THE DETERMINANTS OF THE LOW PARTICIPATION OF BRAZIL IN GLOBAL VALUE CHAINS

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ABSTRACT

There has been a growing trend toward the fragmentation of production processes across countries in Global Value Chains (GVCs) to the detriment of vertical specialization of production within individual nations. Brazil has presented low participation in these cross-border chains and there has been increasing interrogation of the causes and implications of this characteristic of the Brazilian economy. In this context, the paper assesses the determinants of the low participation of Brazil in GVCs through (I) characterization of the country's quantitative and qualitative pattern of integration into GVCs, and (II) analysis of elements that can explain this performance: protectionist policies, technological gaps, isolation from international trade agreements, low productive integration of Latin America and the Caribbean, as well as the so-called reprimarization of the Brazilian economy related to the effects of China's ascension.

1. INTRODUCTION

The fragmentation of production in GVCs challenges traditional thinking about the participation of countries in the international economy and imposes new constraints on the integration of countries across global trade.

The concept of "value chain" refers to the various production stages in which companies engage in order to provide products or services to the market, from their conception to their delivery as final products. Examples of these activities range from design and marketing to assembly, logistics, and distribution, and can be internalized by one company or coordinated among several (Baldwin and Venables, 2013; Backer and Miroudot, 2013; Kowalski et al., 2015). Technological advances across communication and transportation, as well as the reduction of trade barriers, have resulted in companies sourcing inputs from other countries, signifying the emergence of value chains as a global feature. The main objective of leading companies with the division of production into stages located outside their national territories is to reduce costs and improve quality. As a result, they are able to obtain final products

and services that are more competitive and to expand or maintain their position in the markets in which they participate.

The process of geographical fragmentation of production has gained in speed, scale and complexity since the end of the 1970s due to a significant reduction of the costs involved in business transactions. More reliable, dynamic and cost effective telecommunication systems; faster and safer means of transportation; liberalization of investments; a reduction in trade barriers; and the development of management software and powerful computers are examples of elements that have facilitated and potentiated the exchange and coordination of activities among companies distant from each other.

With this new global arrangement, significant changes started to take place in the international economy. Regions and countries have begun to enter the global market as producers of intermediate goods, which currently account for over 60% of world trade; specialization in specific parts and sub-processes has become a more competitive alternative to vertical integration of production within one country; and bilateral or regional trade agreements are slowly replacing multilateral negotiations.

Nations of South and South-East Asia provide examples of successful insertion into GVCs. The integration of their economies into world production began in low technology sectors with intense demand for low-skilled labor and, in some cases, natural resources. In some of these nations, upgrading in GVCs towards more advanced stages of production allowed consolidation of advanced technology sectors. Latin America and the Caribbean (LAC), on the other hand, has not had the same success: while 56% of total South and South-East Asian exports were integrated into GVCs in 2010, a level similar to that of all developed nations (59%), the corresponding percentage for all LAC nations was 40% (Zhang et al., 2014, using data from UNCTAD). Looking at specific nations from both regions and considering the 25 biggest exporters in 2010, the UNCTAD data also reveal that Singapore, Malaysia and South Korea had high rates of participation in GVCs, respectively 82%, 68% and 63%, while Brazil was the second lowest ranked nation, at 37%, ahead of only India.

This analysis must, nonetheless, take into account that insertion into GVCs is considered one factor of high potential impact on the development of small nations, due to their limited internal markets, which imply lesser conditions for the diversification of input production internally. In larger economies, on the other hand, the relative importance of GCV participation to economic development is smaller. This is because an internal market of significant dimensions, as well as making possible a greater variety and quantity of domestically produced intermediate goods, also allows for the use of more restrictive commercial and industrial protectionist policies which are inviable in smaller economies, such as local content policies (Gereffi, 2014).

A second important consideration is that GVC participation implies certain risks, such as that (I) nations which participate in the initial stages of these chains may never develop the autonomy and capacity necessary to create and commercialize goods and services led by their own companies; (II)

involvement in low value added activities may lock companies and national industries in non-lucrative and intellectually restricted segments; and (III) the greatest profits from the final product in transnational chains are concentrated among the leading companies, which control, for example, the brand and conceptualization of the product (Humphrey, 2004).

With these considerations in mind, it is argued that, although GVC participation is no panacea for development (Gereffi, 2014), especially for nations with diversified internal markets, discussion of a nation's integration into these chains is of great importance. This is due to the opportunity that such integration generates for the diversification of trade and, consequently, for job creation and productivity gains resulting from learning, technology transfer and knowledge diffusion. These gains arise from the fact that, as GVC transactions and investments are normally accompanied by quality control systems and predominant global business standards, nations which participate in these chains have the opportunity to acquire new competencies and skills (Sturgeon, Gereffi, Guinn and Zylberberg, 2013). These improvements in productive processes, in turn, may extend to other companies and sectors, not only exporters.

In fact, a study by the OECD, WTO and UNCTAD (2013) revealed a positive correlation between the GVC participation of developing nations and their GPD growth per capita: considering a 20-year period (from 1990 to 2010), economies with faster growth in GVC participation (top quartile of GVC participation growth) had a rate of GPD per capita growth approximately 2.5% greater than economies in the lowest quartile.

Thus, despite its relatively diversified productive structure, Brazil's low integration into GVCs has been suggested as one of the problems that may explain its persistent difficulties in sustaining economic growth, more than two decades after initiatives to open its economy at the beginning of the 1990s.

In this sense, analysis of the combined effects of protectionism and low involvement of the Brazilian productive sector in innovation, which has widened the technological gap, is fundamental to understanding Brazilian industry's low competitiveness and difficulties in international integration.

Beyond the question of technology, other factors have also hampered an increase in Brazil's participation in GVCs: isolation from new types of international trade agreements; the weak commercial and productive integration of the LAC region as a whole, given that GVCs are still primarily organized by regions; and the so-called reprimarization of the Brazilian economy, as a result, in large part, of the ascension of the Chinese economy and the intensification of primary product exports from Brazil to China.

In order to analyze each of these determinants of Brazil's low participation in GVCs and understand the impacts of its limited integration in world commerce, this article is structured in five sections, following this introduction. The second section presents a theoretical framework for the proposed discussion, with a literature review of definitions of different forms of GVC participation (backward and forward) and of its determining factors. The third section shows quantitative evidence of Brazil's limited

insertion in these transnational chains, using indices of backward and forward participation. The fourth section discusses certain characteristics of the Brazilian economy which shape its low integration in GVCs. The fifth section deals with global factors that influence Brazil's participation in these chains. The final considerations of the sixth section make recommendations regarding priority actions in order to boost Brazil's integration into GVCs.

2. THE PARTIPATION OF COUNTRIES IN GVCs: BASIC TIPOLOGY AND DETERMINANTS

Academic literature about GVCs (Baldwin and Venables, 2013; Backer and Miroudot, 2013; Gereffi et al., 2001) usually divides the participation of countries in GVCs into backward and forward linkages: backward refers to the participation of foreign inputs in national exports; forward refers to the portion of inputs produced in a country contained in third parties' exports.

A country that predominantly performs activities of product assembly and export of final goods is likely to present a higher level of backward participation. On the other hand, a country which concentrates on the supply of inputs to be assembled in other nations is likely to be characterized by a higher level of forward participation.

Each of these forms of engagement is determined by distinct elements, which may be structural factors of the economy or factors arising from trade or industrial policies. Kowalski et al. (2015) conducted an econometric study seeking to correlate the GVC integration index and various aspects of the economy. As a result, the authors propose a list of elements that have the greatest impact on the participation of a country in these GVCs due to the high statistical significance found in this correlation. The results of the authors' study are presented below, along with further explanations about the relevance of each of these factors to determine the participation in GVCs:

1 - Size of the internal market: positive correlation with forward participation index and negative correlation with backward participation index. The explanation is that the larger the domestic market, the greater tends to be (I) the variety and quantity of domestic intermediate products available for supply and demand, and (II) the amount of these products used in third parties' exports.

2- Import tariffs: negative correlation between import tariffs imposed on a country's exports and its forward participation index; negative correlation between tariffs imposed by a country on intermediate inputs and its backward participation. One of the characteristics that defines the GVCs (OECD, 2013) is that final exports increasingly incorporate intermediate imports, considering that the decentralization of production might generate potential productivity gains and higher competitiveness. Thus, the restricted access to such imported inputs, as a result of tariff and non-tariff protectionist measures, could result in a significant competitive disadvantage (Miroudot, Rouzet, Spinelli, 2013).

3 - Inward foreign direct investment (FDI) openness: positive correlation with backward participation. Reason: many foreign multinationals establish subsidiaries in other countries to import intermediate products, process and then export them.

4- Logistics performance, quality of infrastructure and quality of institutions: positive correlation with backward participation. The explanation of Kowalski et al. (2015) for this evidence is that companies face risks when producing abroad, such as the possibility of delays in the delivery of components, which may result in the interruption of production lines temporarily. Therefore, it is natural that such companies seek trade partners with an adequate logistics infrastructure, in order to reduce failures in the production and supply chain and various costs of stock maintenance, depreciation, cross-border handling, and coordination of production.

In addition, it should be noted that the reliability of high-performance logistic and infrastructure matches a broader framework of "institutional quality". This concept refers to the credibility of the government and national companies when it comes to fulfilling their commitments and agreements and it is also linked to the political and macroeconomic stability of the nation.

5- Investments in research and development (R&D) and intellectual property rights: positive correlation with backward participation given that a particularly important driver for upgrading in GVCs is the investment in knowledge-based capital and the existence of intellectual property rights. In Hausmann (2014), R&D activities are responsible for the creation of intellectual property, representing an important source of income and value added in the production process.

6- Preferential trade agreements (PTAs): positive correlation between the share of imports covered by PTAs and the backward participation index. The number of PTAs has increased mainly due to difficulties faced in multilateral trade negotiations, represented by the deadlock of the Doha Round negotiations, and the need to update the rules of international trade. In this context, the new PTAs are not limited to the scope of the World Trade Organization (WTO) agreements on market access through the reduction of tariff and non-tariff barriers to trade between the partners. PTAs often incorporate and promote new topics, such as harmonization of technical norms and standards, intellectual property, the openness of the service sector and investment. This contributes to reducing costs of transactions and to eliminating antagonisms in the regulatory framework of the signatory countries, which could create obstacles to the international fragmentation of production.

7- Location: negative correlation between backward participation and distance to the closest manufacturing hubs. The reason is that GVC activity is usually organized around large manufacturing hubs, as large industrial economies tend to develop supply chains in their trade and investment relationships with neighboring countries.

8- Degree of industrialization: positively correlated with the backward participation and negatively with forward participation. Reason: economies exporting raw products tend to have less

imported intermediates used in their exports, given the primary stage of processing in which these products are sold externally. On the other hand, forward participation tends to be higher, as these commodities are used as inputs into production processes in third countries and resold by them.

Aiming to apply the methodology developed by Kowalski et al. (2015) in order to understand the low integration of Brazil into GVCs and considering the diversity of the elements listed by the authors, it was decided to analyze in greater detail in this paper five of the eight aforementioned factors. Factor 1 (market size) will not be taken into consideration because it is a structural element of the Brazilian economy. Discussions on the openness to FDI (factor 3) and on the quality of the logistics infrastructure and institutions (factor 4) require an assessment that exceeds the limit of a single academic paper. Further, these discussions involve themes that are strongly connected to each other, due to the impacts of the Brazilian institutional framework on openness to FDI and on the capacity of the country to attract this kind of investment. Thus, factors 3 and 4 will be analyzed in a thorough manner in another paper.

The other factors will be discussed throughout this paper considering their implications for increasing Brazilian competitiveness in the international market. Section 4 assesses market conditions for the development of business competition, in light of factors 2 and 5. In this sense, the discussion of the different types of tariff and non-tariff protectionism (factor 2) associated with the acquisition of technological competencies (factor 5) is necessary in order to understand the Brazilian competitive dynamic. The fifth section analyzes the way in which elements related to the country's ability to negotiate trade agreements at the international and regional level have or have not promoted a greater integration of the national productive sectors into GVCs. Thus, factor 6 is addressed in the discussion of Brazilian isolation from new international trade agreements (section 5.1); the question of location (factor 7) is covered in section 5.2, discussing the low trade and productive integration of Latin America and the Caribbean; and finally, factor 8, on the degree of industrialization, is analyzed in section 5.3, which evaluates the impacts of trade relations with China on Brazilian deindustrialization and on Brazil's pattern of integration into GVCs.

3. QUANTITATIVE EVIDENCE OF LOW BRAZILIAN PARTICIPATION IN GVCs

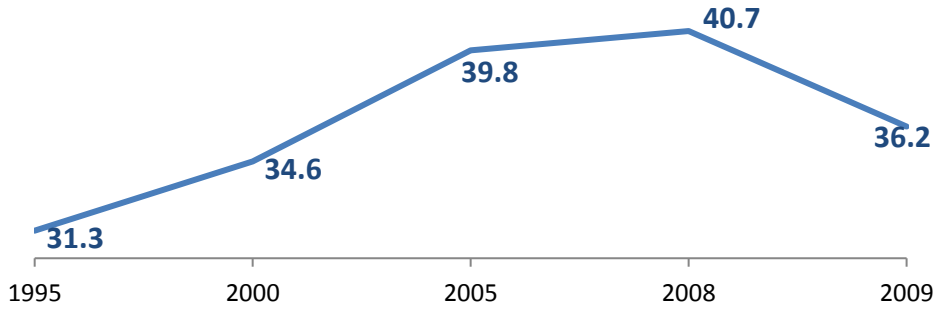
In 2013, the WTO and OECD jointly launched an index to measure the forward and backward participation of countries in GVCs[1]. Data consolidation is still in progress and the latest year available is 2009. Despite this, the numbers available provide an overall view of Brazil's participation in GVCs and

[1] The index of backward and forward participation is based on Koopman et al. (2010). The methodology used by the authors consisted of decomposition of gross exports into value added shares by source country. As a result, the authors developed a matrix that enabled them to obtain the contribution of foreign industries to exports and the contribution of domestically produced intermediates to exports in third countries. The general GVC participation index simply adds the backward and forward participation and is expressed as a share of gross exports.

enable us to observe its historic evolution from 1995 to 2009 and to draw a comparison with the results of other countries.

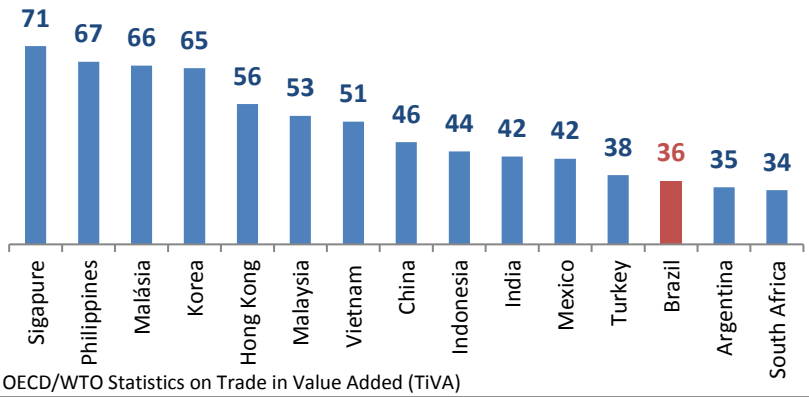
Figures 1 and 2 show that Brazil is behind many developing countries (selected from the list of the 25 largest developing economies) when it comes to its participation in GVCs. In 14 years, the country had a minor increase in its participation, rising until 2008, before declining in the years that followed.

Figure 1: GVC participation index - Brazil



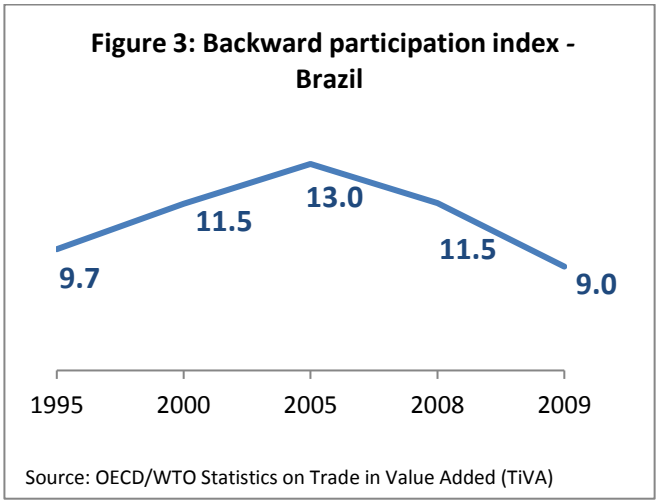
Source: OECD/WTO Statistics on Trade in Value Added (TiVA)

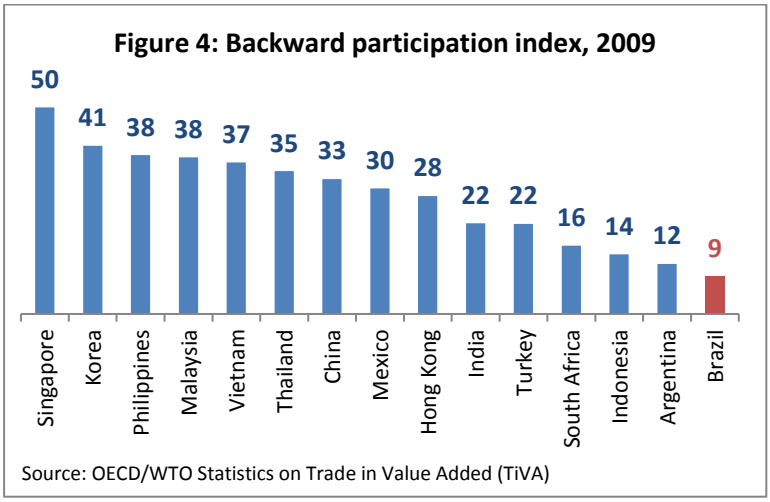
Figure 2: GVC participation index, 2009

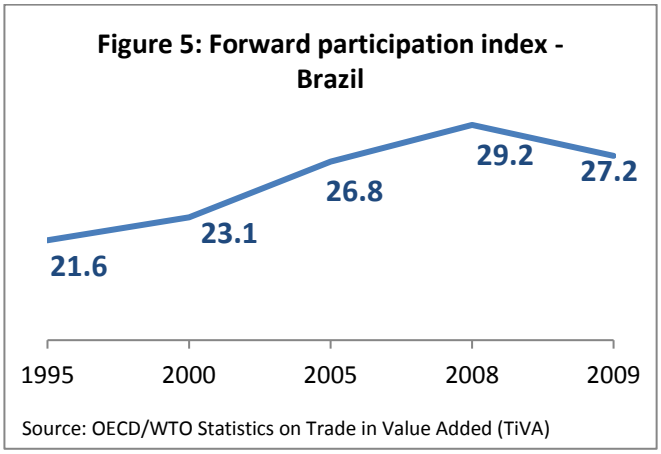


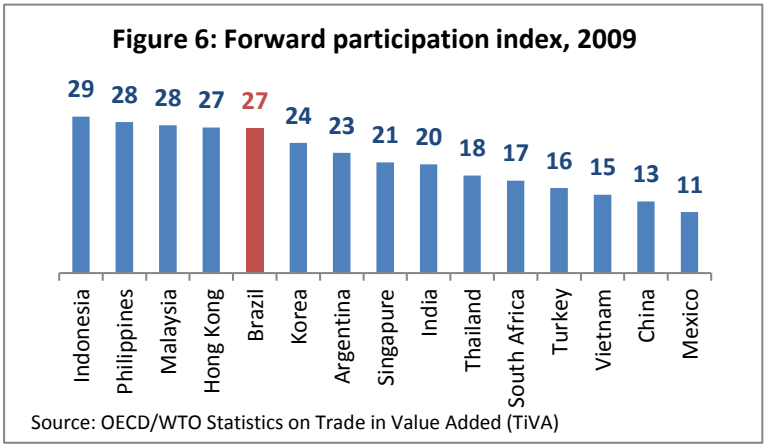
Source: OECD/WTO Statistics on Trade in Value Added (TiVA)

By decomposing the index in backward participation (Figures 3 and 4) and forward participation (Figures 5 and 6), it is observed that the most critical point for determining the low participation of Brazil in GVCs is the modest use of foreign inputs in its exports. In turn, the share of Brazilian inputs in the exports of third parties is relatively high. This can be explained, mainly, by the high relevance of primary goods exports in the national economy, which are subsequently processed by other countries.







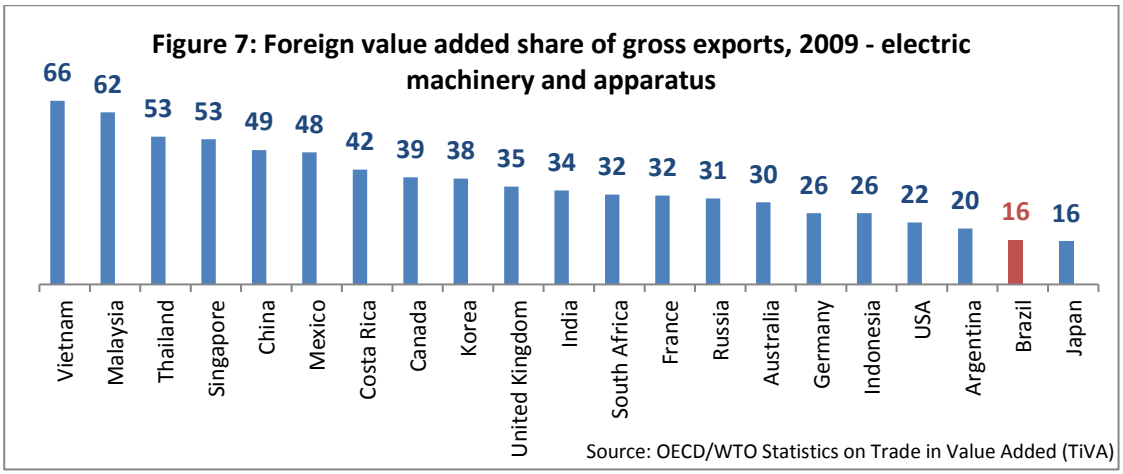


Both the backward and forward index show a decrease from 2008 to 2009. In the backward, however, this declining trajectory had been underway since 2005, while in the forward it started in 2009.

One of the factors that may explain the decrease both in the forward and backward index from 2008 to 2009 is the global economic crisis, because it was exactly during this period that the largest drop in Brazilian exports (as a result of a decrease in world demand) was observed, together with a decline in the country's imports. However, the element that could justify the decrease of the backward participation also since 2005 is the intensification of the relative primarization of Brazilian exports, with increasing participation of products which require fewer imported inputs, such as the external sale of commodities in a primary stage of processing.

Another proxy variable that can be used to measure Brazil's backward participation in GVCs is the foreign value added in exports. For a country with average levels of technological sophistication and income, such as Brazil, one would expect to see relatively high foreign value added in the export of medium and high technological products. This is due to the fact that for these goods, competition imposes prices and technological standards that are unlikely to be reached in case of majoritarian dependence on local inputs and equipment. Lower values, on the other hand, indicate a high density in domestic production chains and are expected in technologically advanced economies (Kowalski et al., 2015).

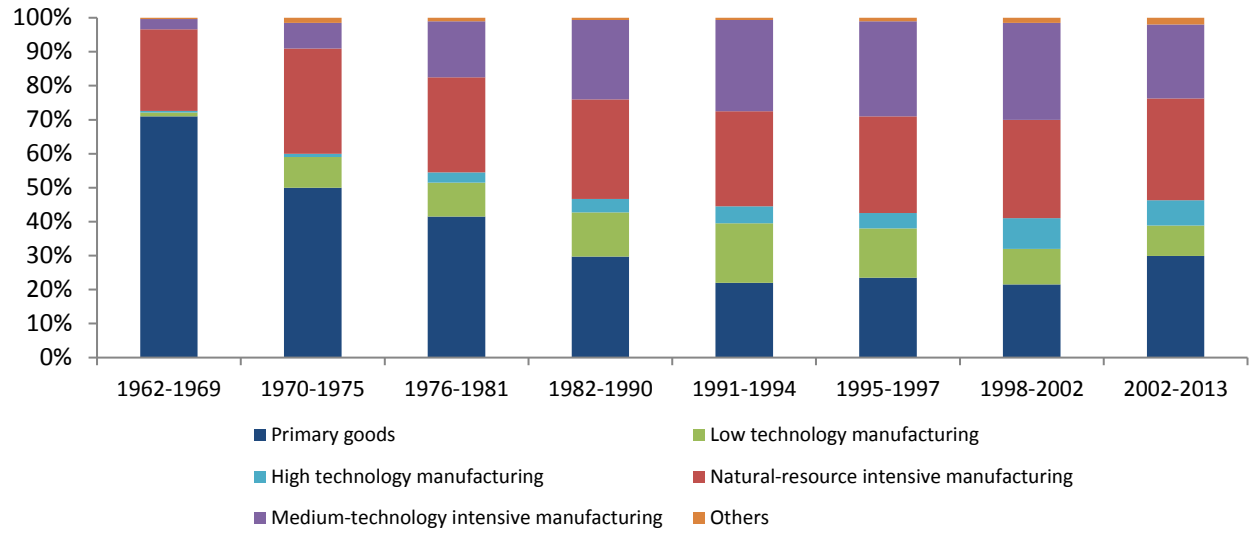
Figure 7 shows the index of foreign value added in exports of electrical machinery and apparatus, a sector of medium-high technology intensity according to the OECD classification. The six largest indices correspond to countries with average levels of technological sophistication, while the three largest exporters of manufacturing products present relatively low indices – Japan, United States and Germany. The Brazilian index is the lowest in Figure 7 and resembles Japan's result, suggesting a low backward engagement in GVCs and the risk of low capacity to compete in the export of these medium-high technology manufactures.



In addition to discussing Brazil's degree of engagement in GVCs, it is also important to make a brief qualitative analysis of the country's participation. As mentioned previously, with few exceptions, the role of a supplier of primary products to be processed by foreign companies prevails over that of an exporter of products with higher added value.

Between 2003 and 2013, primary products and natural resource intensive manufacturing accounted for about 60% of the country's exports, an amount that has increased in relation to the previous decade (refer to Figure 8). In 2014, primary products represented 48.7% of Brazilian exports, while manufacturing products amounted to 36.3%, according to the Brazilian Ministry of Development, Industry and Foreign Trade (MDIC). In addition, the share of manufacturing in gross domestic product (GDP) also dropped from 18.5% in 2004 to 13% in 2014, according to the Federation of Industries of the State of São Paulo (FIESP).

Figure 8: Brazilian exports



Source: UN Comtrade

Thus, Brazil's participation in GVCs is not only limited, but also consists mainly of raw material supply for production processes. The risks related to this regressive specialization of Brazilian exports are many, such as the excessive instability of the economy due to commodity price volatility (Larrain, Sachs, Warner, 1999), as well as the adverse effects on the exchange rate as a result of the so-called Dutch disease.

4. DOMESTIC CONDITIONING FACTORS OF THE LOW PARTICIPATION OF BRAZIL IN GVCs

This section discusses how two of the determinant elements of participation in GVCs are manifested in the Brazilian economy and how they are interrelated with each other: tariff and non-tariff protectionism and low technological dynamism.

4.1 TRADE PROTECTION AND ITS IMPACTS ON BRAZILIAN INDUSTRIAL COMPETITIVENESS

The industrial policy of tariff and non-tariff protectionism, as presented by Carneiro (2014), has hindered the entry of foreign intermediate products into Brazil and, as a result, has created obstacles and difficulties for the country's insertion into GVCs.

As shown in Table 1, Brazil has had higher average import tariffs compared to other developing countries, both with regard to the total of imported products and, in particular, to intermediate goods. Between 2003 and 2010, the average import tariffs in Brazil varied little, decreasing from 13.6% to 12.7%, while in Mexico they fell from 18.0% to 6.9%, in Argentina from 14.5% to 10.4% and in China from

11.3% to 8.1%. In 2012, the average import tariff of Brazil's main competitors was between 4.5% and 9%, while that of Brazil was significantly higher, at 12.9% (Carneiro, F., 2014).

Table 1: Evolution of tariff protection - simple average

TOTAL										
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Argentina	14.55	10.45	9.35	9.41	9.45	7.62	7.65	10.42	7.73	7.77
Brazil	13.62	12.36	11.48	11.29	11.31	12.19	12.66	12.77	12.81	12.96
China	11.33	10.49	9.67	9.42	8.97	8.7	8.25	8.08	8.34	
Colombia		11.4	11.37	10.71	10.17	10.09	10.15	10.73	6.62	5.05
India		29.05	17.41		15.88	11.37	11.56			
Indonesia								4.23	4.56	
Malaysia	7.3		7.44	6.1	5.61	5.17	4.85			
Mexico	18.09	8.04	7.29	6.26		5.29	4.55	6.96		
Philippines					5.19	5.33	5.34	5.3		
Korea		11.7		11.74	11.31		11.21	12.22		
Thailand	13.48		10.42	10.38	9.25	9.16	9.22			
INTERMEDIATE PRODUCTS										
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Argentina	12.37	9.84	8.68	8.71	8.83	7.57	7.52	9.37	7.72	7.69
Brazil	12.01	10.84	9.87	9.78	9.86	9.95	10.64	10.75	10.82	10.96
China	9.44	8.85	8.03	7.88	7.55	7.3	6.86	6.7	6.93	
Colombia		9.92	9.98	9.38	8.93	8.87	8.84	9.35	5.06	3.13
India		28.52	16.48		14.62	9.36	9.55			
Indonesia								3.72	3.98	
Malaysia	6.56		7.49	6.13	5.68	5.45	5.07			
Mexico	15.25	6.35	5.58	4.71		3.59	3.07	4.35		
Philippines					4.1	4.22	4.2	4.17		
Korea		10.06		10.11	9.67		9.61	10.34		
Thailand	10.36		6.09	6.09	5.05	5.03	5.07			

Source: Carneiro, F., (2014) using data from TRAINS/UNCTAD

On the non-tariff barrier side, Brazil again showed a high degree of protectionism. Between January 1995 (the year of Brazil's entry into the WTO) and 2014, 2,111 non-tariff measures were notified to trade partners and entered into force (Table 2). Among the countries shown in Table 2, this quantity is only below that of China (2,148 non-tariff measures), a country that has a trade flow almost 10 times larger than that of Brazil, which joined the WTO six years after Brazil (in 2001), and whose economy is still considered "market socialism".

Table 2: Non-tariff barriers to trade - iniciated and entered into force measures

Rank	Country	Antidumping	Countervailing measures	Import Licences	Quantitative Restrictions	Safeguardas	Sanitary and phytosanitary measures	Safeguards measures	Technical barriers to trade	Tariff quotes	Export subsidies	Total	Trade flow in goods - 2014 (US$ Bi)
1	China	212	7	4	21		841		1.053	10		**2.148**	4.301,7
2	Brazil	334	10	2		4	1.014		730	1	16	**2.111**	464,3
3	Korea	93		14	3	4	488	80	638	67		**1.387**	1.098,2
4	India	651	2	3	59	39	93		91			**938**	784,6
5	Mexico	134	10	2		2	273		459	11	5	**896**	809,1
6	Argentina	237	3	19		6	179		341			**785**	137,3
7	Colombia	67		6		7	255		253	58	18	**664**	118,8
8	Philippines	6		38	6	11	266	7	243	14		**591**	129,6
9	South Africa	162	6	10		3	37		231	53	62	**564**	213,0
10	Malaysia	63		15		2	33		210	13		**336**	443,0
11	Indonesia	84		2		26	98		92	2	1	**305**	354,5
12	Russia	6		1		1	14		74			**96**	805,8

Source: WTO

A specific type of barrier that has been commonly used in Brazil is the requirement for minimum local content. Policies of this type have been applied to various sectors of the Brazilian economy, such as petroleum and gas, with the objective of using incoming foreign investment to increase the participation of national industry in the supply of goods and services, generating employment and income. This paper argues that such policies are not necessarily inconsistent with Brazilian participation in GVCs, since they can be designed in such a manner as to attract investment, stimulating projects in partnership with local suppliers and aiming for transmission of technology and knowledge (Pereira, 2014).

However, the manner in which local content policies have been adopted in Brazil has been heavily criticized. For Araújo Jr (2015), a peculiarity of local content policies in Brazil is the use of a Basic Productive Process (BPP)[2] criterion for the concession of federal, state and municipal fiscal concessions. At issue is the fact that the BPP of each product is defined not by government, but rather by the company interested in obtaining the fiscal incentive.

In order to be efficient, Brazil's local content policy therefore needs to be reexamined, with a focus on encouraging partnerships that result in learning and technology transfer, not merely on guaranteeing the purchase of Brazilian products and on fiscal incentives.

The numbers and information presented above reveal, therefore, that strongly protectionist policies persist in Brazil, which may lead to a lack of incentives for the development of new and competitive technological skills, as well as competitive difficulties in export markets. As mentioned above, this is due to the fact that tariffs and other import barriers have the effect of hampering the entry of intermediate goods, being, in effect, taxes on exports (Carneiro, 2014). Thus, the critical element that may result in a lack of competitiveness is not in itself the low uptake of foreign inputs in products for export, but rather the producer's inability, in practice, to make a free decision regarding whether to use domestic or foreign inputs, as a result of the drastic price differences between them.

4.2 INNOVATION, RESEARCH AND DEVELOPMENT AND INTELLECTUAL PROPERTY – DESIGN ELEMENTS FOR INDUSTRIAL AND INNOVATION POLICY

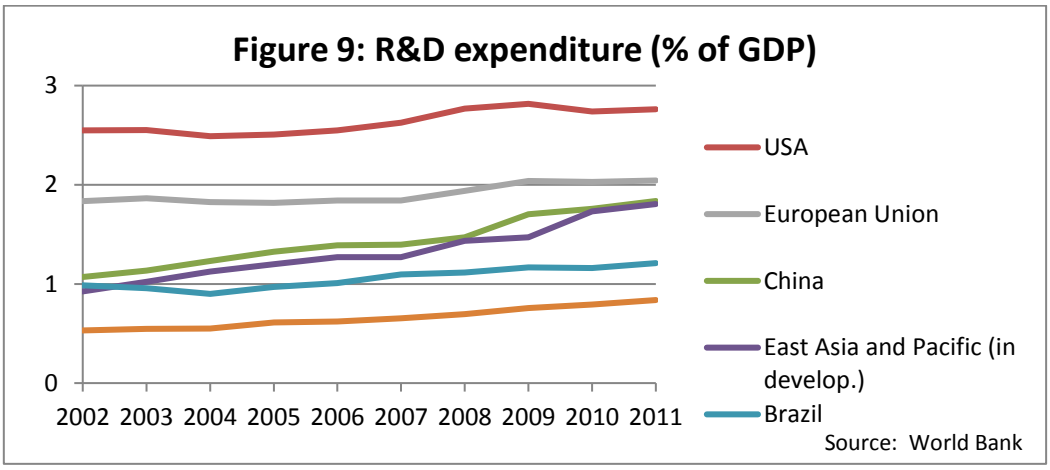
A second factor that must be taken into consideration in order to analyze Brazil's participation in GVCs is the low technology intensity of the Brazilian productive structure, which has led to a technology gap between Brazil and developed economies, even in more traditional sectors in which Brazil could be expected to have a certain degree of technological competency, such as plastics and rubber, metallurgy and food and beverages.

A central question for the analysis of a nation's efforts to innovate, with the objective of stimulating competitiveness, is expenditure by the productive sectors of the economy on R&D. By comparing R&D

[2] The definition of BPP was established by Federal Law 8387 of 1991, as 'the minimum set of operations in the manufacturing sector that characterizes effective industrialization of a determined product'.

expenditure in different economies, especially among nations in different stages of development, it is possible to perceive the relevance of the technological dimension to increases in national competitive capacity. For Dori et al. (2014), an economy's engagement with technological activity is a critical element in achieving or strengthening market share for the nation's exports and, in this manner, increasing its capacity to compete in external markets.

In this sense, a comparison of Brazil's R&D expenditure with that of its international competitors serves as an indicator of the nation's low competitive capacity: as shown in Figure 9, Brazil's R&D expenditure, at 1.2% of GDP in 2011, was below the average of developing nations of East Asia and the Pacific and slightly higher than the average for the Latin America region.



The Brazilian results of R&D expenditure, which can be measured by the country's number of patents in operation or by the country's capacity for innovation, are also less than satisfactory. Brazil is poorly ranked in The Global Innovation Index 2015, occupying the 70th position among 141 nations, behind other nations of its own region, such as Chile (42nd), Colombia (67th) and Uruguay (68th). When considering the relationship between R&D expenditure and patents in operation, Brazil continues to underperform other nations, both developed and developing. The number of patents in operation is some 50 times greater in the United States, 40 times in Japan, 16 times in South Korea and China and 13 times in Germany (Table 3).

Table 3: Patents in force X R&D expenditure, 2011

Country	Patents in force	R&D expenditure (% of GDP)
Germany	527,917	2.89
Brazil	41,453	1.21
China	696,939	1.84
Korea	678,005	4.04
USA	2,113,628	2.73
Japan	1,542,096	3.39

Source: WIPO

One factor which may explain differences in these measures between Brazil and other nations mentioned above is the participation of private finance in R&D, which is significantly higher in the latter (84% in Japan, 78% in China, 75% in South Korea, 70% in Germany, 63% in Chile and 58% in Colombia, compared with 47% in Brazil)[3]. Private participation in R&D expenditure is key to increasing innovation, given that patents, one of the principal outcomes of R&D expenditure, are typical products of the business environment and an important instrument to increase company competitiveness.

To illustrate the relationship between Brazil's low level of innovation and its competitive difficulties, a comparison was undertaken between innovation effort in Brazil and in a highly developed nation, Germany (Figures 10 to 12). R&D expenditure in the two nations was compared with their participation in world export markets, as well as with labor productivity[4]. Data were obtained for different sectors of economic activity, which were selected based on their level of technology intensity, according to the classification of the OECD. The following sectors were selected:

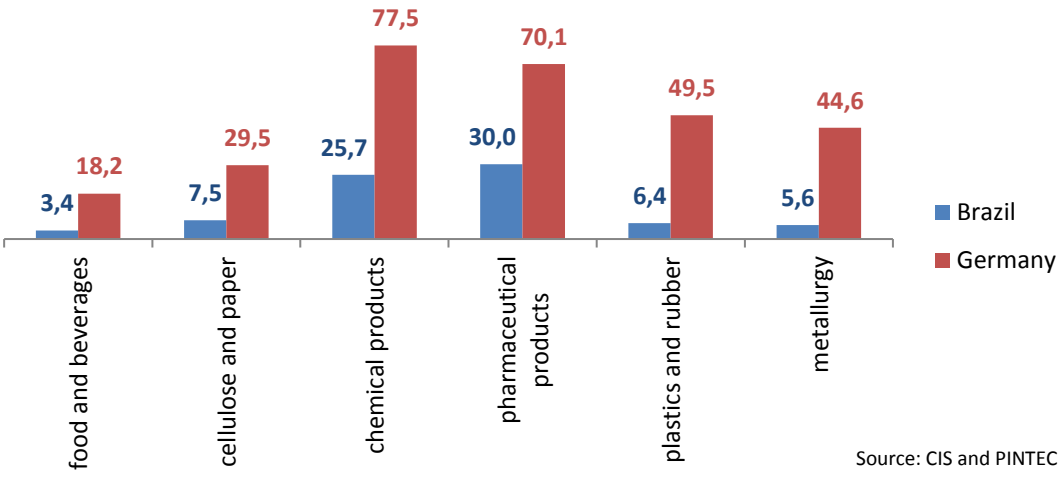
(a) High technology intensity: (i) pharmaceutical products;

(b) Medium-high technology intensity: (ii) chemical products;

(c) Medium-low technology intensity: (iii) metallurgy; (iv) plastics and rubber;

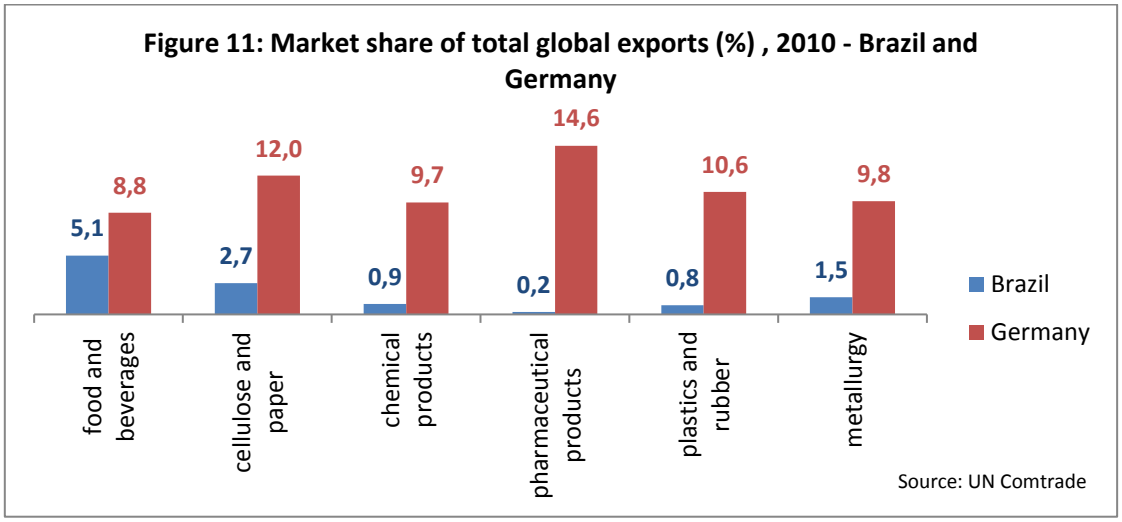
(d) Low technology intensity: (v) food and beverages; (vi) cellulose and paper.

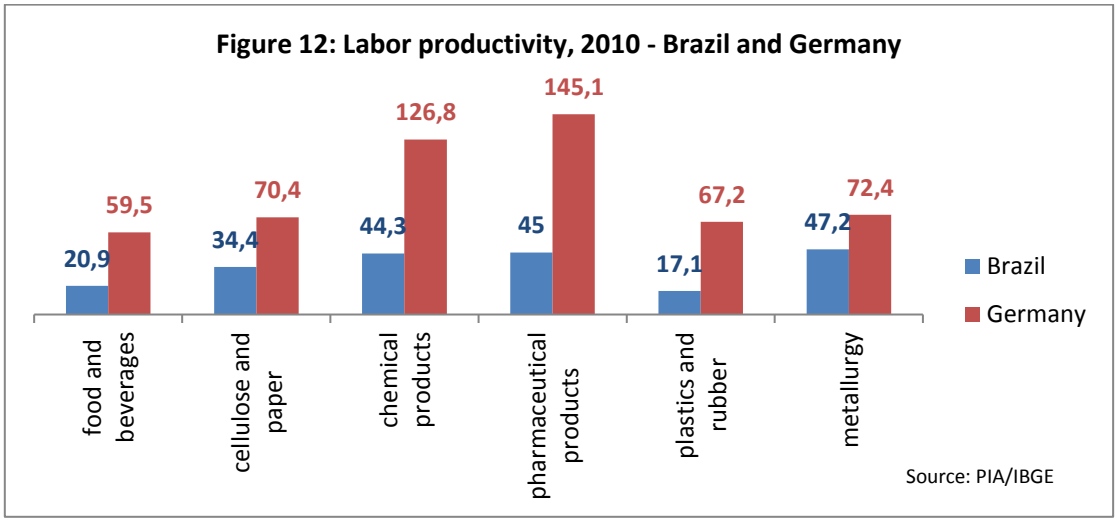
Figure 10: Percentage of companies that undertake internal R&D activies (%), 2010 - Brazil and Germany



[3] Data for the United States and Uruguay were not available.

[4] Labor productivity was determined as the relationship between the value of industrial transformation (VTI) – the difference between the gross value of industrial production and the costs of industrial operations – and the number of personnel employed in industry. VTI was deflated by the wholesale price index (IPA – industrial products), for Brazil, and by the Industrial Producer Price Index, in Euros, for Germany.





The data in the three figures above show large technological difference between the Brazilian and German economies in terms of the percentage of companies that undertake internal R&D activity (Figure 10). In the chemical products sector, this percentage is three times higher in Germany than in Brazil. Considering low technology intensity sectors in which Brazil is relatively blessed with natural resources, such as metallurgy, the technological gap is likewise considerably pronounced. In this sector, the percentage of companies that undertake internal R&D activity is eight times higher in Germany than in Brazil.

Although econometric studies are needed to demonstrate the relationship between low innovation effort and weak competitive performance, Brazil's low presence in world exports (Figure 11), especially in medium-high and high technology intensity sectors, indicates that efforts should be pursued to try to improve the nation's technological and competitive performance. The limited market share of Brazilian exports of low technology content is also noteworthy. In the cellulose and paper and metallurgy sectors, for example, Brazil is expected to be highly competitive given both the technological maturity of these industries globally and Brazil's long development of the sectors domestically. However, Brazilian market share of total global exports is below 5% (2.6% for cellulose and paper and 1.5% for metallurgy), while

German participation in the two sectors is 12% and 11% respectively. In sum, as a result of its technological lethargy, Brazil is unable to position itself as a significant competitor in the international market even in sectors in which it has some degree of productive skill.

Further evidence of the low competitiveness of the Brazilian economy can be found by comparing levels of labor productivity between the two nations. Brazil's low productivity is characteristic of all the sectors analyzed above, including those of low technology intensity (Figure 12).

One factor that explains Brazil's weak integration in international markets is the lack of consolidation of its private sector as a key element of the national innovation system, as briefly mentioned above. In the absence of a technologically dynamic private sector, Brazil has tended to fail in its efforts to promote the conditions necessary for economic development by way of fostering investment and innovation (Reiner and Staritz, 2013; Reinert, 2007).

According to Reiner and Staritz (2013), one of the challenges that must be met by industrial policy makers in developing nations is the promotion of greater strength in technological skill in the private sector, encouraging leading companies to pursue modernization efforts in local production. This is due to a recognition that private agents are the fundamental element of economic dynamics in capitalist economies and, in this sense, the result of their actions reflects the competitive conditions of the nation (Gadelha, 2001).

Thus, the State's fostering of innovative activities by private agents should be incentivized as a direct form of action for industrial transformation and the promotion of economic development, creating conditions for domestic companies to compete in international markets with companies at the forefront of technology.

5. GLOBAL CONDITIONING FACTORS OF THE LOW PARTICIPATION OF BRAZIL IN GVCs

This section discusses global aspects that impact Brazilian participation in GVCs: section 5.1 analyzes Brazil's isolation from new international trade agreements; section 5.2 addresses the regional factor related to the low productive and trade integration in Latin America and the Caribbean; and section 5.3 presents the impacts of the bilateral trade relations with China on the pattern of Brazilian insertion into GVCs.

5.1 ISOLATION OF BRAZIL IN INTERNATIONAL TRADE AGREEMENTS

The small number of international trade agreements in which Brazil is a signatory, the low representation, in general, of these agreements in the country's foreign trade, and the little-elaborated and innovative character of their contents are factors that negatively impact Brazilian participation in GVCs.

First, the low number of signed agreements is explained by the fact that Brazil has prioritized the multilateral sphere as the main forum for international trade negotiations, because the country believes that this framework provides better conditions for developing nations to coordinate their positions, increasing their bargaining power relative to the interests of developed countries. However, the Brazilian strategy was undermined by the Doha Round deadlock at the same time that large economies began to give priority to PTAs as the main regulatory source of international trade, given their greater agility in the negotiation.

Regarding the representativeness and character of Brazil's existing agreements, in the regional vector, MERCOSUR is the main project of Brazilian trade integration. The following trade agreements are currently in force between the members of MERCOSUR and: (i) Chile; (ii) Bolivia; (iii) Mexico (general); (iv) Mexico (automotive industry); (v) Peru; (vi) Colombia, Ecuador and Venezuela; and (vii) Cuba. Brazil also signed agreements with (i) Guiana and (ii) Suriname (only rice).

Overall, these regional agreements provide for a wide margin of tariff preferences to be granted to a significant number of products (Thorstensen, V. et al., 2013), as shown in Table 4. Consequently, Brazilian exports have gained greater access to some important markets to the country's trade agenda. Together, they represent about 10% of the Brazilian export destinations, according to the MDIC data.

Table 4: Tariff preference to Brazilian exports

	Tariff rate - simple average (%)	Average margin of preference (%)*	Number of sectors
Argentina	0.01	100	92
Bolivia	0.11	97.29	88
Chile	0.19	99.91	93
Colombia	2.1	76.51	89
Equator	5.34	53.58	71
Paraguay	0.18	99.09	92
Peru	1.47	58.47	80
Uruguay	0.16	99.14	95
Venezuela	3.92	-	-

* Difference (in %) between tariff applied to Brazil and the most favored nation tariff (MFN)
Source: Baumann, R., Ceratti, R. (2013)

Regarding the content of the regulatory framework of these agreements, however, nothing new has been presented in relation to the rules already laid down in the WTO agreements. There was also no evidence of the approach of new themes.

In the extra-regional vector, Brazil and MERCOSUR have PTAs signed with India, Israel, the South African Customs Union (SACU), Egypt, and Palestine, of which only the first two are currently in force. The participation of these countries in Brazilian exports is also variable, being relatively relevant in the case of India (2.13%) and Egypt (1.03%), but small in the case of Israel (0.18%), Palestine (0.01%) and SACU (0.56%), according to the MDIC data. The terms of the agreements are also less innovative.

From the facts mentioned above, it is observed that Brazil has two major challenges when it comes to international trade agreements. The first is to advance in the themes brought forth by them so that they are not limited to tariff liberalization and other issues already covered in the scope of the WTO. The second challenge is to maintain (in the case of regional integration) and expand (in the case of extra-regional integration) the condition of the tariff preference granted to Brazil. In Latin America, despite relevant preferences given to Brazil in a region whose participation in the Brazilian trade agenda is of major importance, the proliferation of PTAs involving Latin American countries, but without the participation of Brazil, threatens to undermine Brazil's tariff preferences. It is noteworthy that the loss of preference in these markets may have a negative impact on the Brazilian manufacturing sector, considering that approximately 77% of Brazilian exports to Latin America are precisely those same manufactured products (MDIC).

Within the extra-regional scope, the overall risk arising from the isolation is, in addition to the tariff competitive disadvantages, that the country also bears the burden of identifying and complying with the various regulatory subsystems brought upon by these new agreements, while the exporters who wish to access the Brazilian market may do so by relying on the multilateral rules (Thorstensen, V. et al., 2013).

Thus, the country needs a far more aggressive strategy in its commercial diplomacy regarding the negotiation of trade agreements, in order to avoid an increasing loss of ground in tertiary markets and its leading role in international trade decisions.

The Brazilian effort is currently focused only on the presentation of a proposal for a free trade agreement between MERCOSUR and the European Union, with limitations imposed mainly by Argentina. No other relevant initiative in bilateral agreements involving Brazil is in progress. The country is therefore dependent on the success of an extremely complex agreement (due to a large number of countries involved) and whose negotiation and conclusion is not a priority for the European Union, given its current focus on the Transatlantic Trade and Investment Partnership.

5.2 THE REGIONAL FACTOR: LOW TRADE AND PRODUCTIVE INTEGRATION OF LATIN AMERICA AND THE CARIBBEAN (LAC)

As explained in section 2.1, GVCs are currently formed primarily at the regional level. LAC, however, has a low productive integration, with negative impacts on Brazil's engagement in CGVs. Two main factors explain this weak productive integration: the low level of trade complementarity between countries in the region; and the lack of a strong, efficient and comprehensive trade agreement on regional economic integration.

5.2.1 Low trade complementarity level and the absence of a regional manufacturing hub

Given the abundance of natural resources in LAC countries and, consequently, the comparative advantage in the production of primary products, there is a common supply of raw materials among Brazil and its neighbors, especially South American countries. This common supply of basic goods is combined with the absence of a broad trade network of manufacturing products in the region and also with the absence of a manufacturing hub that could centralize the demand for primary goods within LAC. Thus, this is a structural factor that determines the low trade complementarity in the geographical region where Brazil is situated and contributes to a low productive integration since the countries that produce primary products in common tend to have a lower level of fragmentation of production among them. This is explained by the fact that, considering the lower level of processing of primary products compared to manufactured products, the input exchange among its producers becomes relatively less relevant.

This scenario of low commercial complementarity and weak productive integration is reflected in the low percentage of intraregional trade in LAC as compared to other groups of countries: while in the LAC region, intraregional trade accounts for only 18% of its total exports, this figure escalates to 63% in the European Union and 50% in the ASEAN + 5[5] and NAFTA groups, according to the Economic Commission for Latin America and the Caribbean (ECLAC).

In addition, the share of parts and components in intraregional trade is only 9% in LAC, significantly below the European Union (17%), ASEAN + 5 (37%) and North American Free Trade Agreement (NAFTA0 (18%), also according to ECLAC.

It should be further noted that, as mentioned in the beginning of this section, the physical-natural availability of primary resources in the region is not the only factor that contributes to a low trade complementarity and weak productive integration in the region, but also the absence of a strong manufacturing hub. Unlike the United States in North America, Germany in Europe, and Japan and China in Asia, LAC has no 'headquarter' economies. The presence of a strong manufacturing country can play a key role in creating and promoting trade complementarity and productive integration. This is because their ability to invest in and open subsidiaries in neighboring countries to meet the demand for inputs for the industry can make each country specialize in specific components, exporting these parts to other multinational factories and at the same time importing inputs from them that are not produced domestically.

5.2.2 Lack of comprehensive and efficient economic and trade integration agreements

LAC countries are not integrated into a regional trade agreement, but rather they are interconnected by a complex web of multiple agreements, each of them with its own trade standards. This can result in

[5] The Association of Southeast Asian Nations, a group comprised of Indonesia, Malaysia, the Philippines, Singapore and Thailand.

variable rules applicable to each country, depending on agreement signed, causing institutional disorder and hindering the productive integration in international chains.

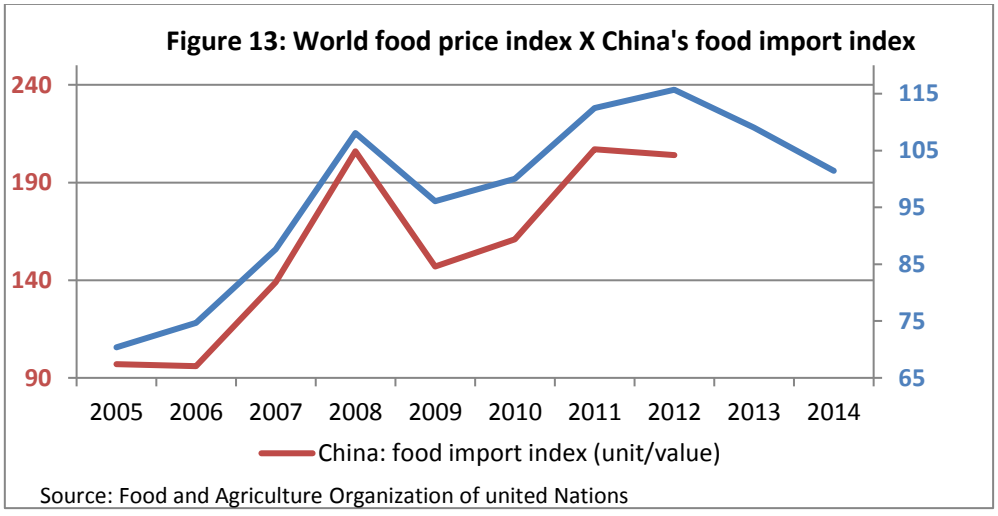
The strongest of these agreements exclusively involving LAC countries is MERCOSUR. However, free trade within the bloc does not take place as freely as it might due to delays in the trade liberalization schedule and barriers maintained by country members, such as exceptions to the granted preferential tariffs, non-automatic import licenses, and non-internalization of negotiated commitments.

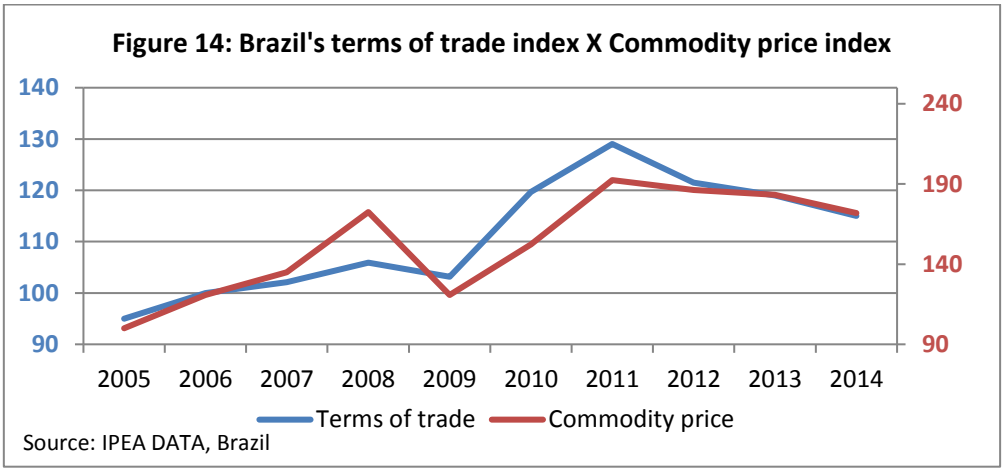
As a result, this lack of integration and coordination of LAC countries into an efficient trade agreement that encompasses a large number of countries is reflected in a high cost of intraregional trade, discouraging the formation of Latin American production chains.

5.3 THE CHINA EFFECT AND THE DEINDUSTRIALISATION OF THE BRAZILIAN ECONOMY

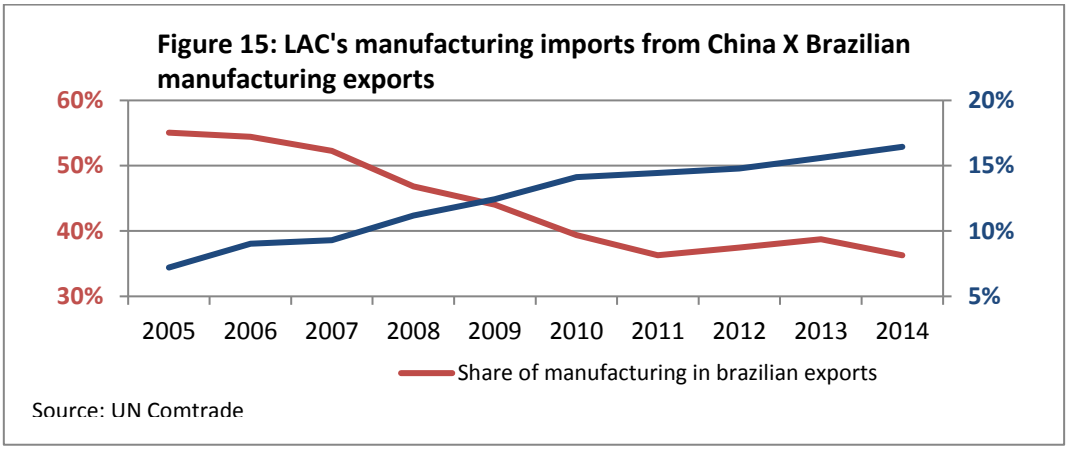
This section aims to discuss briefly how the deepening of trade ties between Brazil and China and the rise of this new Asian economic superpower has contributed to the so-called reprimarization of Brazilian exports and deindustrialization in Brazil, in particular since 2006. As discussed in Section 2, these two processes are significant in determining the pattern of Brazil's engagement in GVCs (it was observed a positive correlation between the level of industrialization and the backward participation and a negative correlation with the forward participation).

On the one hand, China's economic growth has given rise to an increased demand for raw materials, increasing both their prices and the income of countries producing these primary goods (see example in the food commodity market in the Figure 13, which establishes a correlation between the increase in the food world price index and the rise in Chinese imports of these products, especially between 2005 and 2011). Brazil, in particular, benefited from the general rise in commodity prices until 2011, with its terms of trade improving until that year (Figure 14).





On the other hand, China's comparative advantage in the production of manufactured goods (advantages that are driven mainly by low wages and an undervalued currency) allowed the country to gain ground in the markets for industrial imports, including, among these, the LAC countries. Struggling to fight the competitiveness of Chinese products, Brazil lost its market share of manufacturing in the LAC region, its main export destination for these products. Figure 15 shows the fall of the share of manufacturing in Brazilian exports parallel to the increase in the Chinese exports of these manufactured products to LAC.



Therefore, this trend of the rise in commodities prices, combined with the increase in exports of Chinese manufactured products to LAC, led to a rise in the share of natural resources, i.e., with lower technological level, in Brazilian exports, to the detriment of the share of manufactured products, with higher levels of technology.

Finally, it is worth stressing that another factor contributed to the reprimarization of Brazilian exports: trade policies implemented by China, which inhibit the entry of various processed products by applying higher import tariffs to these goods. The soy example perfectly illustrates this scenario: while the Chinese tariff charged over the soy oil is about 9%, the tariff applied to soybeans (non-processed) is

approximately 3%. This kind of protectionism is also applied to several other primary products processed by Brazil, such as iron, steel and leather.

6. FINAL COMMENTS

As a final reflection of this work, it is important to note that on one hand, the fragmentation of production in global chains increasingly enables countries to become exporters of manufactured goods without having to develop an end-to-end chain to the final product. On the other hand, companies which lead those GVCs may completely change the production structure and the development path of these countries by shifting location from one country to another according to gains offered by more attractive conditions for production. Thus, participation in the GVCs brings forth two essential questions:

(I) There is no "registration form" to participate in these GVCs. A country that wishes to enter into these chains must ensure a framework of internal competitiveness and offer advantageous conditions of production to foreign multinationals, so they opt to invest in this country over the others (Baumann, 2014).

(II) The development of GVCs has intensified competition among countries either to integrate into this new kind of world productive organization or to maintain their position in it. As a result, national industrial and commercial policies have been increasingly directed, respectively, to create market conditions that are able to strengthen competition and reduce technological gaps, and to deepen bilateral and regional trade agreements.

Having outlined a scenario of the difficulties involved in some of the key factors for the participation in GVCs, some priority actions are presented bellow as recommendations to the Brazilian government in order to meet these challenges and to further the country's integration into GVCs.

1) Protectionism: It was argued earlier that the protectionist policy in Brazil might evolve into an obstacle to the inclusion of Brazilian exports in the global market. It should be added, however, that the main objective of Brazilian protectionism is to strengthen the domestic industry. Thus, if import tariffs were reduced drastically and abruptly, it is likely that this would generate a destabilizing effect on the domestic productive structure, causing losses for competitiveness instead of gains.

However, a critical point that needs an urgent revision is the way in which incentives are set to companies and sectors contemplated by a protectionist industrial policy. The absence of targets and rules for the end of tariff and non-tariff barriers; the definition of the BPP (Basic Productive Process) by the company interested in receiving fiscal incentives instead of the government; and the selection by the government of "national champions" to boost their growth based on subjective criteria, instead of their competitive potential, are points that must be reevaluated to promote industrial development and competitiveness.

2) Use of innovation policy as the main tool for industrial policy: reducing the technological gap between Brazil and leading countries in the global market is urgent due to the low presence of Brazilian

exports in foreign markets, even considering exports from sectors characterized by a low technological dynamism. Therefore, investing in the consolidation of the private sector as a key element of the national program of technological innovation becomes fundamental. One way to do so would be to build stronger partnerships between the government and the private sector in order to strengthen the cooperation between science and industry, with a view to generating applied knowledge to the productive sector.

3) Trade preference agreements: it has been argued that Brazil must adopt an aggressive and strategic stance in negotiating the new PTAs to ensure its position as rule maker and not as rule taker in the governance of international trade. It is suggested that in such negotiations, the country should focus on assuring these three main points:

a) A gradual implementation of measures negotiated in accordance with the sensitivity of the sectors of the national economy, thus securing to segments with a critical performance more time for adaptation.

b) General, specific and sectorial safeguards, reducing the internal political resistance in sectors adversely affected by the agreements and softening the initial impact suffered by those segments.

c) Mutual recognition mechanisms on the part of regulatory agencies and harmonization of standards and rules, so that the PTAs are not limited to tariff liberalization and can more deeply affect trade integration. If possible, these PTAs should also include guidelines such as intellectual property, government procurement, environment, social clauses and investments.

4) Latin America and Caribbean regional integration: To overcome the scenario of low regional integration, it is argued that it is highly relevant and urgent that Brazil uses its regional leadership and economic strength to advance integration within MERCOSUR. It is essential to resolve differences hindering the bloc, in particular regarding the disputes between Brazil and Argentina. In addition, the foreign trade policy of its members must be better coordinated, which is not contradictory with the possibility that bloc negotiations occur at different paces between its members to make sure that the needs and particularities of each country are met.

Secondly, it is important that greater coordination and articulation of Latin American countries take place through comprehensive trade agreements that promote regulatory convergence and reduce trade costs between the signatories. This is essential because it could attract investment and production from outside the region, which, in turn, would help to create more complementarity and productive integration within LAC.

In other words, in the absence of a regional manufacturing hub, GCVs do not necessarily have to originate within LAC and the increase of productive integration needs not to be seen only as an instrument to develop such chains with regional origin. A greater Latin American integration can also attract companies from outside the region and encourage them to establish part of their production chain within LAC.

An essential first step, however, is that Latin American countries coordinate among themselves to define the strategies and priorities of regional development - where they stand, where they are leading to, how and when - so that they can direct foreign investment according to their projects. If they fail to do so, there is the risk that Latin American nations lose part of their sovereignty over the resources from their own territory and also the control over the ends of their exploitation by foreign firms.

5) Relations with China: regarding economic exchanges with China, Brazil should have a firmer and more assertive attitude to negotiation with this emerging superpower. This might include demanding the termination or reduction of trade barriers that hamper access of Brazilian products with a higher degree of processing in the Chinese market. This is relevant to reverse the Brazilian process of deindustrialization. In spite of Chinese economic strength, the Brazilian government must not ignore the fact that China depends on commodities from Brazil to feed its huge population, generate energy and build the infrastructure of its giant industrial centers. This gives Brazil some bargaining power which has not been explored to date.

Evaluating and acting on the five aforementioned priority points may allow some alternatives to promote Brazil's integration into GVCs. This, in turn, may further the development of the national economy through the diversification of the country's foreign trade, the creation of new jobs, and the gains in productivity as a result of the knowledge and technology acquisition that normally accompany transactions and investments related to GVCs.

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