PRODUCTIVE INTEGRATION AND LOCAL ADVANTAGES: THE VALUE CHAINS OF BRAZILIAN AGRIBUSINESS IN A COMPARATIVE PERSPECTIVE[1]

Abstract

Due to the climate and soil conditions, in line with funding and research policies, Brazilian agribusiness presents with great weight the economic activity of the country, making an average of 20% of the national GDP in the last 20 years, besides representing about 36% of Brazilian exports. At the same time, the emergence of global value chains and the great fragmentation of production around the world have altered the global patterns of productive integration, influencing production, international trade, domestic value added, productivity, employment and distribution of income. Given the importance of agribusiness to the Brazilian economy and in view of the new productive conformation, the objective of this article was to analyze the degree of productive integration and the Brazilian locational advantages to the specialization in the agribusiness value chains, defined in a pioneering way based on the hypothetical extraction of the Agriculture, Hunting, Forest and Fisheries sector (S1). The results indicated that Brazil, in perspective to the other sectors of the other countries, has high productive integration and wide locational advantages to the specialization in several sectors of agribusiness value chains, even in the most dynamic sectors.

Key words*: Global Value Chains. Specialization. Input-output.*

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1. Introduction

The change in the microelectronic, media and transportation paradigm associated with the Third Industrial Revolution provided the relocation of, or part of, production chains around the globe, in the quest for comparative advantages associated with the production of each link in the production chain. This new production conformation is called Global Value Chains, henceforth CGV, which can be defined as the value chains of the end products of all the activities that add value to their production and are identified by the industries in the countries where the last stage of this production process is located (TIMER *et al*., 2015).

Several authors verified that the emergence of GVC and the great fragmentation of the productive process around the world altered the global patterns of productive integration, influencing production, international trade, domestic value added, productivity, employment and distribution of income (TIMER *et al*., 2015, MENG *et al*., 2013, LOS *et al*., 2015).

In Brazil, particularly, the favorable conditions of climate and soil, aligned with the policies of financing and research, favored Brazilian agribusiness in such a way that the great weight of agribusiness and agricultural activity remained even after the industrialization process and the outsourcing cycle production, implying relatively successful Brazilian agribusiness in recent years (GUILHOTO *et al*., 2007).

According to IBGE[2] data, Brazilian GDP fell by 3.8% and 3.6% in 2015 and 2016, respectively, while agribusiness GDP increased by 1.8% and 4.8% in the same period, that agribusiness accounts for about 20% of Brazil's GDP in 2016 and accounts for about 36% of total Brazilian exports. Between 1996 and 2016, the average share of agribusiness in the national GDP was 21.93%, according to CEPEA[3] data. In this context, the agribusiness chains can be distinguished in four macrosetors (FURTOSO and GUILHOTO, 2003; GUILHOTO *et al*., 2007): i) inputs; ii) agriculture and livestock; iii) industry, and; iv) services, which corresponded with average participation of 0.87%, 4.38%, 7.27% and 9.42% in Brazilian GDP, according to CEPEA, between 1996 and 2016.

In addition to the importance of Brazilian agribusiness, It should be noted that Brazilian exports are relevant in the international market, with Brazil being the world's largest agricultural exporter and the largest global exporter of sugar, orange juice, coffee and soybeans in grains, as well as being a major global player in the export of tobacco, poultry, corn, rice and beef (OECD-FAO, 2015).

Accompanying this transformation of the last decades, agribusiness has evolved, modernizing itself, inserting itself in the market economy and forming complex networks of storage, processing, industrialization and distribution, with increasing narrowing of the relation between agriculture and industry, with deepening of the technological relations, productive and financial (FURTOSO and GUILHOTO, 2003).

With the new production conformation, the agribusiness complex approach and agribusiness value chains have gained notoriety (DAVIS & GOLDEBERG, 1957), aiming to give importance to a web of activities, upstream and downstream of the farm, geared to the production of goods and services of agricultural origin (GUILHOTO *et al*., 2007), which in the new production structure may be dispersed around the globe as an integral part of agribusiness value chains.

In this new production structure, the agroindustrial sector is treated as a strategic element of an important macrosector of the modern economy, with a strong agribusiness sector, highly dynamic, connected with all economy and with relevant performance in the process of economic development (FURTOSO AND GUILHOTO, 2003).

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In this context, and understanding that the economic liberalization associated with the economic stability experienced by Brazil from the 1990s has led to major transformations in the productive structure, the objective of this article is to investigate how Brazil has coupled itself to the new global conformation of production of chains of value of agribusiness after the Brazilian economic stabilization, in the period 1995-2011, using the pioneer form for Brazil of the global input-output tables estimated by WIOD.

In addition, this article contributes to the analysis of Brazilian agribusiness chains by defining them precisely from a sector perspective and indicated their persistence over the period using the hypothetical extraction technique of the Agriculture, Hunting, Forestry and Fisheries sector (1) between 1995 and 2011. With this, one can define the longitudinal sectoral productive integration of agricultural goods and services.

Regarding the analysis of the integration of Brazil into Agribusiness Value Chains, this paper contributes to the calculation of the traditional integration indexes of the Global Value Chains (VAX rate) and to propose an indicator of comparative advantage revealed in terms of added value (VARCA). These indicators are capable of capturing the specializations and the sectorial advantages associated to the new productive conformation.

The relative integration of Brazil into global value chains was constituted by making normalizing the indicators of integration, specialization and the regional decomposition of growth relative to it. The results indicated that Brazil is part of the global chains of agribusiness value, with high productive integration and locational advantages to specialization, especially in the sectors with the highest growth potential

This article is divided into three sections, in addition to this brief introduction. The second section deals with the methodological bases used in the scope of this article, the third section presents the results of the agribusiness chains from the perspective of Brazil, and finally, the fourth section presents a brief summary of the results and is succeeded by the conclusions.

2. Methodology

2.1 Empirical Strategy and Database

One way to measure and evaluate the changes in the production structure observed in the world is through the analysis of the global input-output tables, covering the longest period possible. The data provided by WIOD meet the needs of this article, with a longitudinal coverage from 1995 to 2011, thus contemplating the new productive conformation of global value chains.

For to construct this article, the data provided by WIOD (World Input-Output Databases) were used, which constitute a time series of input-output tables, multilaterally connected among all 40 countries and opening 35 sectors for each country.

The WIOD was created, according to Dietzenbacher *et al*. (2013), with the aim of establishing itself as a broad database, capable of generating indicators and statistics of international trade, providing the test and quantification of academic research, taking into account the Tables of Uses and Resources, the national accounts, and the compatibility with the satellite accounts[4].

For to identify the Brazilian agribusiness chains, the hypothetical extraction of the agricultural, hunting, forest and fishing sector (S1) from Brazil's national input-output matrix was made available by WIOD, with the opening of 35 sectors between 1995 and 2011[5]. Were defined the sectors with total above-average production as a result of the hypothetical extraction of the purchases and sales of the Agriculture, Forestry, Hunting and Fishing (S1) sector, or

[4] For more details see Dietzenbacher et al. (2013).

[5] For more details on the hypothetical extraction method see Dietzenbacher *et al*., (1993), Haddad *et al*., (2009) and Perobelli *et al*., (2006).

sectors immediately below average, were defined as sectors belonging to Brazilian agribusiness chains at specific periods, but with tenacity in their production variations longitudinally.

Once the sectors of the Brazilian agribusiness chains were defined, the value added tax on gross exports (VAX Rate), a traditional measure of the Global Value Chains, was calculated and which aims to measure the integration of Brazilian agribusiness into the aforementioned new production conformation through of the global input-output tables. In parallel, it is suggested an extension to the coefficient of revealed comparative advantage proposed by Bowen *et al*. (2012), in order to be able to capture agribusiness specializations in the context of global value chains, the comparative advantage index revealed in terms of added value (VARCA), for which the shift-share was applied, with the objective to capture the locational advantages of specialization in these sectors.

From the indicators of integration, specialization and locational advantages to specialization, we sought to understand how Brazil was associated with this productive conformation of the Global Value Chains in relative terms, that is, the coefficients were normalized so that Brazil represented the unit and the other WIOD countries were positioned in terms relative to Brazil, allowing for comparison.

2.2 The Global Input-Output Model

The pattern of international trade has changed considerably in the last decades, and especially after the beginning of the so-called globalization period (HUMMELS *et al*., 2001), so it is appropriate to transmit these observed changes in international relations to the methodological approaches about this topic. In this sense, Hummels *et al*. (2001 understood that the relations of production were increasingly interconnected at the global level, with each country specializing in a stage of the productive process and the result was the proposition of a method capable of capturing the degree of sectoral integration of each country with the rest of the world, in a correspondence relationship for the measurement of added value fragmentation.

In other words, with the increasing fragmentation of productive structures around the globe, it is appropriate to measure the intensity of the outsourcing of production processes and the consequent addition of value in several countries scattered throughout the world in the structure that has been called the Global Value Chains (GVC).

Be it an input-output model, expressed as in Miller and Blair (2009) by:

$$X = (I - A)^{-1}F \qquad (1)$$

in which $X_{n\times1}$ is a column vector with n lines, $I_{n\times n}$ is an identity matrix of dimension $n \times n$, $A_{n\times n}$ is the matrix of technical coefficients, also of dimension $n \times n$ is the column vector of final demand and $(I - 1)^{-1}$ is denominated in the economic literature as the inverse matrix of Leontief, here also expressed as B. Thus, one can rewrite Equation 1 as:

$$X = BF \qquad (2)$$

From 2 the model can be represented in its interregional form, according to Koopman *et al*. (2012), by:

$$B^D X + F^D = X \qquad (3)$$
$$B^M X + F^M = X \qquad (4)$$
$$\mu B^D + \mu B^M + B_v = \mu \qquad (5)$$

where B represents a matrix of $n \times n$ coefficients for domestic production, F is a final demand vector, including gross formation of fixed capital, private and public consumption and exports, of size $n \times 1$, M is a vector of imports $n \times 1$, B_v is a vector of dimension $1 \times n$ which indicates the value added rate on the total output for sector i of the country j and μ is a unit vector of dimension $1 \times n$. In addition, every overwritten D indicates that the variables are domestic, every overwritten M makes references to imported variables and i and j indicate the respective sectors and countries.

Equations 3 and 4 represent the equilibrium conditions for the production of domestic goods and the production of imported goods, respectively, and equation 5 is the equilibrium condition that adds restriction to the input-output coefficients. The sum of the elements of the line of sector i in equation 3 shall be equal to the sum of sales for all domestic and intermediate use in the economy for the same sector i.

Similarly, in equation 4, the sum of the elements of column j indicate the total imports of sector i, which must be equal to the sum of sales of the product of country j in the same sector for all users of the economy, including intermediate inputs for all sectors, domestic final consumption and capital formation. Finally, the elements of equation 5 imply that the total output, X, in each sector i must be equal to the sum of the value added directly in sector i and equal to the cost of intermediate inputs for all domestic and imported production.

From equations 3, 4 and 5 it is possible to evaluate international trade, in its equilibrium conditions, for the production of imported and domestic goods and services in terms of added value, in line with global value chains.

2.3 Integration and Specialization Measures: VAX Rate and VARCA

Given the ability to measure the increasing fragmentation of production structures around the globe, using the global input-output model, taking into account value-added trade, it is appropriate to measure the intensity of the outsourcing of production processes and the consequent addition of value in several countries. For this purpose, the composition of domestic value added on gross exports is one of the main indicators of global productive integration and, consequently, of Global Value Chains (HUMMELS *et al*., 2001).

The value added indicator on gross exports (VAX rate) is a traditional measure of Global Value Chains where the basic idea is to construct an index for the higher the VAX rate, the lower the country's specialization in that segment.

The VAX rate was also used by Johnson and Noguera (2012), Koopman *et al*. (2012), Timmer *et al*. (2015) and Baldwin and Lopez-Gonzalez (2015), among others, and can be obtained by (TIMMER *et al*., 2015):

$$VAX = A'_v(I - A)^{-1}F^{DM} \quad (6)$$

where A'_v represents the vector line A_v transposed value-added participation over the total production for sector i of country j, dimension $1 \times n$. $(I - A)^{-1}$ is the inverse of Leontief and F^{DM} is a column vector of final demand for domestic products D and imported M.

Each element of the VAX column vector of equation 6, with dimension $n \times 1$, can be interpreted as the participation of the value added externally in the production of exported domestic goods and, as suggested by Hummels *et al*. (2001) and Koopman *et al*. (2012) this can also be considered a measure of specialization.

Formally, the domestically added value rate on gross exports is defined by Johnson and Noguera (2012) as the bilateral sectoral level of domestic value added participation in relation to gross exports and is given by the ratio between added value of industrial activity s of sector

i of the country and total production of industrial activity s of sector i of country j, $\frac{A_v}{X}$, with specialization inversely proportional to the returned index.

Having in view of this new production paradigm and its consequences on productive integration, it is also necessary to evaluate the sectoral specializations in such a way that it is possible to determine which countries have comparative advantages revealed in terms of added value in each sector from the perspective of the global value chains. In this sense, we propose the estimation of an index capable of capturing sectoral specializations in line with the new production conformation of global value chains, called VARCA (Value Added of Revealed Comparative Advantage), based on Bowen *et al*. (2012), by means of:

$$VARCA = \frac{X_{ij}^{Mv}}{X_{wj}^{v}} \frac{X_{i}^{Mv}}{X_{j}^{Mv}} \quad (7)$$

where X_{ij}^{Mv} represents the exports of country i of industry j in terms of value added, X_{wj}^{v} indicates the world production of industry j in value added, X_{i}^{Mv} is the total export of country i in value added and X_{w}^{Mv} is the total worldwide export value added.

The higher the index, the greater the comparative advantage revealed in terms of value added in the sector i of country j in this activity, and conversely, the lower the index, the lower the comparative advantage revealed in terms of added value, here also understood as sectorial specialization..

2.4 Decomposition of Regional Growth

From the sector-specific specialization indicator for each country (VARCA), for the years 1995 and 2011, it was sought to verify which sectors and which countries had locational advantages and this specialization, here denominated of locational advantages to the sectorial specialization (LA) from the point of view of global value chains through the regional decomposition of growth.

The analysis of regional components (shift-share) decomposes the growth of the comparative advantages revealed in terms of added value (VARCA), measured at the global level, in the national component, structural component and regional component (CEREJEIRA, 2011), which influence the growth of each region by virtue of the productive composition of each one.

The classical model of regional growth decomposition can be expressed as (CEREJEIRA, 2011):

$$\Sigma_j = \Delta\Psi_{ij} = \Sigma_j[\Psi_{ij}(t) - \Psi_{ij}(t-1)] = \Sigma_j\,[N\Psi_{ij} + S\Psi_{ij} + R\Psi_{ij}] \quad (13)$$

where $N\Psi_{ij}$, $S\Psi_{ij}$ and $R\Psi_{ij}$ are respectively the global, structural and regional components for the variable Ψ measures in region i and sector j in periods t and $t-1$, expressed individually as:

$$N\Psi_{ij} = g_{N\Phi} \times \Phi_{ij}(t-1) \quad (14)$$

$$S\Psi_{ij} = \left(g_{N\Phi_j} - g_{N\Phi}\right) \times \Phi_{ij}(t-1) \quad (15)$$

$$R\Psi_{ij} = \left(g_{ij} - g_{N\phi_j}\right) \times \Phi_{ij}(t-1) \quad (16)$$

where $g_{N\Phi}$ is the growth rate of the variable Φ at the national level in relation to the base year $(t-1)$, $g_{N\Phi_j}$ is the growth rate of the variable Φ at the national level in relation to the sector j e g_{ij} is the growth of the variable Φ, observed in the region i e sector j.

The global component represents the growth that the region i would obtain if its variation were the same as observed globally, and the larger the coefficient of the j sector already located in region i, the greater the growth of this sector and the region relative to the global growth. The structural component reflects the weight of the productive structure of each region in the growth, in which positive values indicate that in the region the sectors with the highest growth had a weight higher than the global level (CEREJEIRA, 2011). Finally, as the growth of each sector may be different from that observed at the global level, the regional component measures the regional growth deviation from that observed at the global level (MATLABA *et al*., 2014), with positive values indicating that sector j of region i has greater regional comparative advantages, favoring higher sectoral and regional growth rates.

For the purposes of this article we can understand each region i as a country i, and we are interested only in the regional component resulting from the application of the shift-share, between 1995 and 2011, to the coefficient of comparative advantage revealed in terms of added value (VARCA), which gives us the advantage of each sector located in each country to specialize in production in terms of added value, so that it is possible to capture through the shift-share the locational advantages inherent in the sectors specialization j of country i under the view of global value chains, here called locational advantages to sectoral specialization (LA).

3. Results and discussion

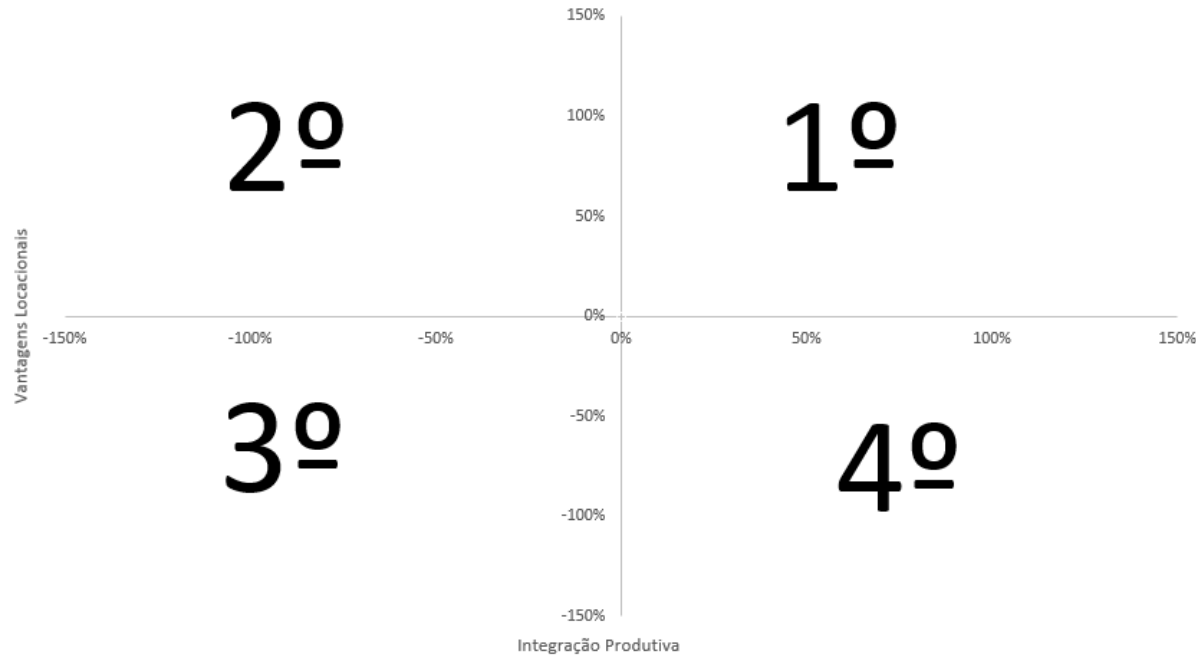
As a way of mapping Brazilian agribusiness chains, the hypothetical extraction of purchases and sales of the Agriculture, Hunting, Forestry and Fisheries sector (S1) from the Brazilian input-output matrix provided by WIOD, with the opening of 35 sectors, was carried out the years 1995 and 2011. The results of the hypothetical extraction indicate the degree of sectoral interdependence, from the point of view of purchases and sales, of the other sectors in relation to the Agriculture, Hunting, Forest and Fisheries sector (S1). The sectors with a variation of above-average production as a reflection of the hypothetical extraction of purchases and sales, as well as the sector of Madeira and Wood Products and Cork (S6), were defined as sectors belonging to the Brazilian agribusiness chains, which from 1999 to 2000, 2006, 2007 and 2008, with variation in production below the average exclusively in those years.

Defined the sectors of the Brazilian agribusiness chains, we sought to understand the degree of productive integration, the level of sectoral specialization and the locational advantages to the specialization for each of the j sectors of the i countries from the perspective of global value chains. In this sense, the value added tax on crude exports (VAX Rate), a traditional measure of the Global Value Chains, was calculated and whose objective is to measure the integration of Brazilian agribusiness into the new production conformation. An adaptation to Bowen *et al*. (2012) in order to obtain a measure capable of capturing agribusiness specializations in the context of global value chains, the comparative advantage index revealed in terms of added value (VARCA) and for which the shift-share, interested in the regional component, with the objective of capturing the locational advantages to the j sectors of agribusiness value chains and located in the i countries.

In order to highlight the relative position of Brazil in relation to the other countries in terms of their productive integration and of the locational advantages to the sectorial specialization, the indicator of productive integration (Rate VAX) in the abscissa axis was plotted and the coefficient of locational advantages to the specialization (LA) on the ordinate axis, both relativized for Brazil, as shown in Figure 1.

As it is considered that the lower the VAX rate the greater the productive integration, and inversely, the greater the coefficient of locational advantages the greater the locational advantages in specializing in the sector, the first quadrant are countries with low productive integration, but with high locational advantages. The combination of high productive integration with high locational advantages occurs in the second quadrant. In the third quadrant are the countries with high productive integration and low locational advantages, and finally, in the fourth quadrant are the countries with low productive integration and low locational advantages (Figure 1).

Figure 1 - Analytical Combinations between Productive Integration and Locational Advantages.



Source: Own elaboration with the research data.

From the indicators of integration and the locational advantages to the specialization in each one, we sought to understand how Brazil is associated with this productive conformation of the Global Value Chains in relative terms.

3.1 Agribusiness Demand and Supply Chains

Table 1 shows in the lines the results of the variation of production in period t of sector j, between 1995 and 2011, as a result of the hypothetical extraction of the purchases of the sector of Agriculture, Hunting, Forest and Fisheries (S1) of the national matrix the same period. The last column of the table represents the average variation in total production in the sectors of the Brazilian economy derived from the same hypothetical extraction and in the same period. The observed results indicate an above-average productive interdependence between the Agriculture, Hunting, Forest and Fisheries (S1) sector and the other sectors of the Brazilian agribusiness demand chains.

The results presented in Table 1 indicate, for example, that for the year 1995 the hypothetical extraction of the purchases of the Agriculture, Hunting, Forest and Fisheries sector (S1) would imply in the reduction of the total production of the sector 1 (S1) in 9.88%, a decrease of 4.27% in Mining and Extraction (S2) production, and so on, culminating in an average effect of 2.04%, considering all 35 sectors of the Brazilian economy.

Table 1 - Change in Total Production as a result of Hypothetical Extraction of Sector 1 Purchases, from 1995 to 2011, (%)

Year	S1	S2	S3	S6	S8	S9	S10	S17	S19	S20	S21	Average
1995	-9.88	-4.27	-3.93	-2.38	-4.32	-9.91	-2.59	-2.13	-3.63	-3.63	-3.63	-2.04
1996	-10.02	-4.60	-4.05	-2.56	-4.41	-10.37	-2.82	-2.28	-3.74	-3.74	-3.74	-2.14
1997	-9.58	-4.47	-3.93	-2.37	-4.34	-9.93	-2.69	-2.18	-3.55	-3.55	-3.55	-2.05
1998	-10.11	-4.43	-4.11	-2.48	-4.50	-10.48	-2.75	-2.27	-3.55	-3.55	-3.55	-2.12
1999	-10.57	-4.70	-4.29	-2.16	-4.85	-11.18	-2.95	-2.50	-3.68	-3.68	-3.68	-2.23
2000	-10.57	-4.86	-4.41	-2.27	-4.86	-11.02	-2.97	-2.58	-3.98	-3.98	-3.98	-2.30
2001	-9.68	-4.58	-4.12	-4.85	-11.18	-2.83	-2.62	-3.97	-3.97	-3.97	-2.18	-2.22
2002	-10.87	-4.79	-4.36	-5.50	-12.19	-3.06	-2.94	-4.50	-4.50	-4.50	-2.30	-2.42
2003	-11.09	-5.52	-4.80	-6.57	-14.36	-3.67	-3.33	-5.22	-5.22	-5.22	-2.73	-2.79
2004	-11.27	-5.23	-4.80	-6.75	-15.30	-3.50	-3.26	-5.35	-5.35	-5.35	-2.66	-2.78
2005	-11.43	-5.06	-5.14	-6.83	-13.95	-3.52	-3.07	-5.16	-5.16	-5.16	-2.50	-2.75
2006	-10.51	-4.57	-4.80	-2.28	-6.50	-12.32	-3.20	-2.81	-4.62	-4.62	-4.62	-2.49
2007	-10.82	-4.34	-5.07	-2.34	-6.41	-12.38	-3.16	-2.74	-4.62	-4.62	-4.62	-2.49
2008	-10.63	-4.28	-5.20	-2.58	-6.61	-15.35	-3.22	-2.85	-5.05	-5.05	-5.05	-2.67
2009	-10.43	-4.41	-4.96	-2.91	-6.64	-12.91	-3.36	-2.52	-4.89	-4.89	-4.89	-2.55
2010	-9.87	-4.07	-4.80	-2.53	-6.28	-12.41	-3.08	-2.41	-4.59	-4.59	-4.59	-2.39
2011	-10.08	-4.42	-4.54	-2.44	-6.16	-11.69	-3.00	-2.31	-4.52	-4.52	-4.52	-2.34

S1: Agriculture. Hunting. Forestry and Fisheries; S2: Mining and Extraction; S3: Food. Beverage and Tobacco; S6: Wood and Wood and Cork Products; S8: Coke. Refined Petroleum and Nuclear Fuel; S9: Chemicals and Chemicals; S10: Rubber and Plastics; S17: Electricity. Gas and Water; S19: Sale. Maintenance and Repair of Motor Vehicles; Retail Fuels; S20: Wholesale. except Motor Vehicles and Motorcycles; S21: Repair of Consumer Goods; Retail Sale. except Motor Vehicles and Motorcycles.
Source: Own elaboration.

Table 1 shows that the Brazilian agribusiness chain from perspective of demand is made up of eleven sectors, between 1995 and 2011, in addition to the Agriculture, Hunting, Forestry and Fishing (S1) sector, are the sectors of Mining and Extraction (S2), Beverages and Tobacco (S3), Wood and Wood Products and Cork (S6), Coke, Petroleum Refining and Nuclear Fuel (S8), Chemicals and Chemicals (S9), Rubber and Plastics (S10), Electricity , Gas and Water (S17), Sale, Maintenance and Repair of Motor Vehicles; Retail Fuels (S19), Wholesale Trade, except Motor Vehicles and Motorcycles (S20) and Repair of Consumer Goods; Retail Sale, except Motor Vehicles and Motorcycles (S21).

Table 2 shows the results for the variation in total production as a result of the hypothetical extraction of purchases from the Brazilian national matrix between 1995 and 2011. The results show that all of the agricultural, hunting, the sectors showed a variation in total production above average and persistence over the years, characterizing a high degree of sectoral interdependence to the period.

The results of each row in Table 2 can be interpreted as the variation of production in period t of sector i as a result of the hypothetical extraction of sales of the Agriculture, Hunting, Forest and Fishing sector (1) of the Brazilian national matrix in the same period. The last column of the table represents the average change in total production from the same hypothetical extraction over the same period.

In 1995, for example, the hypothetical extraction of sales of the Agriculture, Hunting, Forestry and Fisheries sector (S1) would imply a reduction of the total production of the Agriculture, Hunting, Forestry and Fisheries sector (S1) in 62.66%, a reduction of 2.67 in the total production of Mining and Extraction (S2), and so on, resulting in an average effect that would reduce 2.89% of total production in the 35 sectors of the Brazilian economy.

Table 2 - Variation in Total Production as a Result of Hypothetical Extraction of Sales of the Agriculture, Hunting, Forest and Fishing Sector (S1), from 1995 to 2011, in %

Year	S1	S2	S3	S6	S8	S9	S10	S17	S19	S20	S21	Average
1995	-62.66	-2.67	-2.46	-1.49	-2.71	-6.21	-1.62	-1.34	-2.27	-2.27	-2.27	-1.13
1996	-62.33	-2.87	-2.52	-1.60	-2.75	-6.47	-1.76	-1.42	-2.33	-2.33	-2.33	-1.19
1997	-61.51	-2.75	-2.42	-1.46	-2.67	-6.11	-1.65	-1.34	-2.19	-2.19	-2.19	-1.13
1998	-62.14	-2.75	-2.56	-1.54	-2.79	-6.51	-1.71	-1.41	-2.21	-2.21	-2.21	-1.17
1999	-61.06	-2.87	-2.62	-1.32	-2.96	-6.83	-1.80	-1.52	-2.25	-2.25	-2.25	-1.21
2000	-61.18	-2.97	-2.70	-1.39	-2.97	-6.75	-1.82	-1.58	-2.43	-2.43	-2.43	-1.26
2001	-59.77	-2.74	-2.46	-2.90	-6.68	-1.69	-1.57	-2.37	-2.37	-2.37	-1.30	-1.20
2002	-59.87	-2.87	-2.61	-3.29	-7.30	-1.83	-1.76	-2.69	-2.69	-2.69	-1.38	-1.30
2003	-59.98	-3.31	-2.88	-3.94	-8.61	-2.20	-2.00	-3.13	-3.13	-3.13	-1.64	-1.53
2004	-61.01	-3.19	-2.93	-4.12	-9.33	-2.14	-1.99	-3.27	-3.27	-3.27	-1.62	-1.55
2005	-62.75	-3.18	-3.22	-4.29	-8.75	-2.21	-1.93	-3.24	-3.24	-3.24	-1.57	-1.56
2006	-61.70	-2.82	-2.96	-1.40	-4.01	-7.60	-1.98	-1.73	-2.85	-2.85	-2.85	-1.39
2007	-61.19	-2.66	-3.10	-1.43	-3.92	-7.58	-1.93	-1.68	-2.83	-2.83	-2.83	-1.37
2008	-58.66	-2.51	-3.05	-1.51	-3.88	-9.01	-1.89	-1.67	-2.96	-2.96	-2.96	-1.43
2009	-59.23	-2.61	-2.94	-1.72	-3.93	-7.65	-1.99	-1.49	-2.89	-2.89	-2.89	-1.37
2010	-58.81	-2.40	-2.82	-1.49	-3.69	-7.30	-1.81	-1.42	-2.70	-2.70	-2.70	-1.28
2011	-55.17	-2.44	-2.50	-1.35	-3.40	-6.45	-1.65	-1.28	-2.49	-2.49	-2.49	-1.16

S1: Agriculture, Hunting, Forestry and Fisheries; S2: Mining and Extraction; S3: Food, Beverage and Tobacco; S6: Wood and Wood and Cork Products; S8: Coke, Refined Petroleum and Nuclear Fuel; S9: Chemicals and Chemicals; S10: Rubber and Plastics; S17: Electricity, Gas and Water; S19: Sale, Maintenance and Repair of Motor Vehicles; Retail Fuels; S20: Wholesale, except Motor Vehicles and Motorcycles; S21: Repair of Consumer Goods; Retail Sale, except Motor Vehicles and Motorcycles.
Source: Own elaboration.

Indeed, the results of Table 2 show that the Brazilian agribusiness chain from the point of view of supply is composed of sectors between 1995 and 2011. In addition to the agriculture, hunting, forestry and fishing sector (S1), the main productive chains (S8), Chemicals and Chemicals (S9), Chemicals and Chemicals (S9), Chemicals and Chemicals (S9), Chemicals and Chemicals (S9), Chemicals and Chemicals (S9), Mining and Extraction Rubber and Plastics (S10), Electricity, Gas and Water (S17), Sale, Maintenance and Repair of Motor Vehicles; Retail Fuels (S19), Wholesale Trade, except Motor Vehicles and Motorcycles (S20) and Repair of Consumer Goods; Retail Sale, except Motor Vehicles and Motorcycles (S21).

The hypothetical extraction methodology allows to conclude that the Brazilian agribusiness chain is composed of eleven sectors, since between 1995 and 2011 all sectors listed in Table 1 and 2 showed a variation in total production above the average, and in all periods of time, indicating the stability of Agribusiness Value Chains longitudinally in the period evaluated. In this way, the later analyzes focus on these sectors.

The only exception was the Wood and Wood Products and Cork (S6) sector, which, both from the perspective of purchases and sales, showed a reduction of relative importance in the years 1999, 2000, 2006, 2007 and 2008, since the variation in production was below average, exclusively in those years. However, the sector of Wood and Wood and Cork Products (S6) returned to compose the subgroup of sectors with above-average production chains, both from the perspective of purchases and sales from 2009 onwards. This result may indicate a cyclical component by which the Wood and Wood Products and Cork sector (S6) passed during part of the decade of 2000, in such a way that the decision was to consider it as belonging to the Agribusiness Value Chains.

In order to analyze the agribusiness production chain, it concentrated on the analysis of the sectors shown in Tables 1 and 2, which are characterized by being traditionally subsidized by local governments and located according to natural resource endowments.

With the strengthening of the new production structure of the Global Value Chains, there are indications that new countries have been incorporated into international value generation networks, leading to the deconcentration of production. Corroborating this analysis, Table 3 shows the sectoral participation of WIOD and Brazil in the total production generated globally by the agribusiness value chains and included in the data base used in the years 1995 and 2011. The results of Table 3 indicate, for example, that in the year 1995, 76.48% of the total production generated in the Agriculture, Hunting, Forestry and Fishing (S1) sector was in the 40 countries of WIOD, while in 2011 this share was reduced to 72.79 %. In terms of Brazil, the results show that 3.76% of the total production generated in the Agriculture, Hunting, Forestry and Fisheries (S1) sector was concentrated in Brazil in 1995, a share which increased to 5.34% in the year of 2011.

In line with the new production structure, there was a pattern for most of the sectors belonging to the agribusiness production chain, with a reduction in the share of total production in the WIOD countries and, conversely, a rise in the share of Brazil in total to the period. Confirming this analysis, it can be noted that in 1995 the WIOD countries comprised 85.35% of the total production of the sectors belonging to the agribusiness chain, compared to a participation of 81.54% in the year of 2011. In contrast, Brazil had a 2.87% share of the total production of the sectors of the agribusiness chain in 1995 and increased its share to 3.79% in 2011, which reveals a market gain in relative terms.

It should also be noted that, despite the process of production fragmentation, WIOD is global input-output tables continue to be representative in terms of agribusiness chains, covering more than 80% of total production in both periods.

Table 3 - WIOD and Brazil share of Total Production in 1995 and 2011 (%)

SECTOR		WIOD		Brazil	
		1995	**2011**	**1995**	**2011**
S1	Agriculture, hunting, forestry and fishing	76.48	72.79	3.76	5.34
S2	Mining and Extraction	55.41	43.93	2.70	5.37
S3	Food, Beverage and Tobacco	84.05	80.63	3.79	4.93
S6	Wood and Wood and Cork Products	90.47	85.90	1.80	1.89
S8	Coke, Refined Petroleum and Nuclear Fuel	82.79	88.54	4.97	4.08
S9	Chemicals and Chemicals	91.29	90.72	2.75	3.34
S10	Rubber and Plastic	89.78	88.06	2.47	2.67
S17	Electricity, Gas and Water	95.76	82.94	2.69	3.73
S19	Sale, Maintenance and Repair of Vehicles **	93.83	93.27	2.81	3.53
S20	Wholesale *	88.70	82.94	1.23	2.30
S21	Consumer Goods Repair; Retail business *	90.32	87.26	2.59	4.54
	AVERAGE	**85.35**	**81.54**	**2.87**	**3.79**

* Except for sale, maintenance and repair of motor vehicles.
** Retail Fuels.
Source: Own elaboration.

This new dynamic of global value chains points to an increase in production dispersion, with deconcentration in the total production and reduction of the domestic content contained in the exports longitudinally, according to Timmer *et al*. (2015), Meng *et al*. (2013), Baldwin and Lopez-Gonzalez (2015) and Los *et al*. (2015). In order to verify the occurrence of the reduction

of the domestic content exported longitudinally, Table 4 shows the share of the domestic content contained in the exports to the 40 WIOD countries and to Brazil in the sectors belonging to the agribusiness value chains in 1995 and 2011 and shows the reduction of domestic exported content, in line with the trend of global value chains.

The results in Table 4 indicate, for example, that the 40 WIOD countries, including Brazil, had 73.59% of the total domestic content contained in exports to the Agriculture, Hunting, Forestry and Fisheries (S1) sector in Brazil. In the Brazilian-only terms, data show that 3.06% of all domestic content exported in the world in 1995 was Brazilian origin in the sector of Agriculture, Hunting, Forestry and Fisheries (S1), while in 2011 this fraction increased to 12.23%.

Table 4 - Share of WIOD and Brazil in Domestic Content Exported in 1995 and 2011 (%)

SECTOR		WIOD		Brazil	
		1995	**2011**	**1995**	**2011**
S1	Agriculture, hunting, forestry and fishing	73.59	61.62	3.06	12.23
S2	Mining and Extraction	45.00	47.22	1.95	3.07
S3	Food, Beverage and Tobacco	84.06	76.82	3.39	5.54
S6	Wood and Wood and Cork Products	83.4	82.93	2.03	4.21
S8	Coke, Refined Petroleum and Nuclear Fuel	70.42	65.09	1.14	2.48
S9	Chemicals and Chemicals	86.33	77.54	0.80	1.15
S10	Rubber and Plastic	95.87	93.85	0.73	1.17
S17	Electricity, Gas and Water	91.13	89.88	0.01	2.83
S19	Sale, Maintenance and Repair of Vehicles **	98.96	96.62	1.13	1.51
S20	Wholesale *	96.12	91.15	0.08	0.18
S21	Consumer Goods Repair; Retail business *	96.29	94.62	0.73	1.46
	MEAN	**83.74**	**79.76**	**1.37**	**3.26**

* Except for sale, maintenance and repair of motor vehicles.
** Retail Fuels.
Source: Own elaboration.

The observance of Table 4 indicates a pattern of reduction of the domestic content exported to the majority of the sectors belonging to agribusiness value chains (except the Mining and Extraction sector - S2) and deconcentration of the generation of added value for countries besides WIOD, which can be mimetized by the reduction of the average exported domestic content in the sectors of the agribusiness value chains of the WIOD countries, going from 83.74% in 1995 to 79.76% in the year 2011. The productive deconcentration and the reduction of exported domestic content can be interpreted according to Los *et al*. (2015), as the greater integration of the WIOD countries into the new productive structure of global value chains in agribusiness.

In an opposite way, the results in Table 4 an increase in Brazilian share of domestic exports in all sectors, and is reflected in the increase in Brazil's average exported domestic content in the sectors of agribusiness value chains, which increased from 1.37% in 1995 to 3.26% in 2011. Although the relative increase of the exported domestic content can be used as a proxy for the productive disintegration, towards the global value chains, in the same line as Los *et al*. (2015), Timmer *et al*. (2015), Johnson and Noguera (2012) and Meng *et al*. (2013), the results for Brazil should be analyzed with some caution, since Brazil also obtained a significant relative market gain, as shown in Table 3, so that it can not be affirmed, further, that there was disintegration relative to agribusiness value chains for the period.

In general terms, the sector results in Table 4 indicate the reduction of the domestic content exported both to the sectors belonging to the agribusiness value chains and to the WIOD countries, including Brazil, which had an average domestic exportation rate of 83.74% in 1995 and deconcentrated the generation of value added around the world in the period, achieving an average exported domestic content rate of 79.76% in 2011.

Table 4 - Share of WIOD and Brazil in Domestic Content Exported in 1995 and 2011 (%)

SETOR		WIOD[1]		Brasil[2]	
		1995	2011	1995	2011
S1	Agriculture. hunting. forestry and fishing	73.59	61.62	3.06	12.23
S2	Mining and Extraction	45.00	47.22	1.95	3.07
S3	Food. Beverage and Tobacco	84.06	76.82	3.39	5.54
S6	Wood and Wood and Cork Products	83.4	82.93	2.03	4.21
S8	Coke. Refined Petroleum and Nuclear Fuel	70.42	65.09	1.14	2.48
S9	Chemicals and Chemicals	86.33	77.54	0.80	1.15
S10	Rubber and Plastic	95.87	93.85	0.73	1.17
S17	Electricity. Gas and Water	91.13	89.88	0.01	2.83
S19	Sale. Maintenance and Repair of Vehicles **	98.96	96.62	1.13	1.51
S20	Wholesale *	96.12	91.15	0.08	0.18
S21	Consumer Goods Repair; Retail business *	96.29	94.62	0.73	1.46
	AVERAGE	**83.74**	**79.76**	**1.37**	**3.26**

[1] Participation of WIOD's 40 countries in total production, including Brazil, in terms of the rest of the world.
[2] Share of Brazil on total production relative to the rest of the world.
* Except for sale, maintenance and repair of motor vehicles.
** Retail Fuels.
Source: Own elaboration..

In general terms, the sector results in Table 4 indicate the reduction of the domestic content exported both to the sectors belonging to the agribusiness value chains and to the WIOD countries, including Brazil, which had an average domestic exportation rate of 83.74% in 1995 and deconcentrated the generation of value added around the world in the period, achieving an average exported domestic content rate of 79.76% in 2011.

The sectors of the agribusiness chains were defined and the dynamics of the domestic content exported longitudinally to Brazil and to all WIOD countries, the domestic content of exports (Rate VAX) and the coefficient of location advantages, originating from the decomposition of regional growth, were normalized to Brazil and are shown in Figures 2, 3 and 4. The sample countries to be compared with Brazil were selected as the main economies of Europe, in addition to Russia, India, China (The BRIC's) and the United States.

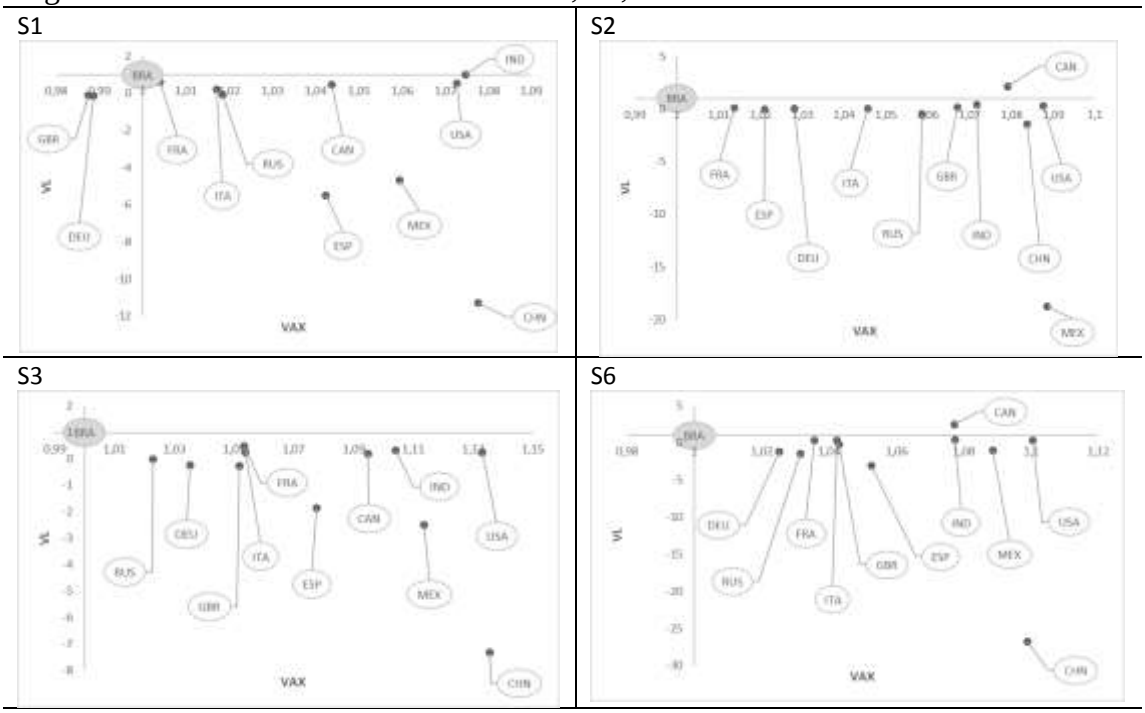
It is defined as high productive integration the sectors that presented coefficient of integration (Rate VAX) below the Brazilian coefficient for each sector (JOHNSON AND NOGUERA, 2012) and high locational advantages (LA) the countries that present locational advantages superior to the locational advantages of Brazil.

Figure 1 shows the position of the other countries in relation to Brazil in terms of the relationship between productive integration and locational advantages for the Agriculture, Hunting, Forest and Fisheries (S1), Mining and Extraction (S2), Food, Beverages and Tobacco sectors (S3) and Wood, Wood Products and Cork (S6).

For the Agriculture, Hunting, Forestry and Fisheries sector (S1), Brazil has high relative locational advantages, with a lower level only in relation to India, and high productive integration, with a lower level only in relation to the Kingdom United and Germany (Figure 2,

S1). The result concerning locational advantages can be justified by the economic literature, since, according to the FAO (2012), India was the second largest producer of milk and rice, it was well positioned in terms of the largest producers of chicken and was the sixth largest food exporter in the world, which indicates why India has more locational advantages to specialization in Agriculture, Hunting, Forestry and Fisheries (1).

Figure 2 - VAX and LA rate for Sectors S1, S2, S3 and S6 in selected countries



Source: Own elaboration with the research data.

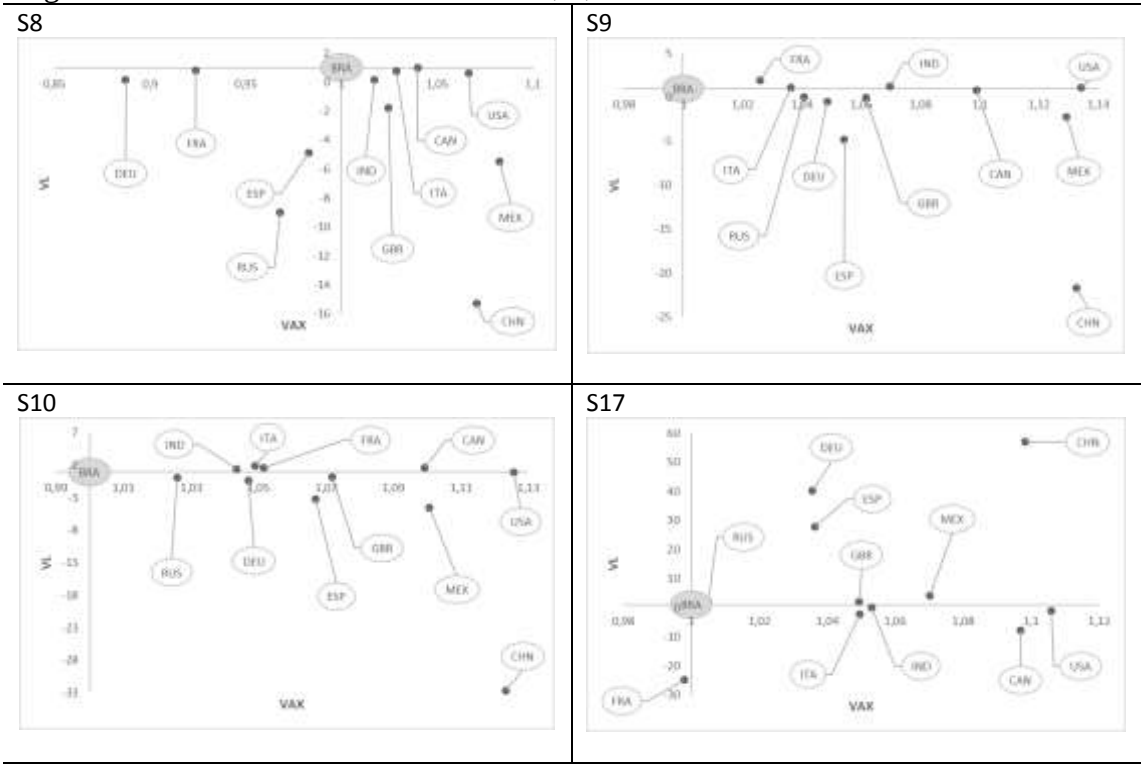
In the Mining and Extraction sector (S2), Brazil has, in relative terms, high locational advantages, with a lower level only in relation to Canada, while in terms of productive integration Brazil is relatively the most integrated, having no other country with higher level of sectoral productive integration in relative terms (Figure 2, S2). The results regarding the locational advantages in the Mining and Extraction sector (S2) can be explained by the endowment of natural resources. According to UNCTAD (2017), Brazil was the second largest producer of iron ore in 2011, which corresponds to a large share of production in the Mining and Extraction sector (2), while Canada had the fourth largest global production.

In the Food, Beverage and Tobacco sector (S3), Brazil is the most integrated and with the greatest locational advantages relative to other countries, since in relative terms there is no other country with higher coefficients (Figure 2, S3). According to the FAO (2012), Brazil was among the five largest producers of milk, pork, chicken, beef, orange, tobacco, corn and rice, as well as being the second largest with only 5.3% of the global market behind the USA, was also the world's largest exporter of coffee, soybeans, beef and sugar cane.

Similarly, in the Madeira, Wood, Wood Products and Cork sector (S6), Brazil was the country with the highest production integration in terms of relative and lower locational advantages only in relation to Canada (Figure 2, S6). Regarding locational advantages, the explanation is that, according to FAO (2012), Canada was, in 2012, the global leader in the export of lumber, the world's second largest exporter of wood pallets, wood and cellulose panels and third largest pulp producer in the world. Canada, therefore, had relevance in the sector of Madeira and Products of Madeira and Cork (S6).

Figure 3 shows the relationship between productive integration and locational advantages for the Coke, Refined Petroleum and Nuclear Fuel (S8), Chemicals and Chemicals (S9), Rubber and Plastics (S10) and Electricity, Gas and Water sectors (S17) in terms related to Brazil.

Figure 3 - VAX and LA rate for Sectors 8, 9, 10 and 17 in selected countries



Source: Own elaboration with the research data

The result for the Coke, Refined Petroleum and Nuclear Fuel sector (S8) indicates that Brazil is the one with major locational advantages in relative terms, having no country with major locational advantages in proportion to Brazil in this sector but is relatively less Germany, France, Spain and Russia (Figure S8). The results for sectoral integration can be justified by the fact that, in 2016, France and Russia were the second and third largest producers of nuclear energy, with 17.34% and 7% of global production, respectively (ELETROBRAS, 2016). while Germany was the sixth largest global consumer of oil, and Spain was the tenth largest producer of energy (BP, 2017).

In the Chemicals and Chemicals Sector (S9), Brazil presents itself as a global reference in terms of productive integration, but with fewer locational advantages to specialization than France, India and the United States (Figure 3, S9). These results can be partially justified by the production and trade of fertilizers, responsible for much of the sectoral production and trade and of relevance to the agribusiness chains, in which the USA in 2011 was the largest importer, the second largest producer and the largest producer and the third largest exporter. India was the second largest consumer, the fourth largest importer and the fifth largest producer. France, in the end, was the fifth largest importer of fertilizers (IFA, 2011).

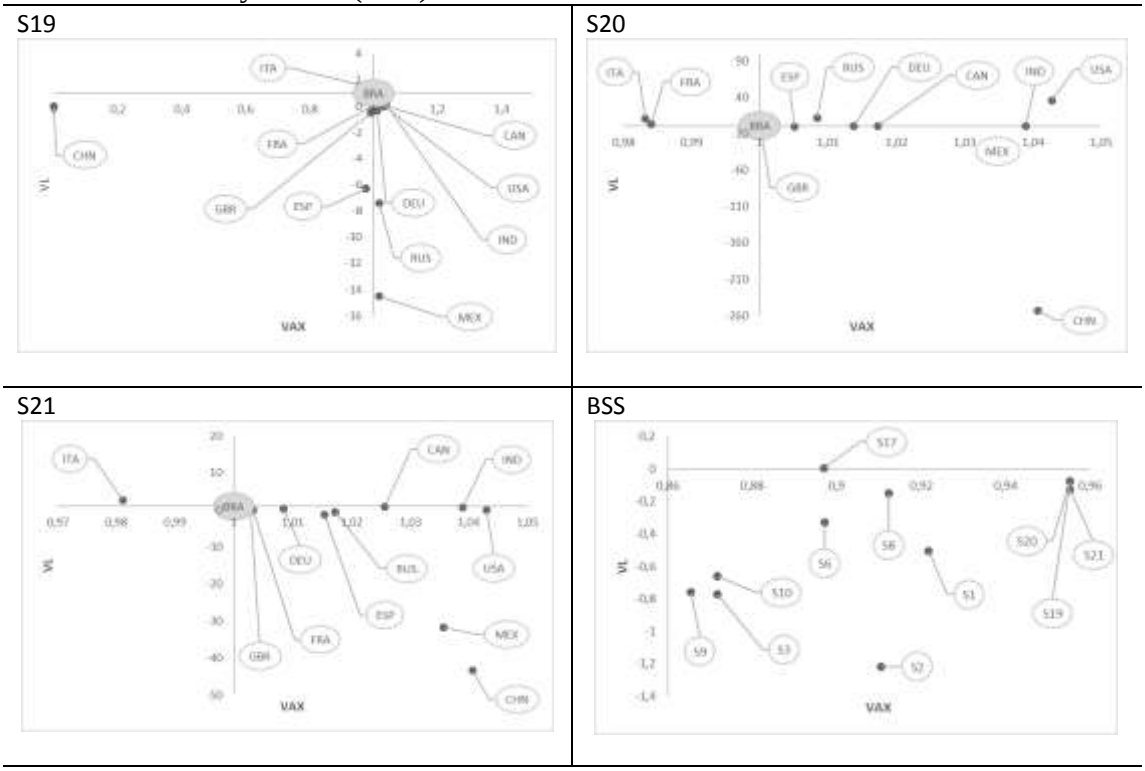
In the Rubber and Plastics sector (S10), Brazil is the country with the highest productive integration in relation to the others, but it has fewer locational advantages than India, Italy, France and Canada (Figure 3, S10). The relative locational advantages can be explained in large part by the fact that India is in 2011 the fourth largest producer of natural rubber in the world (IRSG, 2011), while Italy and France were the second and third largest demanders of plastic of the European Union (PLASTICS EUROPE, 2015).

Finally, in the Electricity, Gas and Water sector (S17), Brazil has a high production integration, being relatively less integrated only to France. On the other hand, Brazil has low relative locational advantages, behind Russia, Germany, Spain, the United Kingdom, Mexico and China (Figure 3, S17). In terms of the locational advantages to the specialization, it can be seen that China, Russia and Germany were countries with greater domestic electric power offerings than Brazil, occupying the first, fourth and sixth position, offering 22.3%, 5.4% and 2.3% of the global total, respectively. In addition, Spain and the United Kingdom were the tenth and eleventh largest net importers of world energy, with a share of 2.7% and 2.8% of the world total, respectively (MME, 2015).

Figure 4 shows the relationship between productive integration and locational advantages to the specialization of sectors the Sales, Maintenance and Repair of Motor Vehicles (S19), Wholesale Trade (S0) and Repair of Consumer Goods; (S21), in addition to a Brazilian sectoral summary (SSB), indicating how the Brazilian sectors are classified in absolute terms considering the global scenario in absolute terms.

In the Sales, Maintenance and Repair of Motor Vehicles sector (S19), Brazil has less locational advantages to specialization only in relation to Italy, while in terms of productive integration the coefficient is lower compared to China, Italy, France, the United Kingdom and Spain (Figure 4, S19). These results can be explained by the size of the motor vehicle fleet in each country, since China, Italy, France, the United Kingdom and Spain had the second (8.5%), sixth (3.8%), seventh, (3.5%), eighth (3.2%) and eleventh (2.5%) the largest fleets of motor vehicles in the world (OICA, 2015), respectively, in 2011.

Figure 4 – VAX and LA rate for Sectors 19, 20 and 21 in selected countries and Brazilian sector synthesis (BSS).



Source: Own elaboration with the research data

For the wholesale trade sector (S20) Brazil has low locational advantages to specialization, with lower coefficient than Italy, France, Spain, Russia, Germany, Canada, India and the United States, but in terms of productive integration, Brazil presents lower only in relation to Italy and France (Figure 4, S20).

Finally, in the Consumer Goods Repair sector; (S21), Brazil has less relative locational advantages than Italy, Canada and India, but high production integration relative to the other countries, with a lower coefficient only in relation to Italy (Figure 4, S21).

In terms of the Brazilian sectoral synthesis, which is presented with the coefficient results in absolute terms, both for productive integration and for locational advantages, it can be noted that the sector with the greatest locational advantages to specialization is the Electricity, Gas and Water sector (S17), while the other sectors, in absolute terms, present low productive integration and low locational advantages to sectoral specialization in absolute terms (Figure 4, S17). This result indicates that, although Brazil presents high productive integration in relative terms and high locational advantages over other countries, these coefficients still present a high growth potential for Brazil when observed in absolute terms, denoting that Brazil still has imminent capacity of expansion in the sectors of agribusiness value chains.

4. Conclusion

The objective of this article was to investigate how Brazil was coupled to the new global conformation of production of agribusiness value chains, defined based on the hypothetical extraction of the Agriculture, Hunting, Forest and Fisheries sector (S1), after the Brazilian economic stabilization, in the period 1995-2011, and using Brazil's pioneer input-output tables as estimated by WIOD.

The sectors belonging to the global value chains of Brazilian agribusiness, with above-average productive interdependence due to supply and demand, were the sectors of Agriculture, Hunting, Forestry and Fishing (S1), Mining and Extraction (S2), Beverages and Tobacco (S3), Wood and Wood and Cork Products (S6), Coke, Petroleum Refining and Nuclear Fuel (S8), Chemicals and Chemicals (S9), Rubber and Plastics (S10), Electricity, Gas and Water (S17), Sale, Maintenance and Repair of Motor Vehicles; Retail Fuels (S19), Wholesale Trade, except Motor Vehicles and Motorcycles (S20) and Repair of Consumer Goods; Retail Trade, except Motor Vehicles and Motorcycles (S21), among which are the Food, Beverage and Tobacco (S3) and Madeira, Wood and Cork (S6), Coke, Refined Petroleum and Nuclear Fuel (S8), Chemicals and Chemicals (S9) stood out in terms of relative locational advantages and high productive integration in relation to other countries.

The analysis of the Value Chains of the Brazilian Agribusiness is relevant for the national economy considering that the agribusiness sector has, historically, accounted for approximately one third of the national GDP and, therefore, has great capacity to generate employment, income and dynamism in the Brazilian economy. In this sense, it can be observed that the results found are to some extent very positive for the Brazilian economy, since in relative terms Brazil achieved a high level of productive integration and high locational advantages to the sectorial specialization, while in absolute terms, considering the global average, Brazil still has low integration and few locational advantages in practically all sectors, which constitutes growth potential for the agribusiness sectors.

In fact, the results suggest that an important way to boost Brazilian agribusiness in a global perspective, taking advantage of the Brazilian locational advantages, would be to undertake policies aimed at inserting the Brazilian agribusiness sectors into global value chains, so that the largest degree of productive integration made possible the greater use of the locational advantages perceived by Brazil, in line with what has occurred in the world to the period.

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6. Appendix

Table A1 - WIOD Sectors in 1995 and 2011.

S1	Agriculture, hunting, forestry and fishing
S2	Mining and Extraction
S3	Food, Beverage and Tobacco
S4	Textile and Textile Products
S5	Leather, Leather and Shoes
S6	Wood & Wood Products
S7	Pulp, Paper, Printing and Publishing
S8	Coke, Refined Petroleum and Nuclear Fuel
S9	Chemicals and Chemicals
S10	Food & Beverage Outlets
S11	Other Non-Metallic Minerals
S12	Basic Metals and Manufactured Metals
S13	Machines and equipment
S14	Electrical and Optical Equipment
S15	Transportation Equipment
S16	Manufacture, Nec; Recycling
S17	Electricity, Gas and Water
S18	Construction
S19	Sale, Maintenance and Repair of Motor Vehicles; Retail Fuel
S20	Wholesale, Except Motor Vehicles and Motorcycles
S21	Consumer Goods Repair; Retail Sale, except Motor Vehicles and Motorcycles.
S22	Hotels and Restaurants
S23	Ground transportation
S24	Water Transportation

S25	Air Transport
S26	Other Support Transport Activities and Auxiliary; Travel Agencies Activities
S27	Posts and Telecommunications
S28	Financial Services
S29	Real Estate Activities
S30	Machinery and Equipment Rental and Other Business Activities
S31	Administration and Public Defender; Social Security Compulsory
S32	Education
S33	Health and Social Work
S34	Other community, social and personal services
S35	Private Families with Employed Persons

Source: Own elaboration based on WIOD.