3.1.2 Currency Undervaluation Results

In both iterations of the model, the variable for currency undervaluation ('subval') has a positive sign, as expected, indicating that currency undervaluation promotes exports. In (i), the currency undervaluation variable (*subval*) is highly significant at 1% and has a large coefficient, suggesting that in this simpler version (*i*), this variable strongly captures currency effects and is relevant in understanding export growth.

In version (*ii*), when adding the liberalisation elasticity interactions, the 'subval' variable alone becomes statistically insignificant. However, the interaction between 'subval' and *lib* is significant and has a very strong coefficient. This fact indicates that currency undervaluation has a much greater impact on exports in a context of liberalised external trade.

**3.2 Imports**

Like the export model, the regressions below depict two iterations for the import growth model, the first (*i*) being simple, and the second (*ii*) with elasticity interactions in Table 5 below. Subsequently, an analysis of the main variables of the study, *lib* and *subval*, will be conducted.

Table 5 - Imports growth in Latin America: 1971-2019

| | **(*i*)** | **(*ii*)** |
|---|---|---|
| Independent Variables: | | |
| Intercept | -4,69 (-4,75) *** | -3,1 (-2,85) *** |
| *m(-1)* | 0,06 (1,45) | 0,06 (1,45) |
| *Y* | 2,15 (15,93) *** | 1,75 (9,61) *** |
| *Subval* | -4,41 (-1,43) | -5,98 (-1,4) |
| *c1982* | -5,32 (-1,57) | -6,61 (-1,96) * |
| *c2008* | -12,01 (-3,68) *** | -10,37 (-3,18) *** |
| *Lib* | 3,85 (3,82) *** | 0,69 (0,5) |
| *lib*y* | | 0,83 (3,28) *** |
| *lib*subval* | | 1,1 (0,17) |
| $R^2$ | 0,55 | 0,56 |

Source: World Bank and Penn World Table 10.01
* Significant at 10%, ** significant at 5% and *** significant at 1%

3.2.1 Trade Liberalisation Results

Contrary to the export results, here the trade liberalisation variable (*lib*) is statistically significant at 1% in (*i*) and has a positive sign as expected. This indicates that in this simpler

model (*i*), liberalisation indeed causes an increase in imports for the sample of countries. In the (*ii*) version, the *lib* variable is not significant, but its interaction with the national income growth variable (*y*) is strongly significant at 1%. This result suggests that liberalisation has an import-increasing effect, but when isolating the standalone effect of liberalisation and considering its combined effect with income growth, it is concluded that the combined effect is predominant, and the standalone effect is not significant.

### 3.2.2 Currency Undervaluation Results

The currency undervaluation variable (*subval*), despite having a negative sign as expected, is not relevant in either version of the import model. This indicates that the exchange rate level is not a significant factor in import growth. The results show that this variable depends much more on national income growth (*y*), which is significant at 1% in both iterations, even in its interaction with *lib*.

## 3.3 Trade Balance

The trade balance will have two iterations, as in the previous analyses, combining all the variables used earlier and adding the terms of trade variable (*tot*), as explained earlier in the balance model section. Following Table 6 below, which displays the results for the trade balance (*tb*), there will be analyses regarding the focus variables of the study.

Table 6 - Trade Balance as % of GDP in Latin America: 1971-2019

| | (*i*) | (*ii*) |
|---|---|---|
| Independent Variables: | | |
| Intercept | 14,56 (3,42) *** | 17,52 (4,15) *** |
| *tb(-1)* | 0,83 (28,24) *** | 0,83 (28,67) *** |
| *W* | 0,25 (2,44) ** | 0,19 (1,53) |
| *Y* | -0,19 (-5,62) *** | -0,07 (-1,62) |
| *Subval* | 0,85 (1,16) | -0,65 (-0,64) |
| *Tot* | -0,14 (-3,35) *** | -0,17 (-4,13) *** |
| *c1982* | 1,13 (1,33) | 1,3 (1,54) |
| *c2008* | 2,4 (2,71) *** | 2,09 (2,07) ** |
| *Lib* | -0,99 (-3,48) *** | -0,53 (-0,76) |
| *lib*y* | | -0,22 (-3,46) *** |
| *lib*w* | | 0,07 (0,37) |
| *lib*subval* | | 3,73 (2,4) ** |
| $R^2$ | 0,82 | 0,83 |

Source: World Bank and Penn World Table 10.01
* Significant at 10%, ** significant at 5% and *** significant at 1%

### 3.3.1 Trade Liberalisation Results

In the analysis regarding *lib*, we observe that the variable is strongly significant at 1% in (*i*) and has a negative coefficient as expected. This indicates that, in the model without considering elasticity interactions, trade liberalisation has a negative impact on the trade balance. In iteration (*ii*), the analysis is more complex with different interactions, but something noticeable in the second version is that the variable lib alone loses significance, indicating that its isolated effect is not significant for the trade balance.

Initially, it is noted that, in (*ii*), the interaction of lib with the variable of global income growth (*w*) is not significant, like the export model where the same interaction is not significant. On the other hand, the interaction of *lib* with the national income growth variable (*y*) is strongly significant, as in the import model, showing that the combined effect of income growth and a liberalisation scenario confidently drives imports and deteriorates the trade balance.

The interaction between *lib* and the currency undervaluation variable (*subval*) is significant at 5% and is positive, with a relatively high coefficient. This result indicates that the combination of a more open external trade context with a competitive exchange rate strongly boosts exports and influences the trade balance towards surpluses.

3.3.2 Results of Currency Undervaluation

The variable for trade liberalisation (*subval*) alone is not significant in either version of the model, pointing to a conclusion that a competitive exchange rate on its own does not have a consistent impact on the trade balance. However, as mentioned above, when analysing the interaction of *subval* with *lib*, we can observe significance and a strong positive coefficient, leading us to the same conclusion that together, trade openness and a competitive exchange rate produce a strong and consistent effect.

**4.4 Discussion**

The three subsections above present different and interconnected data concerning the research issues at hand. This section aims to build that connection by discussing the meaning of the presented results. To do so, like the subsections above, we will separate the discussion between trade liberalisation and currency undervaluation.

4.4.1 Discussion on Trade Liberalisation

The results regarding the variable 'lib,' which captures the effect of trade liberalisation, confirmed expectations for imports, but for exports, the negative sign deviated from the anticipated outcome. This suggests that, in isolation, liberalisation caused a decrease in export growth in the long period. In contrast, the Santos-Paulino and Thirlwall (2004) seminal article has a positive sign for the *lib* variable in exports.

The original question of what the net impact of liberalisation on the Balance of Payments should be was based on the premise that these reforms boosted both exports and imports, and the initial hypothesis pointed to a greater magnitude in imports relative to exports, leading a decrease in the trade balance. However, in the current work we shown the occurrence of a negative effect on exports and a positive effect on imports, with a negative sign result of *lib* in the trade balance became unquestionable.

4.4.1 Discussion on Currency Undervaluation

The results for *subval*, the variable capturing the effects of currency undervaluation as proposed by Rodrik (2008), are less cohesive than *lib*. For exports, *subval* proved to be significant with the expected positive sign, but for imports, despite the negative sign, the results were not statistically significant. This implies that *subval* does not capture the exchange rate effect well in imports, but in other tests conducted with the original exchange rate variable (Real Exchange Rate variation), the variable also showed non-significance. In other words, in

the countries of the sample, imports do not seem to be as influenced by the exchange rate in terms of the present analysis.

One possible explanation lies in the tariff and non-tariff barriers that existed before liberalisation, in greater abundance and some that remained after liberalisation. These import barriers were used as part of economic policy for a long time in Latin America, making this hypothesis more likely. As we do not have a specific variable for this in the model, it may be distorting the exchange rate effect on imports.

As for the impact of *subval* on trade balance, significance also proves to be a problem. The isolated variable is not significant in either version of the model, only its interaction with *lib* is significant. As mentioned in the subsection about trade balance results, from these findings, one can understand that the combination of trade liberalisation and currency undervaluation is powerful. However, the result of non-significance of the *subval* variable alone is still unsatisfactory for the analysis.

## 5- CONCLUSION

The objective of the present article is to understand the impact of exchange rate levels and liberalising reforms on exports, imports, and the trade balance of Latin American countries over the past 50 years has been successfully achieved, although the results are evidently not absolute, leaving room for further understanding.

The hypothesis regarding the impact of trade liberalisation was confirmed; the data indeed showed a trend of trade balance deterioration after liberalisation. However, a crucial caveat is that this hypothesis anticipated a positive impact of liberalisation on both exports and imports. Yet, the empirical exercises made on this article showed that the impact of trade liberalization over exports was negative.

The hypothesis regarding the impact of the exchange rate level was also confirmed, but partially. The exchange rate level, measured through the *currency undervaluation index*, proved highly relevant in describing variations in export growth but not relevant for import growth. The examination of the impact of currency undervaluation on the trade balance reflects this mixed result: undervaluation alone was not relevant, but together with trade liberalisation, it was highly relevant with a powerful effect.

This leads to one of the most interesting conclusions of the present article, which goes beyond the seminal 2004 work, the interaction between trade liberalisation and currency undervaluation. Both phenomena showed an impact over the dependent variables, with trade

liberalisation having more consistent effect than currency undervaluation. However, the interaction between trade liberalization and currency undervaluation proved relevant in most analysed scenarios, and the most surprising aspect was the intensity of its impact. The observed interaction between these phenomena showed the highest coefficients for trade balance and exports.

However, it is crucial to emphasise that the current analysis, prioritising data consistency and temporal coverage, was limited to a sample of seven countries. This limitation implies that the study's conclusions have restricted applicability to all Latin American economies and developing countries in general. Nevertheless, the results closely align with those of Santos-Paulino and Thirlwall's original article, *providing a reasonable case against trade liberalization except if it is done together with an exchange rate policy aimed to achieve a competitive real exchange rate in the long-term*.

Opportunities for expansion and improvement of the present work primarily lie in the enlargement of the country sample to make use of GMM models. This inevitably encounters data challenges, which appear inconsistent or non-existent in major aggregators such as the World Bank and the International Monetary Fund. However, with the time and effort required for data collection, a more comprehensive study including, like the present study, a focus on the long-term impact of trade liberalizations in developing countries would be valuable.

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