



# Determinants of international trade in brazilian soybeans and its main derivatives

## *Determinantes del comercio internacional de la soja brasileña y sus principales derivados*

João Rocilio de Souza Ribeiro, Luis Abel da Silva Filho\*

Universidade Regional do Cariri, Brasil

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### Abstract

Brazilian agribusiness has stood out in the international trade of commodities, particularly the soy complex, which, since the 2000s, has assumed the leading role in the national export agenda. Therefore, this article aims to analyze the determinants of international trade inherent to the Brazilian soy complex covering the period from 2000 to 2019. For this purpose, the Constant Market Share (CMS) model was used, considering four subperiods: 2000-2019, 2004, 2005-2011, 2012-2015 and 2016-2019. The data used to carry out this study were collected from the United Nations Commodity Trade Statistics Database (UN Comtrade). As a result, obtained by the CMS, it is highlighted that the growth effect of world trade and the competitiveness effect was responsible for the increase in exports of soy in grain since the growth of exports of soy oil was explained by the development of world exports, in the first and last subperiod, by the competitiveness effect, in the second subperiod, and by the distribution of markets in the third subperiod. The growth of national soybean meal exports was evident for most subperiods due to the development of world exports, except in the second subperiod in which the competitiveness effect was predominant. Furthermore, it was found that the growth of world exports was responsible for promoting the soy complex in aggregate form in all subperiods.

*JEL Code:* F00, F01, F06

*Keywords:* soja complex; constant market share; Brazil

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\* Corresponding author.

E-mail address: rocilioeconomista@outlook.com (J. R. de Souza Ribeiro).

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## **Resumen**

El agronegocio brasileño se ha destacado en la comercialización internacional de commodities, el complejo sojero, que, desde la década de 2000, asumió el papel protagónico en la agenda exportadora nacional. Por lo tanto, este artículo analiza los determinantes del comercio internacional inherentes al complejo sojero brasileño abarcando el período 2000 a 2019. Para ello, se utilizó el modelo Constant Market Share (CMS), considerando cuatro subperíodos: 2000-2004, 2005-2011, 2012-2015 y 2016-2019. Los datos utilizados para llevar a cabo este estudio fueron recopilados de la Base de datos estadísticos del comercio de productos básicos de las Naciones Unidas (UN Trade). Como resultado obtenido por la CMS, se destaca que: el efecto crecimiento del comercio mundial y el efecto competitividad fueron responsables del aumento de las exportaciones de soja, mientras que el crecimiento de las exportaciones de aceite de soja se explicó por el crecimiento de las exportaciones mundiales, en el primer y último subperíodo, por el efecto competitividad, en el segundo subperíodo, y, por la distribución de mercados en el tercer subperíodo. El crecimiento de las exportaciones nacionales de harina de soja se evidenció, en la mayoría de los subperíodos, debido al crecimiento de las exportaciones mundiales, excepto en el segundo subperíodo en el que predominó el efecto competitividad. Además, se encontró que el crecimiento de las exportaciones mundiales fue el responsable de impulsar el complejo sojero de forma agregada en todos los subperíodos.

*Código JEL:* F00, F01, F06

*Palabras clave:* complejo de soja, market share constante, Brasil

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## **Initial considerations**

In the context of national agribusiness, soy appears as the country's primary production and export crop. This has taken on prominent proportions since it has shown high growth rates in recent decades. This fact is evident, among other factors, due to the composition of a broad international market related to the trade of goods from the soy complex. Among the main factors responsible for this expansion is the stabilization in the production of oils, where, in this process, vegetable protein is extracted, which is in high demand, mainly from sectors related to the production of goods of animal origin. The insertion of soybeans leveraged the concept of agribusiness in Brazil, given its weight both in the physical volume produced and in its calculated financial amount. Due to its vast territorial extension, the country has great potential for increased production, technical improvement, and research, which always seek to be carried out given the issue of sustainability (BRUM et al., 2005).

Considering all the conjunctural factors linked to politics, economics, and climatic conditions, it is possible to verify that only a select group of countries has control over the production and export of certain commodities in the foreign market, thus exercising excellent market power. Given this context, until the mid-1990s, the United States was the leading producer and exporter of products derived from the

soy complex. From that period on, there was an intensification of the productive apparatus aimed at the production of commodities, especially soy, in Brazil and Argentina, where, alongside the United States, they became the most significant global producers and exporters of derivatives of this commodity, inserting in an almost monopolistic market in which conditions of greater competition are identified (CORONEL et al., 2009).

In 2010, revenues from the global sale of soybeans reached US\$ 38,970,328.42, with the United States as the largest exporter of the product, representing 47.69% of the total market share. Despite leading this segment, the USA reduced its Market Share by 26.19% from 2000 to 2010. This result reflects the increase in production and the insertion of countries such as Brazil and Argentina in the global soybean market. In the case of Brazil, from 2000 to 2010, there was a significant increase in its share in world production, from 10.49% to 28.34%. In Argentina, although the segment of soy in grain is of lesser relevance compared to meal and oil, there was a growth from 7.30% in 2000 to 12.80% in 2010. In addition, the low internal demand and differential export taxes, such as higher taxes for soybeans, increase the competitive level of Argentine soybean meal and oil (FAOFAST, 2013).

According to data from the Brazilian Foreign Trade Association (2018), from the 2000s onwards, there has been an increase in the share of commodities in the national export basket to the detriment of manufactured products. From 2000 to 2002, ten products related to the agribusiness segment represented 35.8% of the total exported; from 2012 to 2014, these numbers jumped to 49.3%. Three products stood out: iron ore, soybeans, and soybeans. This concentration of the export basket leaves the country exposed to external shocks related to exchange rate volatilities that may or may not be beneficial depending on their variations, which directly impact the prices of products traded in foreign trade.

In the 2017/2018 harvest, soy appears as the main agricultural crop in Brazil; the cultivation area covers 35 million hectares with a total production of 119.3 million tons. In the period, the area was also expanded in all producing regions, emphasizing the Northeast, Southeast, and Midwest regions, despite climatic problems, which did not harm the overall results (CONAB, 2017). It is worth mentioning the trade war, which started in 2017 between the US and China, which may result in an increase in national exports related to the soy complex due to the decrease in US exports to the Chinese market.

Based on previous information about the international soybean market, and once the relevance of the complex in the context of national agribusiness has been verified, it is necessary to deepen this theme, given the gap in the tangent to the works that cover, in detail, the question of the determinants inherent to the export of items in this sector, at a national level, about the external market, through the use of the Constant Market Share model.

Thus, the present study is organized into five sections, where the first includes these initial considerations. In the second section, there is the theoretical framework where a review of the empirical

literature is addressed regarding external competition in international trade in the soy complex, as well as trade agreements and international trade in the Brazilian soy complex, and, closing this section, there is an approach theory about the exchange rate and international trade of the Brazilian soybean complex. In the third section, the materials and methods used in the study. In the fourth section, the results are discussed, and finally, the final considerations are discussed in the fifth section.

## **Theoretical framework: Foreign competition in the international trade of the soy complex**

The trade liberalization process in Brazil in the 1990s, coupled with a progressive and continuous decrease in tariff and non-tariff barriers, encouraged the national economy to seek trade gains via the modernization of its export-oriented productive apparatus. In addition, with the emergence of the Common Market of the South (Mercosur), there was the possibility of expanding Brazilian foreign trade, mainly for national agribusiness products. In this sense, while the markets expanded, there was also an increase in external competition, mainly for the segment of products related to the national soy complex. This competition is evident, notably, in the case of Paraguay and Argentina, whose production is focused on more elaborate and processed products, which generate more excellent added value (FIGUEIREDO and SANTOS, 2005).

Coronel et al. (2009) point out that the commercialization of some agricultural commodities, particularly products related to the soy complex, have a complex arrangement in terms of their commercial viability. This justification is because the competitive level of countries involves a series of variables of a political and economic nature, such as incentives aimed at agricultural production, tariffs, non-tariff trade barriers, import taxes, government intermediaries, commercial contracts, and other aspects that make up external commercial transactions. It should be noted that in addition to these factors, the internal natural conditions, which substantially impact the productive level of a country, are, depending on these, more advantageous to produce or import a particular product.

In the context of external competition, one factor that most impacts the increase in productivity is the performance of research institutions that operate in segments directly linked to product improvement. In this perspective, considering Brazil's world's largest exporters of soy and its derivatives, there is the performance of the Brazilian Agricultural Research Corporation (EMBRAPA) in Argentina, the National Institute of Agricultural Technology (INTA). In the case of the United States, there are four agencies linked to the country's Department of Agriculture, the National Institute of Food and Agriculture (NIFA), the National Agricultural Statistics Service (NASS), the Agricultural Research Service (ARS) and the Economic Research Service (ERS) (ARS, 2013).

The market performance of the leading global soybean producers and exporters, Brazil, the United States, and Argentina, are strongly linked to their competitive levels, either to reach a more significant number of buyers, with the increase in demand, mainly from East Asian countries or to increase its participation to the detriment of its competitors. Linked to competitiveness and the level of competition, market position is linked to policies both on the side of exporters and importers. In this sense, the example is China, which, even after joining the WTO, maintained its blocking policies aimed at products derived from the soy complex. In the European Union, however, there are no considerable restrictive measures regarding the import of soy and its derivatives. However, there are discussions about the use of transgenic soy from Brazil. It is worth mentioning the implementation of the agricultural law in the United States, which measured the increase in subsidies to domestic producers to increase production (SAMPAIO et al., 2012).

Thorstensen and Ferraz (2011) comment that the increase in preferential trade agreements (APCs) has caused changes in the context of external relations. In this new context of international trade, Brazil still appears as a country with little participation, which results in the loss of several potential markets, mainly because of tariff preferences and quotas related to agricultural products. Furthermore, the reduction of non-tariff barriers given by trade partners to other countries impacts national exports, which, despite having satisfactory results, thanks to agribusiness products, could cover different markets to a greater extent.

One of the markets with the greatest absorption of Brazilian products is the European Union; in this sense, Vieira and Carvalho (2009) point out that the country's relations with the European economic bloc, a bilateral trade, has shown increasing signs of evolution, with Brazil being the main component for future trade agreements between Mercosur and the EU. Data from the Ministry of Development, Industry and Foreign Trade (MDIC) point out that exports to the EU, which until then were less than imports, increased significantly after the 2000s. European market, with emphasis on the soy complex, where France and the Netherlands are the leading importers of national soy meal.

As Becard (2011) points out, it was in the 2000s that trade relations between Brazil and China began to intensify, mainly due to exchange rate flexibility and the relative devaluation of the Real Plan, ending the parity of the real against the dollar, overcoming the financial crisis in Asia and the emergence of new growth streams in the Chinese economy. It is estimated that from 2000 to 2004, there was a 351.8% increase in the purchase of products from Brazil by China and a 106% increase in Brazilian purchases from the Chinese market. In these transactions, the highlighted segment was the national agribusiness, responsible for 70% of the total products exported to China, emphasizing the soy complex and the meat sector.

In 2008, with a view to greater commercial rapprochement between Brazil and China, the national government launched the Agenda China program in addition to boosting bilateral trade between these two nations. Among other measures, the program encouraged an increase in Brazilian exports to the Chinese market, emphasizing more elaborate products that add more excellent value, increased national exports via products that intensively use natural resources, given the increase in Chinese demand, mainly agribusiness items, and promoted actions to attract direct and indirect investments, mainly focused on the field of logistics and infrastructure (BARRAL, 2008). In 2009, China became the largest importer of national commodities, mainly soybeans, taking the top spot in the ranking of trading partners, leaving the United States in first place for 80 years, and the European Union in second and third, respectively (MAPA, 2011).

Some factors, such as an increasingly heated demand for products that make up the soy complex, the conservation of high energy prices, and the increasingly frequent use of biofuels, increase future projections related to the rise in prices of certain agribusiness items, such as the case of the soy complex. However, such an optimistic scenario is conditioned by several factors, including the exchange rate, which directly affects the prices of domestic products designated for export. Given this variable, whatever its alteration, this will directly reflect on the competitive level of the product and, consequently, on the total of its exported volume. The effects of exchange rate volatility, reflected in domestic prices, are called, in the context of the economic literature, the exchange rate pass-through (USDA, 2011).

Sonaglio, Zamberlam, and Bender Filho (2011) point out that the exchange rate, as a macroeconomic policy instrument, has varied effects on some sectors of the economy and some products aimed at the foreign market. In this sense, initially, unforeseen changes in the exchange rate would have positive effects on some agribusiness items, such as soybeans and bran. In the case of soy oil, such an effect would bring bad results, reducing its volume exported after the first periods after the exchange rate change was verified. This panorama indicates that products with a higher level of industrialization are more susceptible to exchange rate changes when compared to the effects on essential products. Thus, given more excellent elasticity to industrialized products, possible price changes because of exchange rate volatility could affect competitiveness and demand for such items more significantly.

According to Barros et al. (2002), the exchange rate is configured as a relevant condition for national agribusiness exports, especially in the case of the soy complex. In this sense, Carvalho and Silva (2008) point out that positive or negative shocks can be generated for the world economy through transactions in the soy complex. This fact derives from its greater sensitivity to volatilities in the exchange rate, prices, external demand, and climate changes. Still, in this sense, the authors point out that the link between the exchange rate and exports related to the soy complex is particularly significant both

concerning the balance in the exchange rate policy and for the performance of the agroexport sector, which innovates to meet specific demands and increase levels of competitiveness.

## **Materials and methods**

### *Data source*

This work aims to analyze the determinants of international trade in Brazilian soybeans, given the different national macroeconomic scenarios experienced during the study period. As a structure, this research has relevant works relevant to this work's respective study area. Information published by the United Nations Commodity Trade Statistics portal was used as a database. Database (Un Comtrade), data in dollars on world exports and world exports of the soy complex, with the respective NCM codes: Soy in grain, 1201.00.10, 1201.00.90, 1201.10.00, 1201.90.00. Soybean oil, 1507.10.00, 1507.90.10, 1507.90.11, 1507.90.19, 1507.90.90. Soybean, 2304.00.10, 2304.00.90.

### *Constant market share model*

Tyszynski (1951) was the first to implement this model. The author analyzed the changes in the Market-Share of countries that traded in manufactured goods between 1899 and 1950. After Tyszynski's work (1951), the model was disseminated in other studies using the same methodology with the addition of a series of different interpretations. The construction of the model allows for calculating the influence that each effect has on exports.

Furthermore, according to Leamer and Stern (1970), the model Constant Market Share is centrally based on the idea that a country's performance in the foreign market is a phenomenon that remains invariable over time. Oscillations in countries' participation in foreign trade are evidenced through competitiveness related to relative prices. Still, according to the authors' thinking, the reason that contributes to a country's low export performance, to the point of not following the average of the world flow, is the focus on commercializing goods whose demand has a growth lower than the average of the products. The export of goods to stagnant nations and the lack of resources are facts that harm the competition of a given country against foreign competitors.

Using the Constant Market Share (CMS) model will direct this research to more concise results about the dynamism of Brazilian soybean exports from 2000 to 2019, with this annual series evaluated in subperiods. Thus, there is a disaggregation of information into four respective subperiods, as follows: the

first subperiod (2000-2004), where there are considered fluctuations in the international prices of agricultural commodities; second subperiod (2005-2011), which represents the boom in commodity prices and the passage of the crisis and post-world financial crisis; third subperiod (2012-2015) where low stocks were recorded in the primary world producers and crisis in the domestic environment; and the fourth subperiod (2016-2019), which points to the most recent period of exports from the national soy complex, with 2018 showing the highest shipments of the entire period.

Among the published works that made use of that principle, the work prepared by Coronel, Machado, and Carvalho (2009) stands out, where, in it, a study is carried out inherent to the performance of Brazilian exports of the soy complex in the period from 1995 to 2006. Still, regarding the soybean complex, Dorneles and Caldarelli (2013) used the CMS model to measure its performance considering national and Mato Grosso do Sul exports from 1997 to 2010. The equation of this model can be expressed as proposed by Merkies and Van Der Meer (1988), respectively:

The present work used Leamer and Stern (1970) 's definitions to expand the model.

$X'$ : value of country A's total exports in period 1;

$X''$ : value of country A's total exports in period 2;

$X'_i$ : value of country A's exports for good i in period 1;

$X''_i$ : value of exports from country A for good i in period 2;

$X'_j$ : value of total exports from country A to country J in period 1;

$X''_j$ : value of total exports from country A to country J in period 2;

$X'_{ij}$ : value of exports from country A to country J for good i in period 1;

$X''_{ij}$ : value of exports from country A to country J for good i in period 2

$r$ : growth of world exports between periods 1 and 2;

$r_i$ : growth of world exports of good i between periods 1 and 2;

$r_{ij}$ : growth of world exports of good i to country J between periods 1 and 2;

The first equation of the model considers that in exports from country A there is no differentiation of destination or goods. Therefore, the export growth of country A is divided into two effects: world export growth effects (i) and an unexplained residual, the competitiveness effect (iv).

$$X'' - X' \equiv r.X' + (X'' - X' - r.X') \tag{1}$$

In the second part, the diversity of goods that make up the export basket of country A to the rest of the world is added.

$$X''_i - X'_i \equiv r_i.X'_i + (X''_i - X'_i - r_i.X'_i)$$

The above identity can be disaggregated, obtaining the expressions, namely:

$$\begin{aligned}
 X'' - X' &\equiv \sum_i r_i \cdot X'_i + \sum_i (X''_i - X'_i - r_i \cdot X'_i) \\
 X'' - X' &\equiv r \cdot X' + \sum_i (r_i - r) \cdot X'_i + \sum_i (X''_i - X'_i - r_i \cdot X'_i)
 \end{aligned}
 \tag{2}$$

In equation (2), the variation in the value exported by country A is explained by three components of international trade: (i) growth of world exports, (ii) composition of country A's export basket, and (iv) country A's competitiveness in the international market.

The third equation specifies the destination markets for country A's exports.

$$X''_{ij} - X'_{ij} \equiv r_{ij} \cdot X'_{ij} + (X''_{ij} - X'_{ij} - r_{ij} \cdot X'_{ij})
 \tag{3}$$

By including the specification of export destination markets, expression (4) is obtained.

$$\begin{aligned}
 X'' - X' &\equiv \sum_i \sum_j r_{ij} \cdot X'_{ij} + \sum_i \sum_j (X''_{ij} - X'_{ij} - r_{ij} \cdot X'_{ij}) \\
 X'' - X' &\equiv r \cdot X' + \sum_i (r_i - r) \cdot X'_i + \sum_i \sum_j (r_{ij} - r_i) \cdot X'_{ij} + \sum_i \sum_j (X''_{ij} - X'_{ij} - r_{ij} \cdot X'_{ij})
 \end{aligned}
 \tag{4}$$

In identity (4), the market distribution effect (iii) is added to the previously mentioned effects. Therefore, the four effects that explain the growth of a country's exports between two periods are defined, namely, according to the proposed model:

I. World trade growth effect: It is observed here whether the country's exports grew at the same rate as world trade.

II. Tariff composition effect: We analyze here whether the change in the structure of the tariff with concentration in goods with the highest growth in demand, that is, whether the composition

effect of the tariff was positive if exports were concentrated in goods with greater expansion or when the growth rate is higher than the world rate.

III. Destination effect of exports: growth resulting from the country's export market distribution.

IV. Residual effect, representing competitiveness: The residual reflects the difference between the effective growth of exports and what would have occurred in the country's exports if the participation of each good for the purchasing markets had been maintained.

The results from this analytical perspective encounter limitations that depend substantially on empirical vanity so that it can be sustained since the aggregation of the four assumptions mentioned above may not corroborate the mechanisms of growth of international trade of a country in its entirety, as defined by Ahmadi-Esfahani (2006), which is a caveat to care in interpreting the results and a technical limitation of this study.

## **Results and discussions**

The constant Market Share model aims to identify the level of participation of a given country or region in foreign trade flows at global or regional levels. The model tends to decompose the aspects that guide the increase in exports and imports and point out their determinants. Thus, the model has been used in several studies that seek to analyze the determining factors of exports, either from a country or economic bloc or from one or more products in specific.

Since Brazil has a greater dynamism in exports of primary products, there is, in the literature, a range of products related to this sector being analyzed using the Constant Market Share model. However, when one makes an apparatus about the works that used the CMS to analyze soy and its derivatives, it is verified that there are still few works that deal with the main items of the soy complex (grain, bean, and oil) considering studies about Brazil vis-à-vis its foreign competitors. In this sense, the following results aim to fill part of this gap. However, before approaching the application of the CMS for national exports of the soy complex, an analysis, expressed just below in Table 1, is in order regarding the performance of total exports from Brazil, considering the countries that imported the most national products covering the subperiods of 2000/2004, 2005/2011, 2012/2015 and 2016/2019.

Table 1

Percentage growth of national exports by selected countries – 2000 – 2019

countries	2000/2004	2005/2011	2012/2015	2016/2019
China	401.32	548.97	-14.72	80.33
USA	51.99	13.84	-9.79	28.33
Germany	59.8	78.59	-28.82	-2.66
Netherlands	68.24	140.52	-41.59	2.94
Argentina	18.33	127.74	-28.87	-27.02
Spain	96.62	117.83	-19.65	55.23
Japan	11.97	174.34	-39.12	17.98
Mexico	130.45	-2.94	-10.41	28.47
Others	109.59	150.62	-21.04	29.34

Source: own elaboration based on Comex data Stat (2021)

When observing the values obtained through the percentage growth of national exports, the 2005/2011 subperiod obtained the highest results, with the USA and Mexico registering a decrease in relation to the previous period. The highlight goes to China, which, throughout the analysis, showed the best results, proof of the dynamism of Sino-Brazilian relations intensified from the 2000s onwards, driven mainly by shipments of soybeans to the Chinese market. Negative values marked the 2012/2015 subperiod for all countries studied, with the sharpest drop in the Netherlands. In general terms, among the countries that presented the biggest falls in the period were the USA and Argentina. It should be noted, however, that these countries are Brazil's main competitors in the soybean sector. On the other hand, China, Spain, and Others showed the highest results, indicating the latter's insertion of the country in other markets.

As highlighted by Maranhão and Vieira Filho (2016), there was, in Brazil, after the 2000s, a technological increase in several sectors, mainly agribusiness. Such action, linked to the growth of world trade and increased demand for commodities, made national exports leverage. In addition, the gains in competitiveness attributed to greater incentives for product improvement research maintained an excellent export performance throughout the 2000s.

Bearing in mind the evolution of the national export performance related to the complex, below, in Table 02, there is the analysis of the percentage growth of Brazilian exports of soy in grain, considering the central importing countries of the commodity from 2000 to 2019.

Table 2

Percentage growth of Brazilian soybean exports by selected countries – 2000 – 2019

countries	2000/2004	2005/2011	2012/2015	2016/2019
China	380.73	540.28	31.26	42.17
Spain	87.56	147.86	-19.53	26.40
Netherlands	45.00	-40.79	5.58	5.83
Germany	147.79	-15.73	-38.10	-92.56
UK	100.76	118.16	1,289.50	-8.34
Thailand	391.31	294.91	12.44	2.65
Italy	182.34	-77.08	-53.56	-56.50
Taiwan	913.97	296.63	-38.10	-30.02
Others	107.80	89.54	6.27	43.72

Source: own elaboration based on Comex data Stat, (2021)

According to the results of Table 02, it is possible to state that in the first subperiod, 2000/2004, all countries showed growth in their imports of soybeans, with emphasis on Taiwan, which registered the highest value with an increase of 913.97%. In the second subperiod, China stood out with the highest recorded value. On the other hand, the Netherlands, Germany, and Italy registered negative values, indicating a decrease in their demands, mainly from the latter, which showed the sharpest reduction. There is a considerable reduction in China compared to the previous period in the penultimate subperiod. However, the highlight is the increase demanded by the United Kingdom, respectively, 1,289.50%, the highest value recorded in the entire analysis. In the last subperiod, four countries, the United Kingdom, Italy, Taiwan, and Germany, recorded declines, with emphasis on the latter, which shrank its imports by 92.56%. The highest positive value was accounted for by exports to other countries, which shows that Brazil has diversified its destination markets for soybeans.

According to data from the National Confederation of Agriculture and Livestock of Brazil (CNA, 2018), Brazilian agribusiness has assumed a prominent position in the number of national exports, having contributed 23% of their total in 2018. In this context, soybeans in grain appear as the product with the highest production volume and representativeness of the national export basket, mainly due to the high demand and availability of land for production.

Further, following the analysis of the percentage growth of national exports of the soy complex, Table 03 shows the results of soy oil based on the central importing countries of this commodity, considering the period between 2000 and 2019.

Table 3  
 Percentage growth of Brazilian soybean oil exports by selected countries – 2000 – 2019

countries	2000/2004	2005/2011	2012/2015	2016/2019
India	122.53	-13.97	51.64	-30.34
Will	224.89	-77.45	-77.00	-100.00
China	2219.19	351.39	-84.96	-17.00
Bangladesh	91.04	985.45	-4.14	22.09
Peru	281.05	232.10	-33.28	86.17
Cuba	66.32	390.25	-23.33	-68.18
Malaysia	-74.20	292.41	-11.28	-85.83
Hong Kong	49.71	289.45	-84.83	-20.82
Others	227.75	60.69	-40.11	-4.58

Source: own elaboration based on Comex data Stat, (2021)

The results in Table 03 express, in the first subperiod, that there was very high growth in China compared to the other results, the highest registered in the entire analysis; among the values, only Malaysia presented a decrease, registering -74.20%. In the second subperiod, from 2005/to 2011, there was a very sharp reduction in China, which had obtained the highest result in the previous period, even though it obtained a positive value, the highlight is Bangladesh, which registered a growth of 985.45% of its oil imports of soy, this value being the highest in the period among the countries studied. In the penultimate subperiod, 2012/2015, only India showed a positive result, reaching 51.64% growth. Among the negative results, the one with the most excellent retraction was the Chinese market, with -84.96%, while shipments to other markets had a drop of -40.11%; this result linked to the negative values of other countries is an indication that demand the external market can direct the oil production of the period to the domestic market, coupled with the growth in demand for the national industry (EMBRAPA, 2014). In the last subperiod, 2016/2019, only Bangladesh and Peru recorded growth, with higher values for the latter, while Iran registered the most excellent retraction of 100%.

According to data from Embrapa (2014), the increasing domestic demand for soybean oil, mainly due to its use for industrial purposes and biodiesel production, is reducing the portion destined for export. Another aspect that directly impacts product exports is the fact that there was an increase from 2% to 10% in the mandatory blend of biodiesel in mineral diesel between the period 2008 to 2018, with an estimated increase in this percentage for the coming years (BRAZIL, 2018).

Concluding the analysis of the percentage growth of Brazilian exports of the main component items of the soy complex, below, in Table 04, there is the growth rate of soybean exports considering the central importing countries in the period from 2000 to 2019.

Table 4

Percentage growth of Brazilian soybean meal exports by selected countries – 2000 – 2019

countries	2000/2004	2005/2011	2012/2015	2016/2019
France	61.73	27.55	-18.95	-3.23
Netherlands	120.45	137.13	-18.11	-15.07
Germany	195.05	167.74	-21.74	7.80
Thailand	125.15	175.02	-29.35	16.92
South Korea	140.95	48.16	25.14	3.31
Indonesia	268.89	12.94	456.07	-0.21
Slovenia	613.48	667.25	34.12	-28.97
Italy	109.79	13.38	-53.65	85.42
Others	81.28	95.39	-33.48	4.36

Source: own elaboration based on Comex data Stat, (2021)

According to the data obtained in Table 04, it is possible to point out that in the first subperiod, 2000/2004, all countries recorded growth in their soybean meal imports, with Slovenia reaching the highest value, 613.48%. In the second subperiod, 2005/2011, all countries maintained a favorable rate, with emphasis again on Slovenia, which reached the highest value of the analysis with a growth of 667.25%. In the third subperiod, only three positive values were recorded, Indonesia being the highlight with 456.07%; Slovenia, which had been showing promising results, had a sharp drop compared with the previous subperiod. In contrast, Italy recorded the greatest retraction with -53.65. In the last subperiod, half of the countries had positive values. In contrast, the other half had negative values; among the positive values, Italy, which in the previous period recorded the most excellent retraction in this one, obtained the highest growth. In the case of the greatest retraction, this was the responsibility of Slovenia, which, until the second subperiod, led to the growth.

According to the Ministry of Development, Industry and Foreign Trade (Brazil, 2019), in 2018, the country achieved US\$ 6.70 billion in exports from soybean meal, representing 2.79% of total exports nationally. Compared to the year 2000, there was an increase of 309% in earnings from the export of soybean meal.

Below, in Table 05, the results of the decomposition of the CMS model for national exports of soy in grain covering the period from 2000 to 2019, subdivided into four subperiods, namely, 2000/2004, 2005/2011, 2012/ 2015, and 2016/2019. Three variables were analyzed to determine the commodity's growth sources: the Growth of World Exports, the Distribution of Markets, and the Competitiveness Effect.

Table 5  
 Decomposition of the growth of national soybean exports – 2000 – 2019

	2000/2004	2005/2011	2012/2015	2016/2019
Growth in World Exports	104.34	104.91	-34.72	125.63
Distribution of Markets	1.58	-74313.91	3.48	-484.48
Competitiveness Effect	-7.35	74307.93	8.05	491.07

Source: own elaboration based on data from UN COMTRADE (2021)

With the results achieved by applying the Constant Market Share model for national soybeans, the growth of world exports was the determining factor for the realization of exports of soybeans since the distribution of markets obtained little representativeness. At the same time, the competitiveness effect recorded a negative value. In the second subperiod, the growth of world exports remained with good results. However, the highlight is the competitiveness effect, which rose radically in the previous period, being the primary determinant for promoting national exports of soy in grain. The distribution of markets, on the other hand, registered a sharp negative value, which indicates that the countries in which Brazil maintained trade relations inherent to soy in grain reached a relatively low growth than all other countries. It is worth noting that this period, among other aspects, encompasses the advent of the global economic crisis that made several economies retract their activities. This fact may be linked to such a reduction in the effect of the distribution of markets. In the penultimate and last subperiod, the determining factor for commodity exports was competitiveness, with 8.05% and 491.07%, respectively.

Regarding the competitiveness of national soybeans, Almeida et al. (2013) point out that one of the factors that most contributed to this was the trade relations between Brazil and China. In this context, in 2011, a cooperative term was signed between China and the Brazilian Agricultural Research Corporation, Embrapa, which consisted of specializing scientific research aimed at sanitary control systems and sanitary and phytosanitary. Such action had as its objective the standardization of national goods according to the regulation of the destination markets; in addition, the action also aimed to improve the genetic resource banks, making them reach greater productivity and better management techniques in the planting and harvesting of soy.

Continuing with the analysis of the application of the CMS model for the main components of the national soy complex, below, in Table 06, are the values achieved for soy oil from 2000 to 2019.

Table 6

Decomposition of the growth of national soybean oil exports – 2000 – 2019

	2000/2004	2005/2011	2012/2015	2016/2019
Growth in World Exports	101.45	100.03	101.82	100.96
Distribution of Markets	0.30	-701546	1195.93	1.06
Competitiveness Effect	-2.79	701546	-1199.87	2.13

Source: own elaboration based on data from UN COMTRADE (2021)

The results obtained with the decomposition of national soy oil exports through the CMS model show that in the first subperiod, the determinant for the promotion of exports of commodity exports was the growth of world exports. In the second subperiod, the determining factor for the promotion of exports was the competitiveness effect, which had previously registered a negative value. The distribution of markets, as well as in the previous analysis, of soy in grain registered a strong retraction, reflecting the decrease in the growth of the countries where Brazil maintained the trade link related to the commodity. In the third subperiod, the countries affected in the previous period recover, making the distribution of markets represent the export growth factor in this interval. In the last subperiod, the growth of national exports was seen as a determinant of exports, and it should be noted that this variable remained at almost constant and positive levels. However, it did not stand out in all periods.

Among some factors that made domestic soybean oil lose competitiveness, it is worth highlighting, as pointed out by FAO (2012), the growth of external competitiveness in this segment imposed mainly by Argentina and East Asia. In addition, the production price of soybean meal and soybeans are more attractive to producers, which makes the oil lose in productivity, which would be aimed at export. In addition, Xavier and Viana (2006) point out that the competitiveness effect reacts to an environment adapted to the consistent generation of competitive advantages through the implementation of macroeconomic, industrial, and foreign trade policies.

Concluding the analysis of the sources of growth of the main components of the national soy complex, below, in Table 07, are the results of the CMS for soybean meal covering the period from 2000 to 2019.

Table 7

Decomposition of the growth of national soybean meal exports – 2000 – 2019

	2000/2004	2005/2011	2012/2015	2016/2019
Growth in World Exports	103.19	102.51	102.83	102.91
Distribution of Markets	-8017.61	-121652.53	25.07	-5978336.48
Competitiveness Effect	8013.54	121649.89	-26.11	5978339.16

Source: own elaboration based on data from UN COMTRADE (2021)

With the results of the decomposition of national soybean meal exports, it can be confirmed that in the first subperiod, the growth of national exports was the determining factor for the growth of national soybean meal, with the competitiveness effect also showing a good result, since the distribution of the markets obtained a negative value of -8017.61%. In the second subperiod, the growth of world exports continued with a good result. However, the highlight is the competitiveness effect responsible for the growth of commodity exports in this period with 121649.89%, since the distribution of markets remained a negative value, however, higher than the previous period. In the third subperiod, again, the growth of world exports was the factor for promoting soybean meal exports, with the distribution of markets being the second factor, competitiveness that came with positive values; in this one, it presented a negative value of -26.11%. In the last subperiod, once again, the growth of world exports contributed most to the increase in commodity exports; in second place was competitiveness. At the same time, the distribution of markets recorded a sharp drop about the previous period, proving positive only in the third subperiod.

Regarding the competitiveness of soybean meal, Coronel, Machado, and Carvalho (2009) point out that the implementation of government policies such as the Rural Producer Certificate, the securitization of debts, and the Modernization Program for the Fleet of Agricultural Tractors and Associated Implements and Harvesters (Moderfrota) modernized the production of the soy complex, mainly soybean, which brought gains in competitiveness for the country.

Once the sources of growth in national exports of soybeans, oil, and bran have been investigated, it is time to analyze this effect for the entire complex in aggregate form to obtain more complete results.

Table 8  
 Decomposition of the growth of exports of the national soy complex – 2000 – 2019

	2000/2004	2005/2011	2012/2015	2016/2019
Growth in World Exports	97.78	98.47	107.22	120.68
Composition of the Agenda	2.57	1.77	-7.29	-20.35
Distribution of Markets	14.08	2.68	-6.56	25.28
Competitiveness Effect	-14.43	-2.92	6.62	-25.60
total growth	100.00	100.00	100.00	100.00

Source: own elaboration based on data from UN COMTRADE (2021)

According to the results, it can be stated that the predominant factor responsible for promoting exports of the national soy complex was the growth of world exports, which stood out in the four subperiods studied. In this sense, it is congruent that Brazilian production and exports accompanied the world trade growth inherent to this sector. Corroborating this fact, Garcia (2012) points out that from 2001 to 2011, soybean exports increased from Rio Grande do Sul to China and the European Union. In addition, in the same period, Mato Grosso, the largest national producer, increased shipments of the commodity to China.

Later, in Table 09, to obtain a more dynamic and complete analysis of exports of the soy complex, there is a breakdown of export growth considering the effect of market distribution, considering the leading world exporters of soybeans. Soybeans in grain; therefore, the study was carried out through the same subperiods of the previous analyses, from 2000 to 2019.

Table 9  
 Decomposition of the growth of soybean exports, market distribution effect – 2000 – 2019

countries	2000/2004	2005/2011	2012/2015	2016/2019
Paraguay	0.15	0.00	-1.01	0.00
USA	0.22	0.00	0.00	0.00
China	51.17	87.15	122.43	130.55
Argentina	0.02	0.09	-0.17	-0.01
Uruguay	0.00	0.00	0.00	14.74
Canada	-0.01	0.01	0.00	0.00
Ukraine	0.00	99.90	0.00	0.00
Netherlands	-25.44	0.00	-33.25	-0.05
Others	73.90	0.00	12.00	89.90

Source: own elaboration based on data from UN COMTRADE (2021)

According to the results of Table 09, China reached 51.17% in the first subperiod, the highest among the countries studied, with the other positive results being of little relevance and having two negative results, respectively, Canada (-0, 01) and the Netherlands (-25.44). The highest value went to “others,” representing that the country maintained a greater dynamic about selling soybeans to other nations outside that list. In the second subperiod, all values were positive, with Ukraine standing out the most, reaching 99.90%. The third sub-period again brings China with the most significant value among the countries, with 122.43%; this indicator indicates that even though this country is configured as one of the world's largest producers of soybeans, it still maintains a strong demand for the commodity. In the last subperiod, there was an increase in the indicator for China and Paraguay. However, it is worth highlighting the value with “others” 89.90%, which indicates that Brazil has diversified its destination markets for exporting soy in grain.

Santos, Batalha, and Pinho (2012) point out that changes in the political and economic scenario at the national level from the 2000s directly impacted the performance of exports of soybeans, with this set of actions leading the commodity to register high parcels in the participation of the global sales of this. Linked to internal factors, the authors highlight the high Chinese demand, which has gained notoriety since 2001, after the country entered the World Trade Organization (WTO).

Next, in Table 10, the results for the decomposition of soybean oil exports are exposed, which was evaluated under the effect of market distribution. To this end, the central exporting countries of this

commodity were used to determine whether Brazil maintained a commercial dynamic towards them from 2000 to 2019.

Table 10  
 Soybean oil export growth breakdown, market distribution effect – 2000 – 2019

countries	2000/2004	2005/2011	2012/2015	2016/2019
Argentina	0.0	0.0	0.0	0.0
USA	0.0	0.0	0.0	0.0
Netherlands	0.1	0.0	0.0	0.2
Germany	0.0	0.0	0.0	0.0
Russia	0.0	100.0	0.0	0.0
Spain	0.0	0.0	0.0	0.0
Bolivia	-7.3	0.0	0.0	1.4
Malaysia	-155.7	0.0	0.0	-15.2
Others	263.0	25.43	100.0	113.7

Source: own elaboration based on data from UN COMTRADE (2021)

As shown by the results obtained in Table 10, Bolivia and Malaysia presented negative values in the first subperiod, with more excellent representation for the latter. During this period, it should be noted that there were almost no soy oil export dynamics between Brazil and the selected countries, indicating that the commercialization of the commodity was the responsibility of other countries. In the second subperiod, only Russia obtained a relevant representation with 100%. In the third and fourth subperiods, the greatest relevance was with the other countries outside that list, with a negative value of -15.2% about Malaysia for the latter. Among other factors, it is essential to mention that Argentina and the USA are Brazil's main competitors in the soy complex segment soy.

Regarding Brazil's little dynamics for soybean oil exports, Coronel, Machado, and Carvalho (2008) point out that, among other factors, there are tariff barriers. Among these, the authors highlight the tariffs inherent to crude oil by the European Union, which imposes around 3.8% if the import is intended for industrial use and 7.6% if it is intended for commercial use. About refined oil, tariffs are around 6.1% if destined for commercial use and 11.4% if imported for industrial use. This scenario may change due to the agreement between Mercosur and the European Union in 2019; thus, with the exemption of tariffs, there was more dynamism between the two markets.

Concluding the analysis of the decomposition of exports of the main component items of the national soy complex, below, in Table 11, there are the results for soy bran, based on the central exporting countries of this commodity from 2000 to 2019.

Table 11  
 Breakdown of soybean meal export growth, market distribution effect – 2000 – 2019

countries	2000/2004	2005/2011	2012/2015	2016/2019
Argentina	0.19	0.00	0.00	0.00
USA	0.00	100.00	0.00	0.00
Netherlands	0.00	0.00	12.34	0.00
India	0.00	0.00	0.00	100.00
Germany	0.00	0.00	2.68	0.00
Belgium	0.00	0.00	87.49	0.00
Bolivia	99.50	0.00	0.00	0.00
China	0.32	0.00	0.87	0.00
Others	-0.01	0.00	-3.39	0.00

Source: own elaboration based on data from UN COMTRADE (2021)

According to the results of Table 11, it can be pointed out that in the first subperiod, only Bolivia obtained a relevant result of 99.50%. In comparison, China presented 0.32% and Argentina 0.19%. The negative result in Others is indicative that Brazil maintains a large part of its soybean meal production destined for domestic consumption. In the second subperiod, the United States was the highlight, obtaining 100%, while the other results, although positive, had little relevance. The penultimate subperiod was the one that stood out the most about the values obtained by the countries, with Belgium registering at 87.49%, the Netherlands at 12.34%, and Germany at 2.68%, with the indicator of other countries registering a negative value again (-3.39). The last subperiod had only India, with a significant result of 100%. Thus, it can be seen that the country is not dynamic about soybean meal exports if the relationships between the leading world producers of the commodity are considered.

The low dynamism present in the results above may be related to the fact that Brazil, according to Escher and Wilkinson (2019), has a significant domestic demand for soybean meal, resulting from the large poultry, beef, and pork production, since the commodity It is widely used in feed. In this sense, exports are destined for already consolidated markets, leaving other countries outside the destination of shipments.

Next, tables 12, 13, and 14 propose an approach regarding Brazil's competitiveness in exports of the main items of the soy complex based on the central exporting countries of these products. The decomposition of soybean exports on the competitiveness effect is expressed below, considering the period from 2000 to 2019.

Table 12  
 Breakdown of soybean export growth, Competitiveness effect – 2000 – 2019

countries	2000/2004	2005/2011	2012/2015	2016/2019
Paraguay	0.12	0.00	-1.38	0.00
USA	0.14	0.00	0.00	0.00
China	23.76	0.00	141.54	-4.12
Argentina	0.01	0.09	-0.23	-0.01
Uruguay	0.00	0.00	0.00	14.54
Canada	0.00	0.01	0.00	0.00
Ukraine	0.00	99.90	0.00	0.00
Netherlands	17.55	0.00	-46.99	-0.03
Others	58.42	0.00	7.06	89.63

Source: own elaboration based on data from UN COMTRADE (2021)

As shown in Table 12, in the first subperiod, all values were positive, emphasizing others, 58.42%, China 23.76%, and Holland 17.55%. In the second subperiod, the values again obtained positive results, but the only relevant value was for Ukraine (99.90%). In the third subperiod, three countries had negative results, namely the Netherlands (-46.99%), Argentina (-0.23%), and Paraguay (-1.38%); it is worth highlighting the excellent result of China (141.54%). In the last subperiod, the most relevant value was again the result of other countries, with 89.63%.

At the end of the analysis, national soybeans do not show relevant effectiveness in competitive terms among the leading world commodity exporters. Part of this is linked to investments in infrastructure and expansion of the production of the leading national competitors, in addition to internal logistical mishaps configured as impeding factors for an increase in export volumes (COSTA; SANTANA, 2014).

Below, Table 13 follows the decomposition of soybean oil exports compared to the competitiveness effect of the leading world commodity exporters from 2000 to 2019.

Table 13  
 Breakdown of soybean oil export growth, Competitiveness effect – 2000 – 2019

countries	2000/2004	2005/2011	2012/2015	2016/2019
Argentina	0.00	0.00	0.00	0.00
USA	0.20	0.00	0.00	0.00
Netherlands	0.15	0.00	0.00	-0.06
Germany	0.00	0.00	0.00	0.00
Russia	0.01	100.00	0.00	0.01
Spain	0.03	0.00	0.00	0.00
Bolivia	-0.30	0.00	0.00	0.09
Malaysia	-14.27	0.00	-0.01	8.30
Others	114.17	0.00	100.01	91.66

Source: own elaboration based on data from UN COMTRADE (2021)

The results in Table 13, in the first subperiod, show that there were two negative results, Malaysia (-14.17) and Bolivia (-14.27) and others with the highest value (114.17). In the second subperiod, only Russia presented a value, however very relevant (100%). In the third and fourth subperiods, a negative value was recorded in each, emphasizing others, being 100.01% in 2012/2015 and 91.66% in 2016/2019. With these results, it can be said that national soybean oil exports are much more competitive than other countries, demonstrating that the world's largest exporters have maintained a suitable production apparatus with investments and technical innovations aimed at export.

In their work, Aguiar and Matsouka (2016) point out that, although exports of national soy have obtained significant growth from the 2000s onwards, these were concentrated on the commercialization of soy in grain, which made the market- share of bran and oil drop considerably. The authors point out that there is an insourcing of external sales in the sector, a factor that may be linked to the lack of competitiveness of soybean oil compared to the leading players in the market in this segment.

Concluding the analysis of the decomposition of exports of items referring to the national soy complex, considering the competitiveness effect, Table 14 shows the analysis of exports of soy beans from 2000 to 2019.

Table 14  
 Decomposition of soybean meal export growth, Competitiveness effect – 2000 – 2019

Countries	2000/2004	2005/2011	2012/2015	2016/2019
Argentina	0.19	0.00	0.00	0.00
USA	0.00	100.00	0.00	0.00
Netherlands	-0.02	0.00	13.10	0.00
India	0.00	0.00	0.00	100.00
Germany	0.00	0.00	3.06	0.00
Belgium	0.00	0.00	84.04	0.00
Bolivia	99.55	0.00	0.00	0.00
China	0.32	0.00	0.84	0.00
Others	-0.04	0.00	-1.04	0.00

Source: own elaboration based on data from UN COMTRADE (2021)

With the results obtained in Table 14 in the first subperiod, there was a concentration of the competitive effect in Bolivia (99.55%), and the other results were of little relevance. In the second subperiod, only the United States presented a satisfactory result for the competitiveness effect (100%). In the third subperiod, there is the most significant number of countries in which Brazil was competitive in the export of soybean meal, respectively: Belgium (84.04%), Holland (13.10%), Germany (3.06), and China (0.84%). In the last subperiod, only India registered a value (100%), with the others being null or with little notoriety.

Sampaio and Costa (2006) point out that one of the factors that contributed to the low competitiveness of bran exports was the protectionist stance of some countries as products add more excellent value. Such action leads exporters to favor products with lower added value, reinforcing the advantage derived from the land factor, which allows lower costs, in which the exporting country transfers part of its natural advantages to the importing market. Another aspect that causes exports of national soymeal to lose competitiveness is its logistics, which lags far behind compared to that found in its main competitors.

Given the results, it is possible to ensure that Brazil maintained the competitive effect with at least one country per subperiod, indicating that the national product managed to insert itself in some of the greatest exponents of world exports of soybean meal; however, it did not stand out with most countries on the list. According to the results of this work, it was found that the national soybean meal has a revealed comparative advantage. However, the non-specialization in the production of the product causes it to lose competitiveness in its central competitor countries, which may be one of the factors that led to the results in Table 14. In this context, Costa and Santana (2015) point out that in Argentina, there was an increase in investments aimed at logistics with the construction of crushing units close to the ports aimed at exporting oil and soybean meal, while in Brazil, The fact that the demand is more significant for soybeans makes producers prefer this product to the detriment of oil and soybean meal.

## **Final considerations**

The present study aimed to analyze the performance of exports of the national soy complex and its main determinants regarding its foreign trade from 2000 to 2019. Based on what was recorded in this work, it can be said that Brazil has consolidated as one of the world's largest producers and exporters of the soy complex. This fact is linked to several internal and external factors registered throughout the analysis, such as the increase in production provided via land availability, which increased the areas of cultivation and new production techniques arising from research led mainly by Embrapa. These economic policies made production viable (Lei Kandir) and a heated external demand.

Using the Constant Market Share model, it was possible to identify the determinants that promoted exports of the main items of the soy complex. Initially, the determinants of the growth of soybean exports were analyzed. It could be seen that in the first two subperiods, 2000/2004 and 2005/2011, the growth effect of world exports was the determining factor, while in the last two subperiods, it was the competitiveness effect the determining factor obtaining these, more expressive values compared to the results of the two initial subperiods.

For soy oil, in the first subperiod, the growth of world exports was verified as the factor promoting exports of the commodity; in the period 2005/2011, the competitiveness effect was the determining factor, reaching the highest value of this analysis, in the third In the last subperiod, the distribution of markets explained the promotion of exports, finally, in the last subperiod, the growth of world exports was again responsible for the performance of soybean oil exports.

Regarding soybean meal, in almost all subperiods, the growth of world exports was evidenced as a source of growth in national exports of soybean meal, except in the second subperiod, where this effect was explained by competitiveness. Regarding the analysis of the sources of growth in exports of the soy complex in the aggregate, the predominant factor in all subperiods was the growth of world exports, which was more evident in the last subperiod, 2016/2019.

After analyzing the decomposition of the growth of exports of the main components of the soy complex, taking into account the distribution effect of markets and the competitiveness effect, measured in a disaggregated way and taking into account the central exporting countries of each item, it was obtained, in order to soybeans, that only China maintained a dynamic demand for the Brazilian item because despite being a large producer, the Chinese market needs to import large quantities of soybeans, which a large part comes from Brazil.

The demand for soybean oil and meal did not show dynamics among the leading exporters, indicating that Brazil does not maintain relevant trade links related to these products with these countries. Regarding the competitiveness effect, in general, consistently relevant results were not obtained for the three items under analysis, which indicates that Brazil does not have competitive products compared to the analyzed countries.

Thus, this Article sought to fill a gap in the studies that portrayed this theme, giving an in-depth character regarding the exports of the national soy complex, evaluating each item (grain, bran, and oil) separately. It is worth mentioning the limitations of this study, a more excellent literary coverage about the explanation of results regarding soybean meal and oil. Finally, as a suggestion for future studies, it would be essential to prepare an analysis on the feasibility of increasing exports of soybean oil, its challenges, and its possible effects on the national economy, given that it is the most valuable product aggregate of the soy complex and what economic policies the central exporting countries have implemented and what are the feasibility and impacts of a possible implementation of similar policies in Brazil.

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