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International trade, regressive specialization, and competitiveness: a decomposition for the growth of Brazilian exports between 1995 and 2014

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International trade, regressive specialization, and competitiveness: a decomposition for the growth of Brazilian exports between 1995 and 2014 [1, 2]

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Abstract

Exports, and *which* exports, are the key to alleviate the balance-of-payments constraint to growth. This article thus investigates the sources of growth in both total and sectoral Brazilian exports between 1995 and 2014, using a new decomposition methodology suited to identify changes in international competitiveness. The results highlight the limitations of Brazil's international insertion. When the country did experience rapid export growth, competitiveness gains contributed but marginally. As a rising tide of growing international trade lifted Brazil's position during the boom years, the country did not gain enough competitiveness to weather the subsequent storm. Therefore, since the 2008 crisis, the country's international insertion has been deteriorating: amongst other factors detrimental to long-term development, its manufactures have been continually outcompeted and global demand has shifted from the goods it produces at a comparative advantage. As such, should growth accelerate in Brazil, the balance-of-payments is likely to resurface again.

Keywords: Regressive specialization; Trade patterns; Brazilian exports.

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1 Introduction

In the ECLAC's writings, the center-periphery model describes an asymmetrical pattern of international insertion. Countries in the periphery export goods with little dynamism in international trade and import goods with rapidly expanding domestic demand. They are specialized in the production of primary goods and those with low technological sophistication, whose international demand grows slowly. Core countries in turn export goods whose income elasticity is greater than one, due to their specialization in industrialized goods (PREBISCH, 1949).

That developing economies export goods with a low income-elasticity of demand and import goods with a high income-elasticity makes it impossible for them simultaneously to achieve high rates of growth and balance their external accounts. Their efforts to eliminate external deficits end up causing recessions or inflation, ultimately limiting growth. In this context, exports are a key variable for economic growth due to the dual role they play: besides being an autonomous source of effective demand, they also act as the primary source of international currency, alleviating the balance-of-payments (BoP) constraint to growth (MEDEIROS AND SERRANO, 2001).

Between 1995 and 2011, Brazilian exports had benefited greatly from the expansion of international trade and grew, on average, 11% per year.[3] This was higher than the growth of world exports, at just over 8% annually. However, as a result of the global trade slowdown triggered by the 2008 crisis and its aftermaths, Brazilian foreign sales began losing ground and even decreased from 2011 onwards.

Over these two decades (1995-2014), it is possible to identify two main changes in the composition of the Brazilian exports. First, while traditional partners such as the United States (US) and the European Union (EU) lost importance, China started to import more Brazilian goods and became the country's main trading partner. Second, basic goods

[3] Source: United Nations Statistics Division (2019).

gained weight and became the largest category, while, in contrast, manufactures *not* based on natural resources lost space.

These changes in the composition of exports boosted the growth rate of Brazilian exports, as shown by some studies which adopt the Constant Market-Share methodology (PINHEIRO E BONELLI, 2007; PEREIRA E SOUZA, 2011; LIMA ET AL, 2015). In these works, most of the observed growth in Brazilian exports between 1995 and 2011 was inertial, as it was attributed to the growth of international trade, while changes in the structure of exports (composition and destination) contributed positively. That is to say, Brazilian exports were concentrated in goods and destinations that were growing fast, giving rise to the strong growth of Brazilian foreign sales in that period.

Although these works explain the relationship between changes in exports structure and the growth rate of Brazilian foreign sales, they do not adequately explain the role of changes in the country's competitiveness. In the methodology they adopted, the competitiveness effect is calculated as a residual, which severely curtails their explanatory power. Moreover, the treatment given to international trade growth in these works does not provide information about the income-elasticity of international trade or about the income-elasticity of Brazilian exports. As such, these studies are unable to examine some of the key aspects of Brazil's changing foreign insertion, particularly during moments of growing international competition – precisely when the BoP constraint is more likely to tighten.

To fill this gap, this article implements a new methodology to explain the growth of both total and sectoral Brazilian exports between 1995 and 2014. The dual goal is thus to identify the main sources of recent export growth and to explain the changes in composition of exports towards less sophisticated goods. A decomposition is proposed that disaggregates the growth of exports into four components. The first component is associated to the country's competitiveness and the second indicates whether the exports of a country are concentrated in goods whose demand is growing above or below average. The third and fourth are related to the growth of global trade and represent, respectively, the income elasticity of international trade and the growth of world income.

This decomposition can thus analytically separate the main drivers of Brazilian exports during the analyzed period, while also identifying the factors that explain the higher-than-average growth of less sophisticated products. Furthermore, the proposed decomposition gives a better treatment to the competitiveness effect and to international trade growth. For the former, the decomposition has a specific term for measuring competitiveness gains and losses. For the latter, we disaggregate international trade growth into two terms that account for the relationship between trade growth and world GDP.

The results show the limitations of Brazil's recent international insertion. When the country's exports grew rapidly, they were basically driven by inertial and external factors, such as rising prices and world demand for goods in which it was already specialized. Brazil surfed the high tide of commodity prices and did not build the necessary capabilities to improve its external insertion. When international competition became more intense, after the 2008 crisis but especially after 2011, exports of Brazilian manufactured products started to lose space in the world market, mainly for Chinese companies. Consequently, the country has been experiencing a deterioration of its international insertion, as it reinforces its specialization in unsophisticated goods, is displaced from international manufactures markets, and sees global demand moving away from the goods it produces at a comparative advantage. The strategy Brazil adopted to manage its international trade pattern was therefore incapable of promoting the necessary medium-term conditions to spur its development, leading to long-lasting consequences as international conditions continue to worsen.

This work is divided into three sections, besides this introduction and the final remarks. Section 1 draws attention to the key role of exports in economic growth, highlighting its dual role as a source of effective demand and of the foreign currency necessary to alleviate the BoP constraint. This section also discusses the recent evolution of Brazilian exports, showing the main changes in their composition as regards both products and partners. Section 2 reviews extant explanations for the recent growth of Brazilian exports, particularly those based on the Constant Market-Share method, and presents the alternative methodology used in this article. The third section presents the results for the decomposition of the growth of Brazilian exports.

1 The balance-of-payments constraint and Brazilian exports

1.1 The balance-of-payments constraint and the dual role of exports

According to demand-led growth theory, exports can have a smaller or larger direct contribution to economic growth, depending on a country's structural characteristics – but the role they play in alleviating the external constraint is indispensable for most countries (MEDEIROS AND SERRANO, 2001, p.106). The balance-of-payments constraint is defined as the scarcity of foreign exchange for the payment of imports. Since external liabilities must be paid in a reference currency, countries that do not issue that currency are limited by their ability to generate foreign currency. To avoid this restriction, there are two options: exports or capital flows. While exports are a direct inflow of foreign exchange, capital flows generate a stock of foreign liabilities with implications that depend on the availability of credit and the costs of this liability (THIRLWALL, 2019[1979]).

The relationship between the BoP and the determination of the output comes from the hypothesis that imports are induced by the level of activity of the domestic economy. With the growth of output, the volume of imports increases and so does the need to obtain foreign exchange. In this process, long-term output is limited by the capacity to generate the foreign exchange necessary to pay for external liabilities. BoP-constrained growth models, following Thirlwall (2019[1979]), establish a relationship where the growth rate of output compatible with BoP equilibrium is equal to the ratio between the income elasticities of the demand for exports and for imports, multiplied by the growth rate of income of the rest of the world. Put more simply, this equals the ratio between the growth of exports and the income elasticity of imports in a country:

$$g_{BP} = (\varepsilon/\pi) g_{RM} = x/\pi$$

where g_{BP} represents the growth rate of output associated to BoP equilibrium, ε and π represent, respectively, the income elasticities of the demand for exports and for imports, g_{RM} represents the growth rate of the rest of the world, and x the growth in exports.

This equation is known in the literature as Thirlwall's Law (e.g., KALDOR, 1978[1971]; THIRLWALL, 2019[1979]; McCOMBIE & THIRLWALL, 1994; MCCOMBIE & ROBERTS, 2002; and THIRLWALL, 2005). Thus, the growth rate of the output compatible with BoP equilibrium is a direct function of the growth of a country's exports (McCOMBIE AND THIRLWALL, 1994). It is worth noting that this result holds even in the presence of capital flows, as pointed out by Bhering and Serrano (2019). This is because, in the short term, a country can go into debt to relax the external constraint, but in the long term this debt must somehow be paid and exports remain the only source of foreign exchange that do not generate counterparts (see also McCOMBIE & ROBERTS, 2002).

However, if economic growth is determined by the principle of effective demand, the growth rate of output that equilibrates the BoP is only an *upper limit*, and not an attractor. In other words, the BoP constraint is asymmetric. On the one hand, the situation where a country recurrently incurs in BoP deficits cannot be sustained indefinitely, since this country would be continually worsening its net international investment position. On the other hand, the opposite situation – in which the country obtains recurrent external surpluses – can be maintained for long periods, as it leads to an improvement in its net international investment position (MEDEIROS AND SERRANO, 2001). Thus, there is no market mechanism that equalizes the observed long-term growth rate of output and that associated to BoP equilibrium, nor are there other mechanisms that ensure the balance of trade is in equilibrium in the long term (BHERING AND SERRANO, 2014). This opens the possibility that some countries are operating systematically below the BoP constraint.

If we assume that long-term output determined by the principle of effective demand is, in general, different from the level of output that balances the external accounts, then we make room for the explanation of different growth paths based on different accumulation regimes. Thus, economic growth will not always be export-led, and there may be different growth regimes associated with different compositions of aggregate demand. In all scenarios, *even in a context where growth is not led by exports*, the latter continue to perform their key function of providing foreign exchange to pay for imports, thus *relaxing the BoP restriction and raising the ceiling of sustainable growth rates*.

1.2 Brazilian exports between 1995 and 2014

Between 1995 and 2014, Brazilian exports grew more than world exports, both for the entire period and for most sub-periods (FIGURE 1). During the whole stretch, world exports grew at just over 7% per year, while Brazilian exports reached almost 9%. The period of greatest dynamism was between 2003 and 2008, when Brazilian exports grew at an average rate of 22% per year, and only between 2011 and 2014 did they grow below world exports. In this phase, Brazilian goods lost ground in the world market and exports decreased approximately 5.5% per year in nominal terms.

Analyzing the composition of exports both by product and by destination, there were two significant changes. First, as shown in the left-hand side of Figure 2, the composition of the main trading partners changed significantly in the period. While traditional partners, such as the United States (US) and European Union (EU), lost importance, China started to import more Brazilian goods and became the major trading partner. At the beginning of the period, the share of exports to MERCOSUR, the US and the EU represented 13%, 22% and 24%, respectively, of the total, while exports to China were less than 3%. During the period exports to China grew by 20% annually. This caused China to become Brazil's largest trading partner, accounting for almost 20% of Brazilian exports in 2014. Meanwhile, MERCOSUR, US and EU countries had their share reduced to 10%, 11% and 18%, respectively.

FIGURE 1 – Annual growth rate of Brazilian and World exports (%)

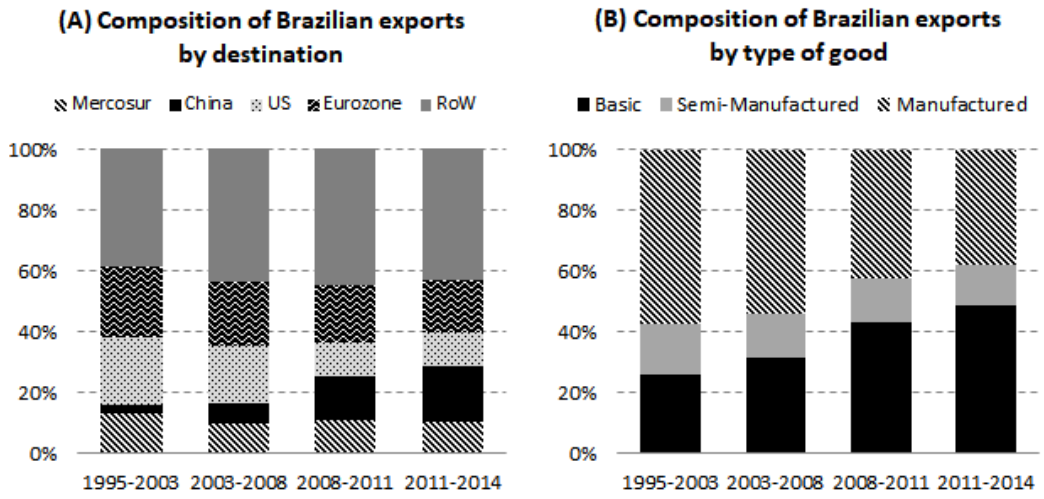
Source: The authors, using UN Comtrade data (United Nations Statistics Division, 2019).

At the same time, there was a change in the composition of exported products. Basic goods gained space and became the main category, jumping from 26% between 1995-2003 to 49% between 2011-2014, while manufactures lost ground, going from 57% to 38% over the same period (right-hand side of Figure 2). This change is connected to the first one, as Chinese demand for Brazilian goods is extremely concentrated in three products: iron ore, soybeans, and crude oil. Between 1995 and 2003, iron ore and soy exports accounted for 24% and 22% of Brazilian exports to China, while crude oil exports were of little relevance (less than 1%). With the strengthening of commercial ties with China and the rise of commodities' prices, these three categories were together responsible for more than 80% of Brazilian exports to China between 2011-2014, with the participation of these goods being 42%, 30% and 9%, respectively, in this stage[4]. As pointed out by Castilho et al. (2017), the share of manufactured products in the Brazilian export basket in 2013 would increase by 10 percentage points if exports to China were subtracted from total exports.

[4] Source: United Nations Statistics Division (2019).

It seems that these changes in the structure of Brazilian exports boosted the foreign sales. However, the question that remains unanswered is what caused these changes. Why did the export of some goods grow much more than others? Moreover, there is also the question about the role played by China in this process. In addition to being a major consumer of Brazilian commodities, how else did China impact this reprimarization dynamic?

FIGURE 2 - Average composition of Brazilian exports by destination and type of good



Source: The authors, using MDIC data.

2 Exports growth accounting

2.1 The Constant Market-Share analysis

The decomposition analysis of exports growth seeks to separate and quantify different effects to understand how they contributed to the variation in the value exported by a country or region. The Constant Market-Share (CMS) methodology, first developed by Tyszynski (1951), is frequently adopted in studies on export performance. It decomposes the variation of the exported value into four sources: (i) growth in world trade; (ii) the composition of exported goods; (iii) the distribution of destination markets; and (iv) a residual effect attributed to changes in that country's external competitiveness. If a country's exports grew at the same rate of world trade, the other effects were jointly nil and, hence, the country's market share in world exports remained constant. A country's exports grow more than world trade whenever: (a) its exports are concentrated in goods whose demand grows relatively more than the average (composition effect); (b) the main destinations for these exports are growing more than the rest of the world (market distribution effect); and (c) the country presents competitiveness gains vis-à-vis other competitors (residual term attributed to competitiveness).[5]

Several works have applied the CMS methodology to account for the growth of Brazilian exports in recent decades, providing valuable contributions to our understanding of the country's shifting international insertion.[6] Pinheiro and Bonelli (2007) perform the decomposition for the period between 1995 and 2004. In addition to the decomposition for the entire period, the authors also apply it to two subperiods: 1995-1999 and 1999-2004. The results are very different for each subperiod and, therefore, the aggregate result turns out to be a combination of the two subperiods. In the first, total exports changed but modestly (almost ten times less than in the following period), mostly due to the growth

[5] For more information on the CMS analysis see Leamer & Stern (1970) or Richardson (1971).

[6] This review focuses on works using the traditional CMS methodology, to guarantee they are comparable to the results presented later in the article. For example, the version developed by Nonnemberg and Carneiro (2015), which decomposes market-share gains instead of the exports rate of growth, or the adopted by Castilho et al (2017), which identifies the countries that gained or lost with variations in market-share of Brazilian exports, are not discussed.

in world trade and the distribution of destination markets, while the composition effect had a small contribution. The competitiveness effect also contributed significantly, but negatively. The absolute value of the competitiveness effect was the highest for this subperiod, indicating that, although total exports grew, they did so while Brazilian competitiveness decreased. For the second subperiod (1999-2004), the component that contributed the most was the growth of trade, followed by the competitiveness effect. Together, they contributed significantly to Brazilian exports growing above the world average. The composition and market distribution effects contributed very modestly, and with a negative value, indicating that Brazilian exports were concentrated in products and markets that were not dynamic. For the whole period, the largest contribution comes from the trade growth effect, which was the source of 77% of the variation in exported value. The other three effects contributed timidly, although positively: the competitiveness effect contributed with 13% while the composition and market distribution effects contributed 3% and 6%, respectively.

Pereira and Souza (2011) applied the CMS analysis to decompose exports growth between 1999 and 2009, seeking to update the discussion by Pinheiro and Bonelli (2007). The authors divide the period into four phases: 1999-2002; 2002-2005; 2005-2008 and 2008-2009. The trade growth effect was the one that contributed the most to the variation of exports in all subperiods. The competitiveness effect was very important for the first period, but gradually lost its importance over time. However, it is worth mentioning that this effect was the only one that contributed positively in the 2008-2009 period, when all other effects – and the resulting growth of exports – were negative. The composition and market distribution effects had a negative and significant value for the first period, representing -26.2% and -18.9%, respectively, of the total variation. In the intermediate periods, they presented small but positive contributions. For the entire period, the picture changes slightly. The most important effects for the growth of exports were the growth of trade, which contributed with 51%, and the competitiveness effect, responsible for 46% of the variation in exports. The composition and market distribution effects were modest and in opposite directions, at 9.6% and -6.8%, respectively. However, it is worth noting that the aggregate result may have been affected by the basis period chosen for the decomposition. In 1999, both the share of basic goods and of China in total exports were much lower, as shown in the previous section. This may have underestimated these

effects, which are weighted by their initial shares in the export basket, and overestimated the competitiveness effect, which is the variation in the exported value not explained by the other components – i.e., a residual term.

Lima, Lélis and Cunha (2015) analyzed the evolution and transformations that occurred in international trade between 2000 and 2011 to understand how Brazilian exports were affected. During this period, there was a notable change in the composition of international trade, when primary products gained in share due to the increase in prices and world demand. In addition, international trade became less concentrated, with developed countries losing their share in both world exports and imports, while emerging economies became a relevant source of global trade dynamism. The authors applied the CMS analysis to Brazilian exports for the period between 2000 and 2011 and, again, the trade growth effect was the component that contributed the most (roughly 65%). The composition and market distribution effects followed, respectively at 14% and 15%. Finally, the competitiveness effect contributed with only 6%. According to the authors, Brazil's positive export performance was due to the expansion of international trade, with Brazilian foreign sales concentrated in dynamic goods and in fast-growing markets: essentially, the sale of natural resources and the emphasis on emerging markets such as Asia, Africa and Middle East.

These works together allow for important conclusions on the evolution of Brazil's international insertion, but they leave key questions unanswered. It is clear that the growth of world trade was the component that contributed the most to the growth of Brazilian exports, while the composition and market distribution effects were marginal but positive. As such, the recent growth of Brazilian exports was inertial, in a sense, as it was led by the growth of international trade, while changes in the structure of exports (composition and destination) contributed at the margins.

What these works do not adequately explain is the role of changes in the country's competitiveness. In the CMS analysis, the share of export growth unexplained either by international trade growth or by changes in the structure of exports (both in terms of goods and destination) is attributed to competitiveness effect. Given its residual character, the importance of this effect varies substantially depending on the level of aggregation of the goods and the basis-period, which are arbitrary decisions. This makes the works not

comparable and prevents them from providing clear information about the evolution of Brazil's external competitiveness, a large gap in light of the fundamental role of competitiveness gains for medium-term development perspectives.

2.2 - An alternative methodology for decomposing exports

To address the limitations of the CMS methodology, this article develops an alternative methodology to decompose exports growth. Crucially, this method treats the competitiveness and trade growth effects more appropriately, leading to greater analytical purchase. The competitiveness effect is no longer a residual, but rather has a specific component associated to it. The trade growth effect in turn is disaggregated into two terms, the income-elasticity of trade and the growth of world GDP. As shown below, these innovations are able to explain key aspects of the evolution of Brazilian exports obscured by the CMS methodology.[7]

Initially, let us define the value country *j* exports of product *i* as follows:

$$X_i^j = \frac{X_i^j}{X_i^W}\frac{X_i^W}{X^W}\frac{X^W}{Y^W}Y^W \qquad (1)$$

where X_i^W represents the value of world exports of good *i*, X^W represents the total value of world exports, and Y^W represents world output. With this decomposition, the value country *j* exports of product *i* is split into four components. The first is the market-share of the country in product *i*; the second is the share of this good in world exports; the third is the share of international trade in world output; and the fourth is world output.

To simplify the notation, let $C_i^j = X_i^j/X_i^W$; $D_i = X_i^W/X^W$ and $T = X^W/Y^W$, so that Equation (1) becomes:

[7] It is beyond the scope of this work to make a detailed comparison of the proposed methodology and the CMS. For a presentation of the main criticisms of the CMS analysis and a more extensive discussion on the proposed decomposition, see Amaral (2016).

$$X_i^j = C_i^j D_i T Y^W \quad (1')$$

In growth rates we have:

$$x_i^j = c_i^j + d_i + t + y^W + r_i \,, where \quad (2)$$

$$r_i = c_i^j d_i + c_i^j t + c_i^j y^W + d_i t + d_i y^W + t y^W + c_i^j d_i t + c_i^j d_i y^W + c_i^j t y^W + d_i t y^W + c_i^j d_i t y^W$$

Here, growth rates are represented by lowercase letters. By Equation (2), we have that the growth of the *i*-th product equals the sum of the growth of the four mentioned components, plus an interaction term (r_i). If $\left(c_i^j\right)$ is positive, the *j*-th country gained market share, that is, it raised its participation in world exports of the *i*-th good and became more competitive. The second component (d_i) captures the dynamism of the product in the world market. If exports of the *i*-th good grew more than the average of global exports, then it is a dynamic good that increased its participation in international trade. The third factor (t) indicates whether international trade has grown more or less than world GDP, thus representing the income elasticity of international trade. The fourth term (y^W) indicates the impact that the growth of world GDP had on the growth of country *j*'s exports. Finally, as in the CMS analysis, the growth in the exports of the *i*-th good is also determined by the interaction between the previous components. To simplify, we aggregate all of these interactions in r_i.

We can now aggregate the exports of all goods to find the *j*-th country's total growth of exports:

$$x^j = \sum_i \lambda_i c_i^j + \sum_i \lambda_i d_i + t + y^W + r \,, where \quad (3)$$

$$r = \sum_i \lambda_i \begin{pmatrix} c_i^j d_i + c_i^j t + c_i^j y^W + d_i t + d_i y^W + c_i^j d_i t \\ + c_i^j d_i y^W + c_i^j t y^W + d_i t y^W + c_i^j d_i t y^W \end{pmatrix} + t y^W$$

where x^j represents the *j*-th country's total growth of exports and λ_i represents the share of the *i*-th good in total exports in the initial period. The growth of a country's exports is thus broken down into the sum of five components or effects. The first term on right-hand

side $\left(\sum_i \lambda_i c_i^j\right)$ can be identified as the competitiveness effect. It consists of the sum of market share gains and losses in the different goods, weighted by the share of each product in total exports. The second effect $(\sum_i \lambda_i d_i)$ captures the dynamism of the export basket, expressed as a weighted sum of the dynamism effect of each good. This component indicates whether the country's exports are concentrated in more or less dynamic products, that is, goods that have gained or lost participation in international trade. The third (t) and fourth (y^W) effects represent, respectively, the income elasticity of international trade and the growth rate of world GDP, indicating how much these two factors impacted the growth of country *j*'s exports (which do not operate through a summation over individual goods). The last term represents the sum of the interaction terms.

We can say that the first two components are related to the country's trade specialization and international insertion. These two effects indicate how much of the growth of exports is explained by the country's export structure, since they are weighted by the share of each product.[8] The income-elasticity of trade and world GDP effects, on the other hand, are related to the global macroeconomic environment and can be seen as a breakdown of the growth of world trade. If world exports are induced by the level of global activity, we have: $X^W = TY^W$, with $T = (X^W/Y^W)$. In this case, the growth rate of world exports is composed of the income-elasticity of trade and the growth rate of world GDP: $x^W = t + y^W + ty^W$. Given the size of these variables, we can consider that the sum of the first two terms (excluding the interaction term ty^W) is a good approximation for the growth of world trade.

This decomposition builds clear links to Thirlwall's (2019[1979]) approach and the determinants of the income elasticity of the demand for a country's exports. Equation (3) shows that the income elasticity of exports will be greater than unity whenever the sum

[8] We chose to weigh the components of the decomposition by the initial shares in order to analyze how the initial composition of the exports affected the exports growth rate. However, it would be equally valid to consider the final shares or an average between the initial and final weights as well.

of the other terms is positive.[9] Thus, for a country to be successful in its exports, it is necessary for it to gain market-share in highly dynamic products. This makes exports less dependent on factors entirely beyond the control of a given country, such as the growth of international trade, and more on its specific international insertion, such as the main trade partners and the goods exported.

2.3 Data sources and aggregation criteria

Data were taken from two main sources and goods were classified in terms of their technological sophistication. International trade data are available from the United Nations Commodity Trade Statistics Database, disaggregated for goods and destinations of trade flows. World GDP is provided by the World Bank. These values are given in current dollars, with world GDP at market prices.[10] Exported goods were then grouped according to the technological classification presented by Lall (2000). According to the author himself, this is a combination of two other classifications, Pavitt (1984) and OECD (1994). The technological classification can cast light on the country's trade specialization and its external insertion, as it reveals whether the country focuses on, say, more technology-intensive goods, which have greater dynamism. Departing from the Standard International Trade Classification (SITC, rev. 2), the 239 items were grouped into five categories: primary products (PP), resource-based manufactures (RB) and low- (LT) , medium- (MT) and high-technology manufactures (HT).[11] Equation (2) was used to

[9] To see this clearly, consider: $x^j = \left[\sum_i \lambda_i c_i^j + \sum_i \lambda_i d_i + t + r_i\right] + y_w$. Whenever the term in brackets is greater than zero, the income elasticity of the country's exports will be greater than unity.

[10] For greater accuracy, we use imports instead of exports in the decomposition. In other words, when we refer to total Brazilian exports, for example, the data are world imports from Brazil.

[11] The technological classification of Lall (2000) has five categories. Primary products (PP) are goods that have little or no processing, being exported practically fresh. Resource-based manufactures (RB) are simple, labor-intensive goods, but there are also those that use intensive capital or scale technologies, such as the processed food sector or oil refining. Low-technology manufactures (LT) are a class of items that use stable and very widespread technology, present in capital goods. The medium technology manufactures (MT) comprise most of the scale-intensive technologies, capital goods and intermediate goods. Finally,

account for the growth of exports in each of the technological categories listed above, and then these results were aggregated in Equation (3) to account for the total growth of Brazilian foreign sales.

The decompositions were carried out for four intervals, based on a periodization of the evolution of Brazilian exports. The first period goes from 1995 to 2003, when Brazilian and world exports grew more slowly. The second, from 2003 to 2008, was marked by China's entry into the WTO, the super cycle of commodities, and the breakneck increase in the volume of international trade and Brazilian exports, which grew approximately 22% per year during this period. The third period runs from 2008 to 2011. In this period, the financial crisis in the US erupted, world trade slowed, and Brazilian trade relations with China had deepened, making Brazilian exports increasingly dependent on primary products and resource-based manufactures. Finally, the last period goes from 2011 to 2014, comprising the beginning of the global trade slowdown[12] and the decline of Brazilian exports in all categories.

high-tech manufactures (HT) are products that employ advanced technology, being characterized by high levels of R&D spending, with emphasis on product design.

[12] For more information about the global trade slowdown see Hoekman (2015).

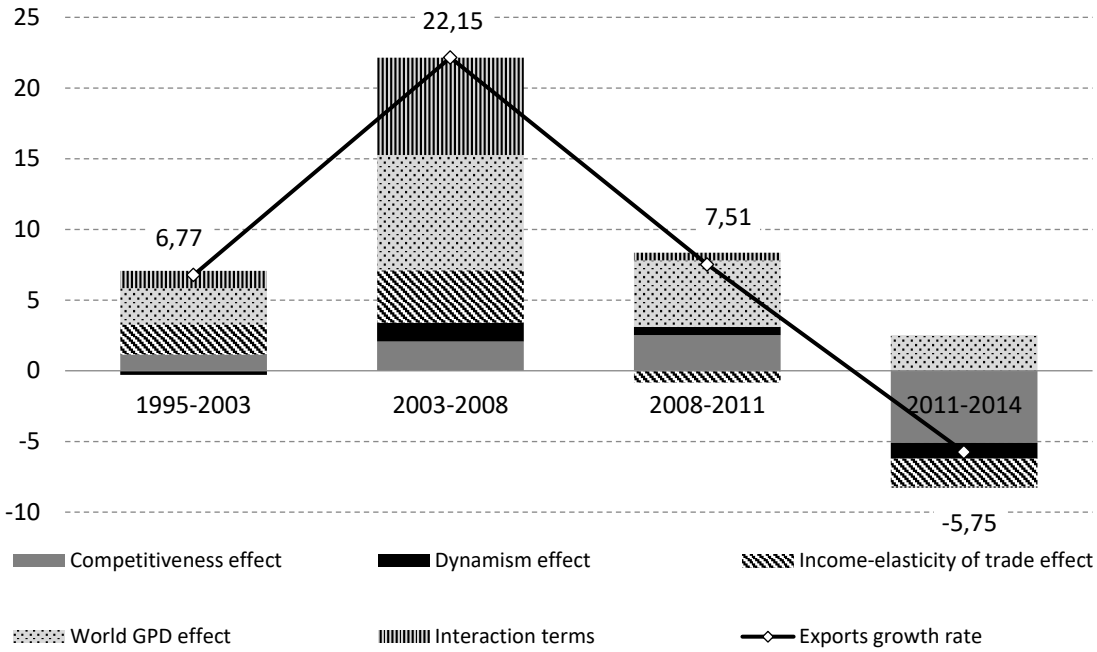
3 The sources of Brazilian export growth between 1995 and 2014

The period of greatest dynamism in Brazilian foreign sales occurred between 2003 and 2008, in which exports grew, on average, 22% per year. Between 1995 and 2003 external sales grew just over 6.5% per year, while in the third period (2008-2011) the annual growth was 7.5%. Finally, in the last period, Brazilian exports began to decline by 5.8% per year. It is worth remembering that Brazilian exports grew more than world exports in the first three periods. This growth was so accelerated that, even considering the drop in Brazilian sales in the last period, the accumulated growth between 1995 and 2014 is still greater than the growth of world exports for the same period.

Figure 3 shows the annualized results for the decomposition, highlighting that the effects associated with the growth of international trade were on average the most important. Even with the slowdown in world trade since 2008, the sum of the effects of the income-elasticity of trade and of world GPD contributed positively to the growth of Brazilian exports in all periods. The competitiveness and dynamism effects, on the other hand, had modest impacts in the first periods. Although these effects were positive during the boom, they do not explain much of this growth and, indeed, are much more relevant to explain the drop in exports from 2011. Finally, the interaction term contributed significantly only in the first two periods.[13]

[13] As this is the sum of the interaction terms, this effect will be greater in absolute terms when all the effects have the same sign.

FIGURE 3 - Decomposition of the growth rate of Brazilian exports, 1995-2014



Source: The authors, using UN Comtrade data (United Nations Statistics Division, 2019).

In the first two periods, the sum of the effects of the income-elasticity of trade and of world GDP explained approximately 70% and 55% of export growth. In the last two periods, these effects had opposite signs, as the income-elasticity of trade turned negative since the 2008 crisis. Even so, world GDP growth more than compensated for the income-elasticity of trade and, jointly, these effects continued to be the main driver of Brazilian exports growth: they represented just over 50% of the growth rate between 2008 and 2011 and mitigated the drop in the last period.

The competitiveness and dynamism effects had a reduced impact in the first three periods but contributed significantly to the decrease observed since 2011. The sum of these effects represented 13% and 15% of the growth of exports in the first and second periods, respectively. In the third period, they contributed with just over 40%, and, in the last, with almost 110% of the fall in Brazilian foreign sales. It is worth noting that, as exports are measured in value, these effects may have been affected by the increase (2003-2011) and the fall (2011-2014) of commodities prices.

The international environment thus played a mostly constant role, boosting Brazilian exports to different degrees over the analyzed period, while the other effects shifted over time. As such, the *expansion* of Brazilian exports in the first three periods was much more related to the evolution of the international environment (the elasticity and world GDP effects), which furthermore cushioned its fall in the last stage. The pattern of trade specialization (dynamism effect) and competitiveness gains, in turn, had but a limited contribution in the expansion phase. They did, however, have a large role in explaining the *fall* of Brazilian exports after the global trade slowdown, due to a combination of a weakening of the competitiveness of Brazilian goods and an increase in international competition.

To analyze the country's regressive specialization, we can explore the results of the disaggregated decompositions made for each technological category (Equation 2) in order to understand why exports of primary products (PP) and resource-based manufactures (RB) grew more than the others. As the effects associated with international trade growth have the same values for all categories, the differences between goods are based on the competitiveness and dynamism effects. By analyzing these effects together, we can understand the relationship between the country's market-share gains and changes in the composition of international trade.

This analysis is inspired in a simplified version of Mandeng's (1991) competitiveness matrix. The key issue is whether the country has gained or lost market share in goods that have gained or lost participation in international trade. In Figure 4, the horizontal axis represents the competitiveness effect of Equation 2 for each category and the vertical axis represents their dynamism effect, that is, the variation of their share in international trade. Finally, the size of the markers reflects the relative weight of each category in Brazilian exports at the beginning of each period.

The results suggest that two factors contributed to the marked growth of primary products and resource-based manufactures in relation to the other categories. The first was the increase in prices and world demand for goods in which the country was already specialized, PP and RB, which explains the rise of these goods in total Brazilian exports. The second was the intensification of international competition due to the global trade

slowdown that begun with the 2008 crisis, an important element behind the drop in the exports of manufactured goods that occurred in the last two periods.

FIGURE 4 – Dynamism and competitiveness effects of Brazilian exports by technological intensity, 1995-2014

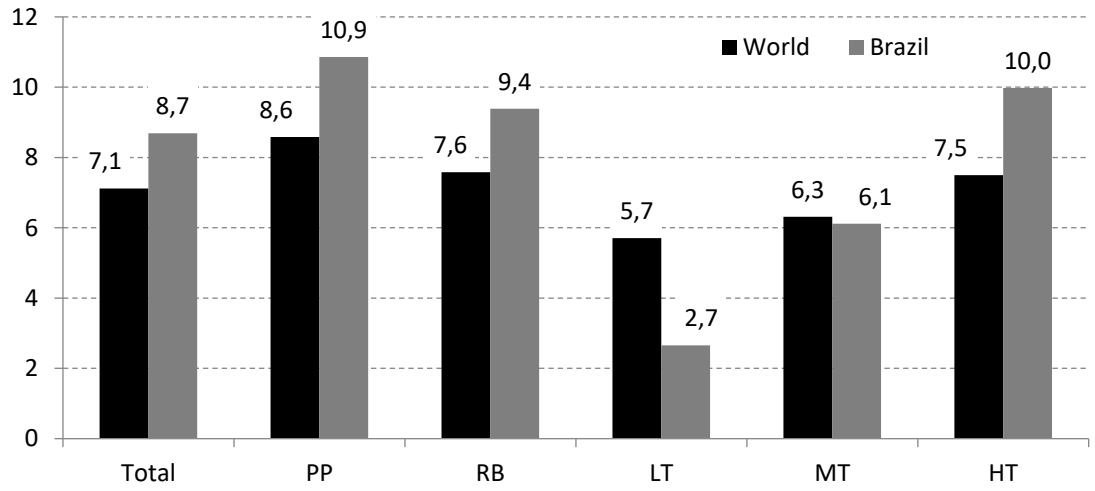
Notes: (PP) represents primary products; (RB) resource-based manufactures; (LT) low-tech manufactures; (MT) medium-tech manufactures and (HT) high-tech manufactures. The size of the markers indicates the share of each category in Brazilian exports. Source: The authors, using UN Comtrade data (United Nations Statistics Division, 2019).

Figure 4 shows that, in most periods, Brazilian exports gained a greater market share precisely in the categories that increased their participation in international trade (PP and RB). To a large extent, this was due to the increase in commodities prices and the growing Chinese appetite for these goods. In other words, the changes in the composition of world trade towards less sophisticated goods had direct effects on Brazilian exports, which continued to gain competitiveness as world demand for these goods increased. This can be seen in Figure 5, which shows the annual growth of Brazilian and world exports between 1995 and 2014 by technological intensity. Brazilian and world growth rate were concentrated in three categories: PP, RB, and HT. However, due to the reduced

participation that HT goods have in the Brazilian exports, their contribution was very small for the total growth of the exports in the period.[14]

The increase in commodities prices, which are concentrated in PP and RB categories, allied with the growing Chinese participation in the international market, has increased the participation of these goods in world exports. In 1995, exports of these two categories represented 31% of world exports, as shown in Figure 6. By 2014 these products had their participation increased to 37% of the total, while manufacturing goods lost ground. The most affected categories were LT and MT goods, which together lost eight percentage points of their share in world exports.

FIGURE 5 – Annual growth rate of Brazilian and World exports, 1995-2014 (%)



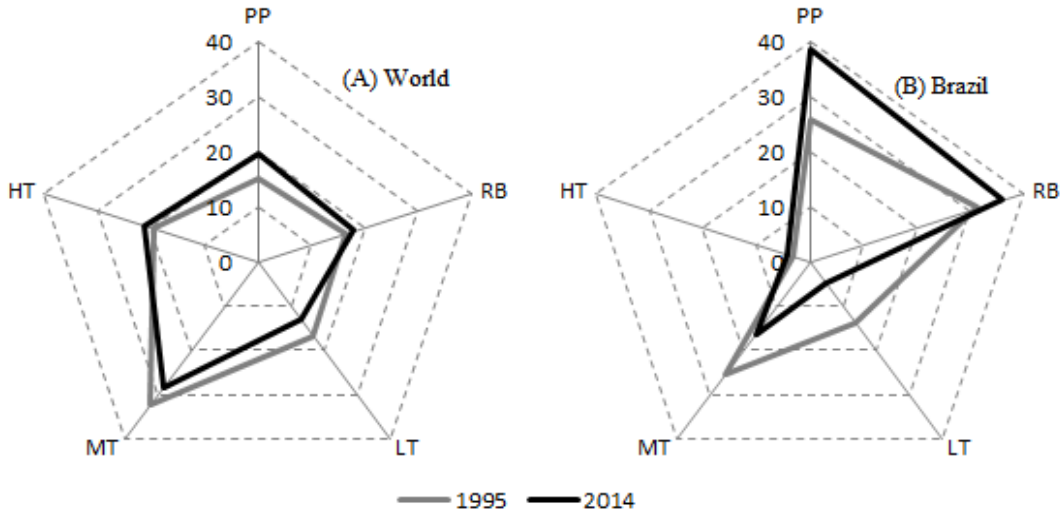
Notes: See notes to Figure 4 for classification. Source: The authors, using UN Comtrade data (United Nations Statistics Division, 2019).

In Brazil, this movement towards less sophisticated goods was more intense than that experienced by the world. Primary products and resource-based manufacture exports grew approximately 10% per year in the period. In 1995, these categories represented 26% and 32% of the total exported, respectively, jumping to 38% and 37% in 2014 – or 75% of total exports. This was, indeed, a deepening of the country's existing trade

[14] In 1995 HT goods represented 3.25% of total Brazilian exports. In 2014, this participation rose to 4.15%.

specialization in 1995, as the PP and RB categories in that year already had a much greater weight in Brazilian exports than in overall world trade.

FIGURE 6 – Composition of World and Brazilian exports, 1995 and 2014 (%)



Notes: See notes to Figure 4 for classification. Source: The authors, using UN Comtrade data (United Nations Statistics Division, 2019).

This movement of deepening specialization can be illustrated by the evolution of the Revealed Comparative Advantage Index (RCA) of Balassa (1965), which indicates a country's trade specialization in a given good. The index is calculated by:

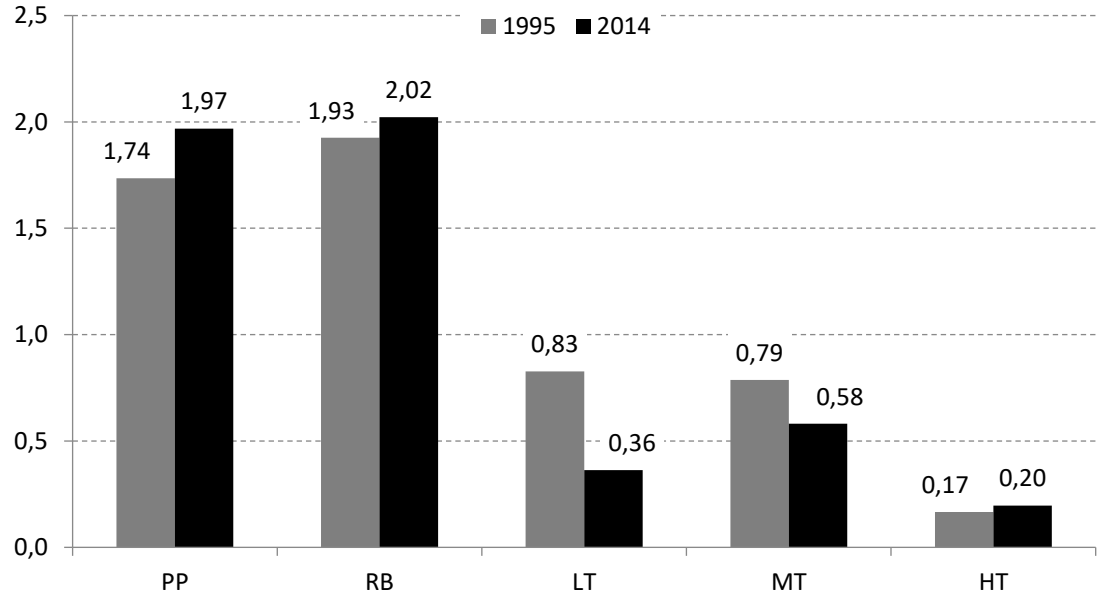
$$RCA = \frac{\left(X_i^j / X^j\right)}{\left(X_i^W / X^W\right)}$$

where X_i^j represents exports of the *i*-th good by country *j*, X^j represents the *j*-th country's total exports, and X_i^W and X^W represent world exports of product *i* and total world exports, respectively. If the index is greater or equal to one, the country has a revealed comparative advantage in the export of this good (i.e. it exports more than the world average of good *i*), and vice-versa.

Figure 7 shows the RCA for Brazilian exports grouped into technological categories in 1995 and 2014. It demonstrates that the country already had comparative advantages in PP and RB categories in the beginning of the analyzed period, strengthening this specialization over these two decades. The values close to 2 that the RCAs for these categories assume at the end of the period indicate that their participation in Brazilian exports is twice that of their shares in world exports. Brazil's comparative advantages in

the commercialization of low- and medium-technology goods, in turn, fell dramatically during the period.

FIGURE 7 – Revealed Comparative Advantage Index (RCA) of Brazilian exports, 1995 and 2014



Notes: See notes to Figure 4 for classification. Source: The authors, using UN Comtrade data (United Nations Statistics Division, 2019).

We can complement this idea using the Demand-Adaptability Index (DA_j) developed by Palma (2009). This indicator shows the capacity of a country to react to changes in the composition of world demand. The DA_j index is derived from the ratio between the country's market share (in the world market) in dynamic products, that is, those that have gained participation in international trade, and those of non-dynamic goods (all weighted by the country's total market share):

$$DA_j = \frac{\sum_i a_i^d}{\sum_i a_i^{nd}}$$

$$a_i = \frac{\left(X_i^j / X_i^W\right)}{\left(X^j / X^W\right)}$$

where a_i is the *j*-th country's market share in product *i* divided by the country's total market share in world exports and the superscripts *d* and *nd* indicate dynamic and non-dynamic goods, respectively. When DA_j equals one, the composition of country *j*'s

exports is exactly equal to that of world exports in terms of their dynamism. A high value for this index suggests that the country was able to keep up with changes in world demand and adapt its exports in the direction of these changes.

The Demand-Adaptability Index for Brazilian exports, using the technological categories of Lall (2000) between 1995 and 2014, was 4.44. This value is high and indicates that the sum of Brazilian market shares in the categories that gained weight in international trade (PP, RB and HT) was more than four times greater than those categories that had their participation reduced (LT and MT). This index strengthens the argument that the growth of Brazilian exports was directly affected by the changes in the structure and composition of world exports between 1995 and 2014.

Thus, the changes in the composition of world demand favored Brazilian exports, as the country already had a strong performance in most categories that rose in international trade. In other words, international demand moved towards goods in which Brazil already had comparative advantages. This caused the country to increase its market share precisely in the dynamic categories, being strongly benefited by changes in the structures of world demand and relative prices between 1995 and 2014.

It must also be highlighted that Brazilian exports increased their market share in the most sophisticated manufactures (MT and HT) until 2008, even though these categories did not gain participation in world trade during the whole period (FIGURE 4). However, since the beginning of the global trade slowdown, the country began to lose ground in these categories. In the first periods, although competitiveness gains were greater in less sophisticated goods, the country was not losing competitiveness in MT and HT goods. Indeed, it even marginally increased its market share in the latter. With the outbreak of the financial crisis, more sophisticated Brazilian exports started to lose market and the growth of exports became even more dependent on primary products and resource-based manufactures, which were benefited by a new cycle of price hikes between 2008 and 2013.

This drop in the Brazilian competitiveness can be attributed to the intensification of international competition due to the global trade slowdown since 2008, with emphasis on the growing presence of Chinese goods in important markets for Brazilian manufactures.

While Brazil had its exports driven by external factors, it was incapable of accumulating sufficient competitiveness gains to face a tougher scenario. At the same time, given the low dynamism of developed economies hit by the crisis, Chinese companies have started to diversify the destination of their exports and gain market-share in new places, outcompeting other producers and displacing their former exports.

According to Hiratuka and Sarti (2017), the international competitive environment has become even tighter after the crisis began. The authors argue that the high and synchronized growth of the global economy between 2003 and 2008 mitigated the impacts of Chinese competition. However, the crisis affected growth of international trade, which started to grow less than the world GDP. In this scenario, China saw its major trading partners (US and EU) depressed by the crisis and, in response, Latin America started to be considered an important consumer market for its industrial products (CUNHA ET AL., 2012), which implied an increasing diversification of Chinese exports to the region and a direct competition of these products with those exported by the most complex economies in the region (Argentina, Brazil and Mexico). As Castilho et al. (2017) point out, the Latin American market is the main destination for Brazilian manufacturing exports, with emphasis on products of greater technological sophistication.[15] Between 2005 and 2013, the share of Chinese goods in Latin American manufactured imports grew, approximately, 10 percentage points, going from 8.3% to 18.2%, while the share of Brazilian goods fell from 6.4% to 4.5%.[16]

Castilho et al (2017) have shown that China was the major beneficiary from Brazil's loss of market-share in manufactured goods in the Latin American Integration Association (LAIA).[17] The authors demonstrate that Chinese manufactured products absorbed 62% of the Brazilian losses in the region between 2007 and 2013. Furthermore, they demonstrate

[15] In 2013, Latin America absorbed 28% of Brazilian manufactured exports, 41% of which were capital goods and transport materials.

[16] Source: Castilho et al (2017).

[17] This association comprises thirteen countries: Argentina, Bolivia, Brazil, Chile, Colombia, Cuba, Ecuador, Mexico, Panama, Paraguay, Peru, Uruguay, and Venezuela.

that the losses associated to China were concentrated in the machinery and transport material sector (67%), basic metallurgical industry (13%) and chemical industry (11%).

The configuration of all these factors presents mounting challenges for Brazilian development. In the last period, the only category in which the country gained competitiveness, PP, was the one that lost the most space in world trade. Furthermore, Brazil's most competitive category, RB, also lost ground. This indicates that world trade is moving towards goods in which the country does not have the necessary capabilities to face increased international competition. We can illustrate this by the Demand-Adaptability Index previously used. While the value of the index was 2.28 and 3.88 for the periods between 2003-2008 and 2008-2011, respectively, for 2011-2014 the index was 0.29, assuming its lowest value. This indicates that, in the last period, the market-share of non-dynamic goods in Brazilian composition was almost three times greater than that of dynamic products.

These results highlight the limitations of Brazil's international insertion over recent decades. When the country did experience rapid export growth, it was mostly driven by relatively inertial factors, with competitiveness gains contributing only at the margins. As this rising tide of growing international trade lifted Brazil's position, the country was incapable of accumulating sufficient competitiveness gains to weather the subsequent storm. When the international scenario turned to the worse, after the 2008 crisis but particularly after 2011, Brazil's manufactures were continually outcompeted by foreign competitors, particularly Chinese ones. Consequently, the country has been experiencing a deterioration of its international insertion, as it reinforces its specialization in unsophisticated goods, is displaced from international manufactures markets, and sees global demand moving away from the goods it produces at a comparative advantage. The tendency is for the balance-of-payments constraint to assert itself in the medium term, should the country's growth rate of domestic output pick up.

Final Remarks

Between 1995 and 2014, Brazilian exports experienced a phase of strong growth, reaching growth rates above those of the world. Importantly, the composition of the country's exports also changed, with basic goods becoming the main category. This growing dependence on commodities, referred to in the literature as a regressive specialization, had its counterpart in the falling share of manufactures not based on natural resources. As Chinese demand for resource-based goods and commodities grew, the prices of these goods rose, and their share of overall international trade increased. If the reprimarization of exports was thus not only a Brazilian phenomenon, it was nevertheless more intense in the latter.

This article analyzed the determinants of the growth of Brazilian exports between 1995 and 2014, using a novel method that decomposes a country's export growth rate into four components. The first is associated with the growth of the country's competitiveness in different goods. The second captures the dynamism of the export composition, indicating whether the country's exports are concentrated in goods that have gained or lost participation in world trade. The third represents the income elasticity of international trade and the fourth captures the effects of world income growth.

The results highlighted that Brazilian exports were driven by factors associated to the international scenario, with a limited – and occasionally negative – contribution of the competitiveness and composition effects. As such, the effects associated with the growth of international trade (income elasticity of international trade and world income) were, on average, the key determinants of export growth between 1995 and 2014. Composition and competitiveness gains had small but positive contributions until 2011, after which they turned negative and drove an overall decrease of Brazilian exports until 2014.

The good performance of Brazilian exports over the aggregate period was related to the increase in prices and world demand for goods in which Brazil was already specialized. The Demand-Adaptability Index was high between 1995 and 2014, indicating that Brazil had a higher market-share in categories that gained weight in international trade (PP, RB and HT) than in those that had lost space (LT and MT). As the country already had a revealed comparative advantage in the production of these goods (PP and RB), the change

in the composition of world demand boosted Brazilian exports and caused the country to increase its market-share for goods in which it was already specialized. This increased the share of primary products and resource-based manufactures in total exports, reinforcing the country's specialization in such goods.

As such, the fast growth of Brazilian exports until 2008 was essentially driven by relatively inertial factors, with competitiveness gains contributing only at the margins. The country was incapable of accumulating sufficient competitiveness gains to face changes in this scenario. After the 2008 crisis, Brazilian manufactured exports begun to lose ground in the two most sophisticated categories (MT and HT), being displaced by foreign competitors, particularly Chinese ones. Meanwhile the country continued to expand its exports of primary products and resource-based manufactures, depending even more on these goods and deepening its commercial specialization. All of this directly contributed to the process of regressive specialization of Brazilian exports, which was intensified since 2011.

Finally, the results for the last period indicates that world trade is moving towards goods that the country is not capable of producing, or in which it does not have a revealed comparative advantage, as evidenced by the Demand-Adaptability Index. Consequently, the country has been experiencing a deterioration of its international insertion, as it reinforces its specialization in unsophisticated goods, is displaced from international manufactures markets, and sees global demand moving away from the goods it produces at a comparative advantage. With commodities prices at a lower level and the loss of competitiveness of industrial products, Brazilian exports may not have the same dynamism of recent periods. As a result, if Brazil manages to increase its growth rate beyond current levels, the balance-of-payments constraint could soon arise once more as an obstacle to the country’s development.

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