

## Specialization and competitiveness: analysis of Brazilian exports of cocoa beans and products

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### Abstract

Cocoa farming was and still is an economic activity of great importance for the economy of Brazil and the rest of the world. During the last few decades, African and Asian countries have increased their presence as producers, increasing global competition and leading to changes in Brazil's participation in foreign markets. In this context, this study analyzes the competitiveness of Brazilian cocoa farming based on exports of cocoa beans and products (powder and press cake, cocoa butter and cocoa liquor). To do so, foreign trade indicators were calculated for the period from 1996 to 2016, in the form of: revealed comparative advantage (RCA); coverage ratio (CR); and trade balance contribution index (TBCI). The data showed that, from 1997, Brazil has moved from being an exporter to import cocoa beans, as a result of the significant drop in production and productivity of the agriculture of the state of Bahia, the largest exporter and importer of cocoa beans in Brazil. In several years, exports of cocoa butter accounted for the greatest contribution to foreign trade. In general, the indicators showed the poor competitive performance of Brazil in the international market of cocoa beans and products. The country lost market share and suffered the greatest loss of competitiveness in the export of such commodities. There is a need to formulate competitive strategies to support the cocoa industry in order to increase its global market share. This could involve conquering more dynamic or little-exploited markets, mainly for cocoa products which offer higher added value.

**Key words:** Brazil, indicators, international trade, market-share.

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## Introduction

Up until the 18<sup>th</sup> century, the export of cocoa beans represented an important source of earnings and currency income for Brazil, with the Amazon Basin being the most renowned region of production. However, cocoa was not significant for the Brazilian agenda of exports, compared to other agricultural products exported by the incipient colony. In 1746, cocoa production was introduced to the southern region of the state of Bahia, specifically in the municipality of Canavieiras, although production was still in its infancy. Favorable climatic and soil conditions, besides the availability of land, favored its cultivation.

Garcez and Freitas (1975) argue that the cocoa economy in Bahia in the mid-18<sup>th</sup> century represented a viable alternative to the crisis faced by the sugarcane market-. This crisis occurred as a result of successive attacks on sugarcane mills by the indigenous resistance, who were forcibly engaged in the production of this crop. Another element was the emergence of the smallpox epidemic, which drastically reduced the indigenous population, creating a shortage of labor. In short, this activity was based on the plantation model, with a focus on external markets (Martins, 2007)-. However, at that time Bahia still occupied a secondary role, in relation to the Amazon region. Then, in the 19<sup>th</sup> century, industrial progress and the consumption of chocolate in Europe and the United States turned the cocoa market into a substantial economic opportunity. As a result, the wealth being generated from cocoa aroused the interest of several countries. This scenario fostered the global supply of this commodity, which boosted cocoa farming in Bahia, a region with climate and soil conditions similar to its natural habitat (Prado Júnior, 1970; Martins, 2007; Ceplac, 2018).

At the end of the 19th century, cocoa farming consolidated in southern Bahia, its production being mainly directed to the international market. In the twentieth century, between 1905 and 1910, Brazil was the world leader in global production of cocoa, with approximately 200 000 tons of cocoa beans produced over this period. The growth of cocoa production, leveraged by the production from Bahia, gave rise to the first chocolate industries, founded in Brazil between the late-19<sup>th</sup> and early 20<sup>th</sup> centuries. These were principally family-based industries, founded by immigrants. The first chocolate factory was settled in 1891 by Neugebauer, initially using craft production techniques and with machinery only introduced into the productive process in 1920. Lacta was founded in São Paulo in 1912 and was a pioneer in the industrial production of chocolate. In 1996 this company was sold to Kraft Foods. Kopenhagen was founded in 1928, followed by Chocolates Garoto the following year, which initially dedicated its efforts to the production of candies. Finally, the Swiss company Nestlé arrived in Brazil in 1921, but only began to produce chocolate in 1959 (Abicab, 2016).

Historically, cocoa cultivation in Bahia was marked by cyclical and structural crises, notably: the crisis of the 1920s (involving the first cocoa shock in the external sector), the crisis of the 1930s (when the Cocoa Institute of Bahia -ICB was created, in 1931), that of the late 1950's (which was overcome with the help of the formation of the Executive Planning Commission for Cocoa Farming -CEPLAC) and, finally, the crisis of the late 1980s (an acute regional crisis, during which an outbreak of witch's broom disease *Moniliophthora perniciosa*, combined with a fall in international

prices, harmed cocoa production) (Menezes and Carmo-Neto, 1993). Political and cultural elements are also worth considering such as the reduced saving capacity of local producers and insignificant political representation for cocoa farmers.

It is worth noting the lack of investments in improved agricultural techniques, as well as ineffective public policies directed to cocoa farming, which, to a certain extent, have contributed to the low productivity of cocoa plantations. In fact, the cocoa crisis triggered in the late 1980s resulted in a number of economic and social consequences, as the spread of the above-mentioned disease in southern Bahia resulted in a historic decline in production and productivity levels. In this context, Fontes (2013) refers to the various effects of the crisis, including ‘[...] the abandonment of plantations by producers, migration to urban areas and the formation of slums in towns and cities near to rural productive areas.’ In addition to these factors, the crisis also resulted in consequences in terms of land value and labor relations (Baiardi, 1987).

Nowadays, most of Brazil’s cocoa bean production is concentrated in two states: Bahia and Pará. In 2016, Bahia accounted for around 54.13% of national production, while Pará accounted for 40%. The remainder of the national production of cocoa beans comes from the states of Espírito Santo, Minas Gerais, Mato Grosso, Rondônia, Roraima and Amazonas (SIDRA/IBGE, 2018).

Through preliminary analysis of the Brazilian trade balance for cocoa beans, it can be inferred that there was a gradual reduction in *ex-post* performance in recent years. During that time, Brazil has been gradually losing market share and has had trade deficits in some years. This research follows the theoretical perspective of Haguenuer (1989), which asserts that evidence of the foreign trade performance of a given sector or product, within a certain geographic scope, is provided by the continuity or increase of its market share. Zugaib (2005) reports that the country operated as a net exporter of cocoa until 1997, meeting demand from the national cocoa processing industry and generating an economic surplus for export. However, domestic cocoa consumption has increased to such an extent that domestic production is no longer enough to meet this demand. As a result, Brazil has imported cocoa beans for a number of years and, therefore, is no longer a major international cocoa exporter.

Despite a significant reduction in productivity, Bahia continues to be the largest cocoa producing state in Brazil. However, other states, such as Pará, have increased their production since the 1990s. Even with the adverse effects of the economic crisis of the 1990s it can still be said that southern Bahia represents the focal point of Brazilian cocoa production.

The Brazilian cocoa processing industry, mainly located in the south of the state of Bahia, absorbs a substantial proportion of domestic cocoa bean production to export cocoa products (such as cocoa butter, liquor, powder and press cake). This is different from the African countries, for example, where most of the production is exported unprocessed (FAOSTAT, 2018).

In the international market, the largest cocoa producers are located in Africa, most notably Côte d’Ivoire, Ghana, Nigeria and Cameroon. In 2016, 67.19% of world cocoa bean production came from this continent, followed by Asia (15.29%), the Americas (16.34%) and Oceania (1.17%).

Between 2000 and 2012, Brazil remained among the seven largest producers of cocoa in the world. However, it was not among the world's largest exporters of this crop. National production of this commodity has basically been directed to domestic consumption, meeting the demand of processing and chocolate production industries (FAOSTAT, 2018).

The cocoa segment is highly significant for the Brazilian economy in terms of the generation of earnings, employment and currency income. Furthermore, Brazil still maintains a significant share of the international market for cocoa and cocoa products.

The present study aims to analyze the competitiveness of Brazilian cocoa farming in international trade between 1990 and 2016. The scope of this study is relevant for guiding the preparation of public policies in the domestic or international context. Furthermore, the findings could potentially support private investment decisions. The study may enable future diagnostic possibilities for the studied segment, contributing to the formulation of public policies that stimulate the local economy by improving competitiveness and increasing insertion into international markets.

## **Materials and methods**

Given that there are numerous variables that may influence the degree of competitiveness of a country in external markets, it is suggested to use a range of indicators to capture the competitive evolution of a country or sector over time. In this sense (1989) argues that 'no synthetic indicator can be used to measure competitiveness as it is proposed'. Sharing the same vision, Siudek and Zawajska (2014) state that: 'since competitiveness is a complex concept determined by a multiplicity of factors, it seems that the most appropriate way to estimate the level of competitiveness is by using multidimensional or composite indicators (indexes) of competitiveness [...]'.

Thus, to measure the standards of specialization and competitiveness of the cocoa segment, a range of competitiveness indicators were used. Details of the calculation of these indicators are presented below.

### **Competitiveness indicators**

#### **Revealed comparative advantage**

The revealed comparative advantage (RCA) index was proposed in 1965 by Bela Balassa, with the objective of consolidating an analytical instrument that could measure the 'revealed' comparative advantage of a country, i.e., *ex-post* of trade flows (Pereira *et al.*, 2011; Soares and Silva, 2013). This index enables analysis of the degree of specialization of a given region, which can include anything from countries to economic blocks, for a given product or productive sector. According to Tonhá *et al.* (2010), the RCA can be used to establish standards of specialization in the domestic and international context.

Balassa and Noland (1989) define this indicator as ‘the ratio of a country’s exports in a particular commodity category to its share in total merchandise exports’ and expressing that the calculation of this index considers the exports of a particular product or sector in relation to the exports of the zone of reference of this product; and compares this quotient with the total exports of the country under analysis with the total exports of the zone of reference (Ilha *et al.*, 2010).

The generic formula for calculating this index can be defined by the equation (1).

$$RCA = \left( \frac{X_{ij}}{X_{ik}} \right) / \left( \frac{X_j}{X_k} \right) \quad 1)$$

Where:  $RCA_{ijk}$  = revealed comparative advantage of product  $i$ , from region relative to a reference zone  $k$ ;  $X_{ij}$  = value of exports of product  $i$  from region  $j$ ;  $X_{ik}$  = total value of exports of product  $i$  in reference zone  $k$ ;  $X_j$  = total value of all exports from region  $j$ ;  $X_k$  = total value of all exports from reference zone  $k$ .

The values obtained from the RCA calculation fall in the interval from zero to infinity: if RCA is greater than unity, then region  $j$  will have a revealed comparative advantage for the product or sector ( $RCA_{ijk} > 1$ ); on the other hand, values between zero and unity reveal comparative disadvantage ( $0 < RCA_{ijk} < 1$ ).

It should be noted that RCA does not consider possible distortions in international trade affecting exports, such as tariff and non-tariff barriers, effects of exchange rate, etc. This is because this indicator preserves certain premises of neoclassical economic theory, such as the doctrine of free international trade with minimal governmental intervention. This indicator is classified as a dissymmetric indicator, since comparative advantage varies from 1 to infinity, while disadvantage varies from zero to unity (Ilha *et al.*, 2010).

### Coverage ratio

The coverage ratio (CR) is a foreign trade indicator that allows us to measure the extent to which exports ‘cover’ imports, for a given product or sector. This indicator has also been used complementarily to RCA (Soares and Silva, 2013; Macedo and Soares, 2015). Its calculation is defined as the quotient between exports and imports, as presented in equation (2) below.

$$CR_{ij} = \frac{X_i}{M_i} \times 100 \quad 2)$$

Where:  $CR_{ij}$  = coverage ratio of product  $i$ , for the country or region  $j$ ;  $X_i$  = value of exports of product  $i$ ;  $M_i$  = value of imports of product  $i$ . Note that:  $CR_{ij} > 1$ : indicates that exports cover imports, over a given period;  $CR_{ij} < 1$ : indicates that the value exported is lower than the value imported;  $CR_{ij} = 1$ : indicates that exports are the same as imports.

Thus, if the CR is greater than unity, the product or sector under analysis contributes to a trade surplus. On the other hand, if the value obtained is lower than unity, the contribution to the trade balance is deficient. This indicator can be used to infer if there is a comparative advantage or disadvantage, whereby:  $CR_{ij} > 1$  indicates that exports cover imports, denoting that the sector or product of a given region or country has a comparative advantage in international markets (Martins *et al.*, 2010).

Joint analysis using the CR and the RCA points out the existence of strengths, weaknesses and neutral aspects in the foreign trade of a certain region or country in the export of a given product. Thus, if the RCA and CR are both greater than unity ( $RCA > 1$ ;  $CR > 1$ ) then the product in question constitutes a strength of the economy, likewise, if both of the above indicators are lower than unity ( $RCA < 1$ ;  $CR < 1$ ) then the studied product is considered a weakness in terms of international trade. The contribution will be neutral when only one of the indicators is less than unity ( $RCA > 1$ ;  $CR < 1$  or  $RCA < 1$ ;  $CR > 1$ ) (Martins *et al.*, 2010; Mota, *et al.*, 2013). Thus, the interaction between these indicators allows us to verify whether the cocoa segment has shown competitiveness in the external sector, rating it as a strength, weakness or as having a neutral effect for the Brazilian economy.

### Trade balance contribution index

This indicator was proposed by Lafay (1990) to help identify the degree of specialization of exports and to evaluate the extent of the contribution of a product or sector to the trade balance. According to Soares and Silva (2013), the trade balance contribution index (TBCI) consists of comparing the observed trade balance for each product, or group of products, with the theoretical trade balance for the same product. Thus, this indicator can be obtained using the following equation (3).

$$TBCI_{ij}^t = \left[ \frac{100}{\frac{(X_i^t + M_i^t)}{2}} \right] * \left[ (X_i^t - M_i^t) - (X^t - M^t) * \frac{(X_i^t + M_i^t)}{(X^t + M^t)} \right] \quad 3)$$

Where:  $TBCI_{ij}^t$  = trade balance contribution index of product i, in a given period of time t, for a region j;  $X_i^t$  = Exports of product i, in a given period t;  $M_i^t$  = imports of product i, in a given period t;  $X^t$  = total exports of the region, in a given period t;  $M^t$  = total imports of the region, in a given period t.

For positive values ( $TBCI_{ij}^t > 0$ ), product i demonstrates revealed comparative advantage, contributing to a positive balance of trade, in a given period t. Likewise, for negative values ( $TBCI_{ij}^t < 0$ ), product i displays comparative disadvantage (Soares and Silva, 2013; Mota *et al.*, 2013).

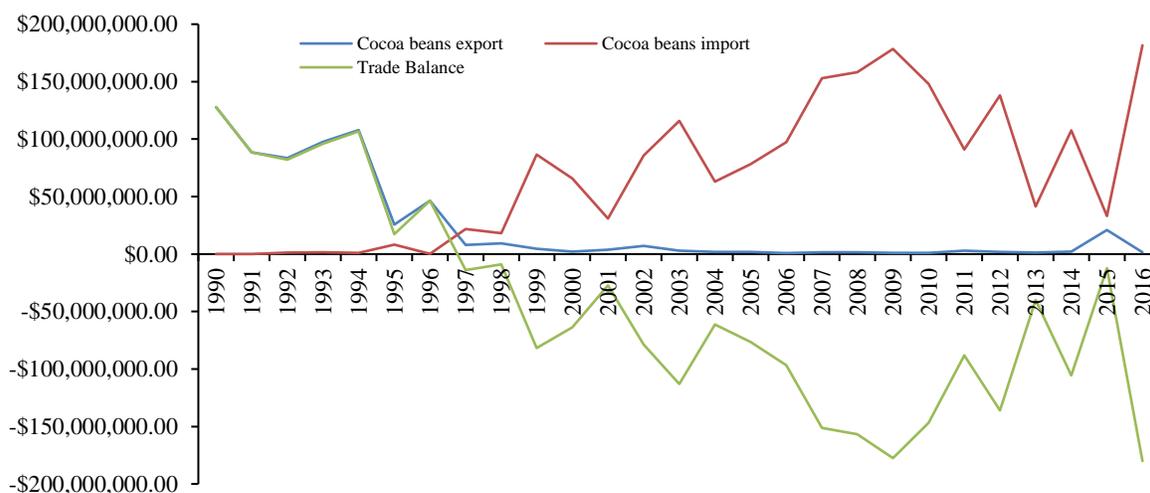
### Data sources

Data on Brazilian and global trade balances were obtained from the World Trade Organization database (WTOSTAT, 2018). Data on Brazilian trade balance for cocoa beans and products and global exports and imports were retrieved from the Food and Agriculture Organization

(FAOSTAT, 2018). Export and import data refer to annual free on board (FOB) values, in US\$. Other information, such as regarding the production and productivity of cocoa farming in Brazil, was retrieved from the SIDRA-IBGE database (2018).

## Results and discussion

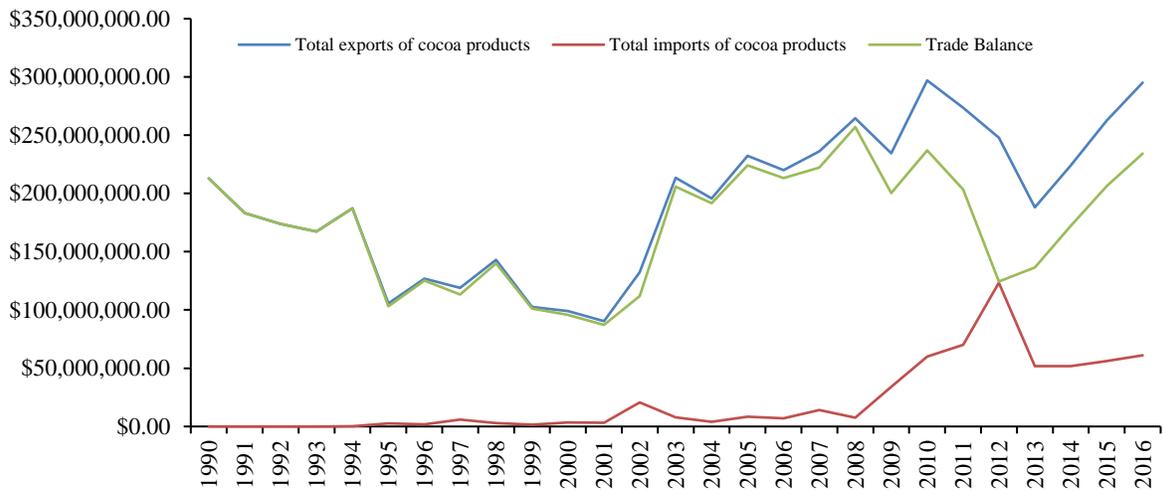
Between 1990 and 1996 there was a trade surplus for Brazilian cocoa beans. However, after 1996, the trade balance remained successively negative, notably in 2009, when the deficit reached US\$ 177 million (Figure 1). In 2016, the deficit once again reached a similar figure, US\$ 178 million, following a drastic fall in cocoa crop production and productivity in Bahia, the largest producer state in Brazil. In 2015, cocoa bean production in Bahia reached 158 000 tons, with productivity of 294 kg ha<sup>-1</sup> (IBGE, 2018). In 2016 the harvest dropped, mainly due to a severe drought occurred in 2015 that drastically affected the crop, decimating countless cocoa trees and decreasing plant productivity.



**Figure 1. Evolution of the Brazilian trade balance for cocoa beans between 1990 and 2016. Monetary values expressed in US\$ Free on Board (FOB) (FAOSTAT, 2018).**

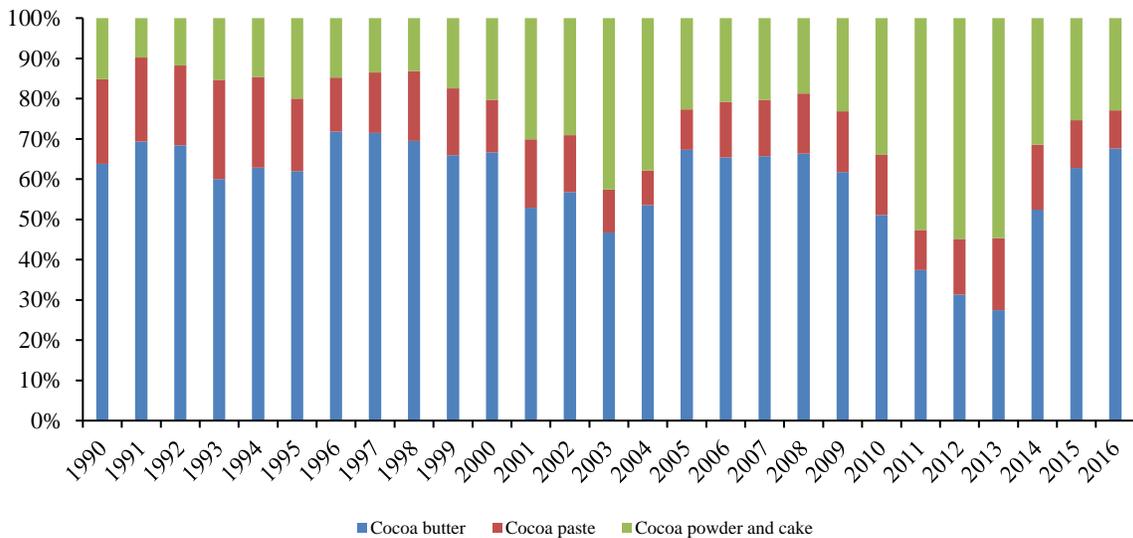
As we have seen, Brazil substantially reduced its exports of unprocessed cocoa, becoming a net importer of cocoa beans in order to mitigate the deficit in domestic production -which has become more pronounced, especially since the last cocoa farming crisis that began at the end of the 1980s. On the other hand, the imported cocoa and a substantial part of the domestic production of cocoa beans has been channeled to meet domestic demand from the cocoa processing industry, which adds value to the product, generating currency income and employment.

On the other hand, Brazil plays a role in the international trade as an exporter of cocoa products and has had a trade surplus in the studied period (Figure 2). It can be observed that Brazilian imports of cocoa products were negligible. The largest figure for imports was recorded in 2012, while exports of cocoa products showed an upward trend starting in 2000 and reaching US\$300 million in 2016.



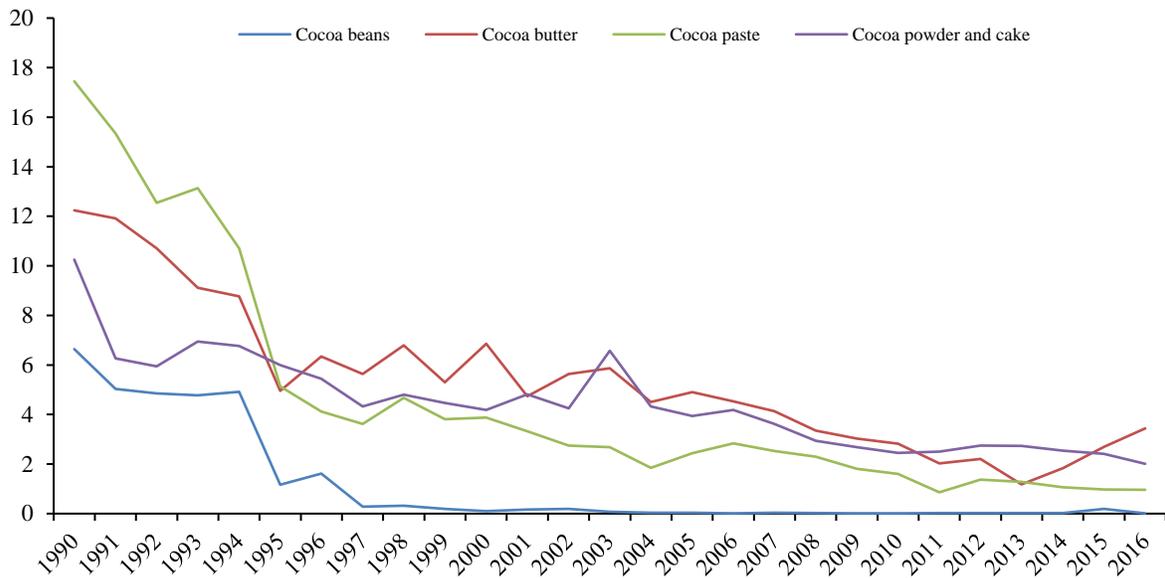
**Figure 2. Behavior of total exports and imports of cocoa products, from 1990 to 2016, in US\$Free on Board (FOB) (FAOSTAT, 2018).**

For a number of years, exports of cocoa butter made the greatest contribution to foreign trade. However, after 2008, it lost its relative importance in relation to the other exported products and between 2011 and 2013, exports of powder and press, cake represented the largest contribution to the trade balance. Finally, exports of cocoa liquor were less significant (Figure 3).



**Figure 3. Relative share of cocoa products in total sector exports 1990 to 2016 (FAOSTAT, 2018).**

Figure 4 shows the results obtained by calculating the RCA for Brazilian exports of cocoa beans and products between 1990 and 2016.



**Figure 4. Revealed comparative advantage of Brazilian cocoa beans and products, from 1990 to 2016.**

At the beginning of this period Brazil demonstrated a revealed comparative advantage in the export of cocoa beans since the RCA in 1990 was greater than unity. However, the RCA gradually decreases for all products over most of the analyzed period (Figure 4). This is a result of the increase in the deficit of domestic production, from 1996, and the growth of imports, which generated negative effects on the trade balance of this product. From this perspective, Brazil loses its advantage in the international market compared to its competitors.

In general, terms, Brazil has shown a comparative advantage for the cocoa butter product in every year of the analysis, since the value of the index was greater than unity. We can note, however, a gradual reduction in comparative advantage over time, denoting loss of *ex-post* competitiveness. Regarding cocoa liquor, it can be seen that in 2011, 2015 and 2016 the loss of revealed comparative advantage is accentuated. For cocoa powder and press cake, Brazil showed revealed comparative advantage over the whole period, but with a decreasing trend. Therefore, from the perspective of RCA it can be concluded that Brazil has lost international competitiveness even for the higher added-value products (MAPA, 2015; IPEA, 2018).

A possible explanation for the increase in cocoa imports in recent years, and the corresponding trade deficit for the commodity, is the duty drawback scheme. The drawback scheme, on the other hand, has fostered the specialization standards of the Brazilian processing industry. According to Zugaib (2005), the increase in cocoa imports in Brazil is associated with the duty drawback scheme, through which an 'incentive granted to manufacturing-exporting companies permits them to import items free of taxes and fees, provided these items are to integrate a final product through transformation, processing or incorporation, with the basic condition that the product is for export'. This scheme brings positive effects for the cocoa processing industry, due to the exemption of taxes on the raw material, permitting the export of value-added goods. In 2010,

Indonesia adopted a similar policy, with the aim of strengthening the competitiveness of its processing industry and adding value to its production chain (Rifin and Naully, 2013). Thus, importation of raw material, which is exempt of taxes, has grown because of the possibility of adding value to the product before selling it on external markets. In Brazil, the state of Bahia is the largest exporter and importer of cocoa beans.

Regarding the coverage rate for cocoa beans, results were higher than unity between 1990 and 1996, this product contributed to the trade surplus. Between 1997 and 2016; however, this index resulted in contribution to deficit, due to the reduction in the quantity exported and a substantial increase in imports, aimed to meet the demand of the cocoa processing industry (Table 1).

**Table 1. Coverage rate of Brazilian exports of cocoa beans and products, between 1990 and 2016.**

Year	Almond	Butter	Paste	Powder and pie
1990	-	-	-	16 149.50
1991	-	31 741 500.00	-	4 472.25
1992	62.05	-	-	1 709.58
1993	63.16	33 459 000.00	-	1 221.48
1994	111.86	117 721.00	2 638.19	703.79
1995	3.13	32.97	39.86	351.63
1996	541.36	1 199.93	10.68	263.87
1997	0.36	85.91	4.32	21.85
1998	0.51	99 305.00	17.62	12.12
1999	0.06	33 844.00	207.78	13.49
2000	0.03	497	45.69	6.54
2001	0.12	1 017.45	71.65	9.25
2002	0.08	130.08	3.17	2.73
2003	0.03	-	21.09	13.69
2004	0.03	52 358.00	98.94	18.99
2005	0.02	78 169.50	423.16	6.44
2006	0.01	35 966.00	186.86	6.86
2007	0.01	25 866.67	7.05	5.08
2008	0.01	3 581.45	87.79	7.02
2009	0.01	14 493.30	252.84	1.60
2010	0.01	12 643.50	56.07	1.71
2011	0.03	381.38	13.81	2.12
2012	0.01	161.84	6.79	1.15
2013	0.03	55.76	10.82	2.16
2014	0.02	93.74	6.42	1.56
2015	0.63	127.29	6.58	1.33
2016	0.01	105.17	11.68	1.20

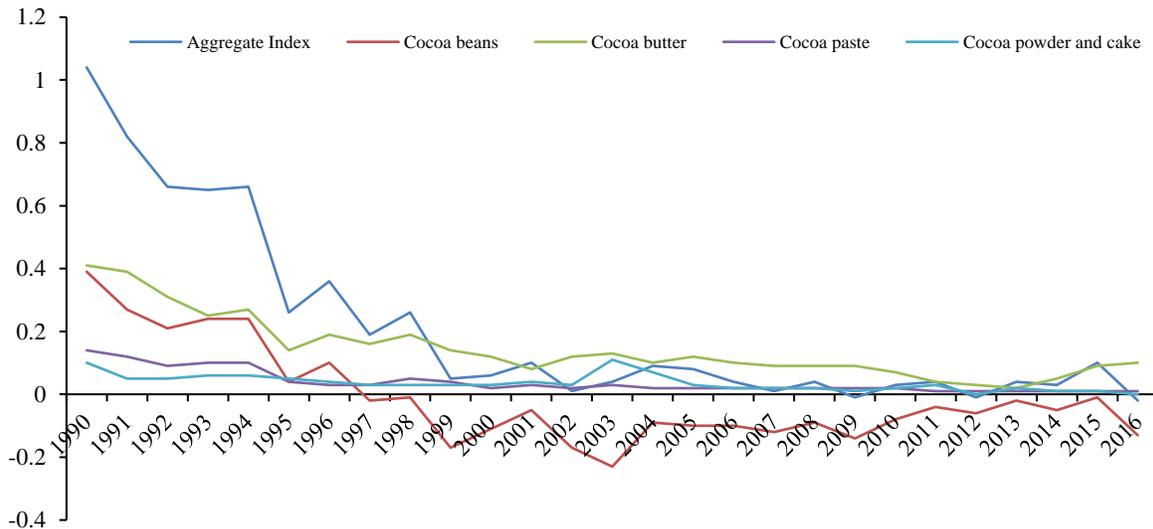
The CR results for cocoa products, in turn, showed a positive contribution to the trade balance for the segment, since exports surpassed imports in every year of the analysis, demonstrating that Brazil has a comparative advantage for this group of semi-industrialized products. Cocoa butter is of particular importance, since it is the product making the largest contribution to the competitiveness of this segment.

The interaction between RCA and CR confirmed that Brazilian exports of cocoa beans only represented a strength of the economy between 1990 and 1996 (Table 2). Subsequently, this product proved to be a weakness, since the revealed comparative advantage did not coexist, nor did this product present surplus trade balances. However, cocoa products represent a strength in terms of international trade, except for the years 2011, 2015 and 2016, when exports of cocoa liquor were a neutral point-in these years this product showed revealed comparative disadvantage.

**Table 2. Interaction between CR and RCA: strengths, weaknesses and neutral points of Brazilian cocoa farming.**

Year	Almond	Butter	Paste	Powder and pie
1990	Strong	Strong	Strong	Strong
1991	Strong	Strong	Strong	Strong
1992	Strong	Strong	Strong	Strong
1993	Strong	Strong	Strong	Strong
1994	Strong	Strong	Strong	Strong
1995	Strong	Strong	Strong	Strong
1996	Strong	Strong	Strong	Strong
1997	Weak	Strong	Strong	Strong
1998	Weak	Strong	Strong	Strong
1999	Weak	Strong	Strong	Strong
2000	Weak	Strong	Strong	Strong
2001	Weak	Strong	Strong	Strong
2002	Weak	Strong	Strong	Strong
2003	Weak	Strong	Strong	Strong
2004	Weak	Strong	Strong	Strong
2005	Weak	Strong	Strong	Strong
2006	Weak	Strong	Strong	Strong
2007	Weak	Strong	Strong	Strong
2008	Weak	Strong	Strong	Strong
2009	Weak	Strong	Strong	Strong
2010	Weak	Strong	Strong	Strong
2011	Weak	Strong	Neutral	Strong
2012	Weak	Strong	Strong	Strong
2013	Weak	Strong	Strong	Strong
2014	Weak	Strong	Strong	Strong
2015	Weak	Strong	Neutral	Strong
2016	Weak	Strong	Neutral	Strong

Figure 5 presents the results obtained using the TBCI. In general terms, from the point of view of the aggregated TBCI for the cocoa segment, Brazil presented a comparative disadvantage only in 2009, 2012 and 2016, when the values were negative. In addition, it was noted that the values obtained were not very substantial, evidence of the weak contribution of these products to the country's trade balance.



**Figure 5. Trade balance contribution index for Brazilian exports of cocoa beans and products between 1990 and 2016.**

Breaking down the TBCI by sub-product, we find that cocoa beans are the product that leveraged the downward trend of this indicator. On the other hand, cocoa butter was the product that most contributed to the segment's trade surplus.

## Conclusions

It has been observed that Brazil's competitiveness in the cocoa market has declined, from 1990 to 2016, for all of the products analyzed here. The reduction in the productivity of cocoa plantations since the 1990s has drastically reduced the importance of the country, and the state of Bahia in particular, in the international market. Regarding cocoa products, the trade balance performance was stronger than for cocoa beans.

The indicators reveal a loss of competitiveness for Brazil, not only for cocoa beans, but for cocoa products as well. With regard to the trade balance for cocoa beans, it must be emphasized that the duty drawback scheme has fostered a greater flow of imports, generating trade deficits, although this has stimulated the trade of products with greater added-value for the country.

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