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## ANALYSIS OF THE NON-TARIFF MEASURES PRACTICED BY CHINA AND THE UNITED STATES ON BRAZILIAN EXPORTS OF THE MEAT COMPLEX<sup>1</sup>

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**Abstract:** The aim of this paper is to analyze the incidence of non-tariff measures imposed by China and the United States on Brazilian exports of the main products in its meat complex (beef, pork and poultry). By calculating the coverage and frequency indices for the period from 2011 to 2022, the number of notifications and punishments applied to the products mentioned was verified, taking into account 12 types of non-tariff measures. The results show a significant number of notifications of barriers trade by China and the US, especially on beef and poultry from Brazil, with sanitary and phytosanitary measures as the main justifications. In addition, the analysis pointed to a possible inconsistency between the number of notifications and the effective punishments, suggesting the need for a review and greater effectiveness in the actions of the Dispute Settlement Body (DSB) of the World Trade Organization (WTO) on possible unfair practices carried out by the Chinese and Americans on the items of the Brazilian meat complex analyzed.

**Keywords:** Non-tariff measures; Brazilian meat complex; Coverage and frequency indices; Dispute Settlement Body; China and USA.

## INTRODUCTION

Within the World Trade Organization (WTO) there are various bodies (World Organization for Animal Health, Codex and the International Plant Protection Convention) that work to ensure that trade relations between its 164 member countries run smoothly. Based on the principle of good relations between nations, the Dispute Settlement Body (DSB) was developed within this organization. The main objective of this mechanism is to mediate and settle trade disputes between nations associated with the WTO (Varella, 2009).

The Dispute Settlement Body was introduced into the WTO during the Uruguay Round, where discussions are opened which may or may not lead to “punishments” for the offending countries. In this sense, the body also works to supervise and monitor whether its decisions have been complied with. The solutions dealt with are basically breaches of agreements. An example of this is the policy of *dumping* or any other commercial practice that one or more countries deem to be unfair, which can be considered a violation of international market rules. From this point on, a kind of trial is held in which the members involved discuss ways of resolving the problem among themselves (Martins, 2002; Varella, 2009).

The case of China, which, according to Ansanelli and Barros (2020), has treated the Brazilian product in a relatively negative way, since it has imposed a high number of technical and phytosanitary notifications on exports of agricultural products from the country, is the type of trade imbroglio that falls within the scope of the CSO. As a result of this Chinese behavior, in 2018, for example, Brazil filed a complaint with this body because it considered the non-tariff measures (NTMs) imposed by the Asians on these Brazilian products to be excessive.

Along with Brazil and China, the United States is recognized as a major player in international trade, especially due to the excessive use of subsidies in its production. For this reason, the US is very active in the CSO's remedies mechanism. In this sense, Bruno, Azevedo and Massuquetti (2012) warn that subsidies are interventions that the government makes in a certain activity in the economy, basically functioning as a transfer of funds to manufacturers and buyers. However, according to the authors, the excessive use of these attitudes by first world nations has negative effects, leading to changes in international trade.

With this in mind, agribusiness is a sector of great importance to the Brazilian economy. As well as producing and exporting grains, Brazil also stands out in the agricultural sector, with the production and export of meat. The country is among the world's largest producers and consumers of meat, just behind the United States and China. Although the latter are among the largest meat producers in the world, both countries import Brazilian meat. In the case of China, this is due to population and income growth, which increases demand for this product. In the case of the United States, the main interest is related to the quality of Brazilian meat, which stands out on the international market due to the favorable climatic and territorial conditions for production (Embrapa, 2023).

To give you an idea, in 2016 Brazil's meat production accounted for 20% of the international market. Between 1994 and 2016, the agricultural sector recorded significant growth, with an increase of 85.2% in beef production, 161.7% in pork production and 284.9% in chicken production. Meanwhile, between 2000 and 2020, Brazil's share of the world meat market was 8.8% and, in 2020, the country reached third place in world production of this complex, accounting for 9.2% of the total. As for the sector's exports, Brazil accounted for 13.4% of the world total, coming very close to the largest exporter, the United States (Embrapa, 2023).

According to the Brazilian Association of Meat Exporters - ABIEC (2023), from June 2022 to May 2023, China was the largest importer of Brazilian beef, accounting for 58.25% of the country's total exports in this sector. The United States came in second, importing 5.89%. In the case of chicken exports, Brazil totaled 4.3 million tons in 2020, which corresponds to around 20.9% of all production worldwide, resulting in revenues of 6.6 billion dollars. As for pork, Brazil was the fifth

largest producer in 2020, showing an increase compared to recent decades, recording revenues of 1.6 billion dollars (Embrapa, 2023).

Given the context and scenarios presented, the aim of this research is to analyze the incidence of non-tariff measures imposed by China and the United States on Brazilian beef, pork and poultry exports, given the excessive use of these trade tools by these trading partners. Therefore, by estimating the coverage and frequency indices, it will be possible to measure the intensity of these NTMs on the items analyzed, as well as making it possible to verify the punishments applied by the CSO in these cases.

In the national literature, it is possible to find a relevant contingent of contributions analyzing the imposition of NTMs on exports of specific items from the Brazilian meat complex, such as those by Viégas (2003), Bellonia and Silva (2007), Mendes, Coelho and Campos (2009), Rubin, Ilha and Lopes (2012), Ansanelli *et al.* (2018) and Ansanelli and Barros (2020), among others. However, this study advances this theme by analyzing this context in a more comprehensive way, considering the three main products of the Brazilian meat segment, as well as building this scenario before China and the United States, two of the main *players* in the global market, as well as important trading partners for Brazil.

In order to meet the proposed objectives, the work is organized follows: in addition to this introduction, Chapter 2 provides a conceptualization of non-tariff measures and the Dispute Settlement Body. Chapter 3 discusses Brazil's meat complex. Chapter 4 describes the methodology used in the study and Chapter 5 presents the results of the analysis of the coverage and frequency indices, followed by a discussion of the results obtained. Finally, the paper's concluding remarks are made.

## NON-TARIFF MEASURES AND THE DISPUTE SETTLEMENT BODY

Non-tariff measures (NTMs) are any public measure that is not a customs duty, such as phytosanitary measures, voluntary export limitations, import licensing schemes or export subsidies (Krugman; Obstfeld, 2015). According to Viegas, Jank and Miranda (2007), they can have a negative or positive impact on the market, as they directly or indirectly influence both the country that imposes them and the country that suffered the imposition and, as a result, they can have an effect on both price and quantity, thus causing distortions in trade, production, consumption, income, employment and well-being.

Sanitary and phytosanitary measures are examples of non-tariff measures which, in theory, aim to preserve and guarantee that products do not have a negative impact on human, plant or animal health or life. These NTMs are of great importance for quality control in the products that are marketed, so they are often justifiable and essential when used correctly (Mendes; Coelho; Campos, 2009).

Although there are reasons for using NTMs, there are situations in which these measures are used for protectionist purposes. To avoid this practice, the Agreement on Sanitary and Phytosanitary Measures (SPS) was developed, with the aim of ensuring that the use of these measures has a scientific basis. The World Trade Organization accepts that new measures are created or maintained as long as they follow standards and the organization is notified to explain the need for such a measure. However, these NTMs can still alter market prices and thus be detrimental to international trade (Mendes; Coelho; Campos, 2009).

Complaints from countries that feel they have been harmed by the trade practices highlighted are referred to the WTO's Dispute

Settlement Body (DSB). According to Thorsen and Oliveira (2014), the dispute settlement system incorporates two legal concepts: *Common Law* and *Civil Law*. *Common Law* is summarized as the idea that processes should be developed according to the decisions of judges and courts, while *Civil Law* represents a set of codified rules which the judges of the process must follow. This idea converges with GATT tradition<sup>2</sup> regarding decisions to be taken by consensus, being changed only by positive to negative consensus, where members need to be against the rule or precedent for it not to come into force.

The Dispute Settlement Body, according to Varella (2009), divides its activities into three phases: the first is consultation between the disputing members in an attempt to an amicable solution through conciliation and mediation. If no agreement is reached, the requesting country requests the establishment of a panel. The second stage takes place once this panel has been established, where the procedure before the OSC begins in which the parties jointly elect three to five experts, whose work should last a maximum of six months. In the event of dissatisfaction or a finding of non-compliance, an appeal is lodged. If the process goes this way, the third step is the appeals body, where the final decision is made. This procedure has seven judges who will make the decision to modify or reverse the contested practice within a maximum of 90 days. Under these conditions, the country still has the chance to appeal the ruling, however, it has a maximum of 15 months to comply with the decisions set out in the report (WTO, 2022).

Da Silva (2006) relates CSOs to conceptions of sovereignty, since this is one of the topics that generates the most conflict. According to some, Brazil's participation in this type of foreign structure is not desirable, as it could be interpreted as a form of submission, undermining national sovereignty. On the other hand,

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2. General Agreement on Tariffs and trade.

there are those who do not see the actions of this body as a threat to sovereignty, arguing that it plays a regulatory role in international relations, adapting to the country's needs.

Despite the conflicting conceptions, it is important to recognize that the law exists as a means of regulating relations and can be shaped according to the specific needs of each context. In this scenario, Rage (2013) highlights the WTO's inability to strictly enforce its decisions, since it is unable to impose its missives on member states through direct sanctions, as direct interference by the organization could hurt a nation's sovereignty, although it can nevertheless authorize retaliatory measures against those who transgress its rules.

The use of unfair conduct is directly related to the CSO. According to Falasque Junior (2018), the use of unfair market practices and the establishment of defense methods are regulated by three agreements: the Anti-dumping Agreement (AA), the Agreement on Subsidies and Countervailing Measures (ASMC) and the Agreement on Safeguards. Failure to comply with these agreements can lead to litigation before the OSC.

According to the WTO (2022), by December 2021 there were 607 cases to be resolved, with 52 members being complainants, 61 as defendants and 90 participating as third parties in the proceedings, reaching the number of 111 components, acting directly or indirectly in the proceedings. Having understood what the dispute settlement body is really about, it is clear that over the years several countries have turned to it, either as complainants or defendants, in search of favorable solutions to their conflicts. Among these many countries, Brazil and one of its largest trading partners, China, stand out, with the latter having an active and constant voice in the organization.

Also based on data from the WTO (2022), it is possible to verify that these two countries are eventually involved in disputes within the institution, being classified as both complainants and respondents, even if they have no direct involvement in the cases. The most recent clash between the two countries was in 2018 regarding "Certain Measures Relating to Sugar Imports", where Brazil requested consultations with China about a safeguard measure imposed by the Asian nation on imported Brazilian sugar. In principle, given that Brazil and China are major trading partners, it would be easy to intuitively state that both have major direct clashes, however, in view of their long years of cooperation, conflicts are relatively small compared to countries in the European Union and the United States, for example.

Due to the intense involvement of the United States in deadlocks at the SCO, the country is also characterized as a good object of analysis, since, according to WTO data (2022), since the creation of the SCO in 1994, it has a total of 15 disputes against Brazil, being 11 of them as plaintiffs and 4 as respondents, while China has only 1 as defendant. When comparing claims in general, the proportion between Brazil and China is almost equivalent, while the US has a much higher number, mainly as a claimant.

When it comes specifically to NTMs applied to the meat market, Miranda (2001) points out that some of the barriers applied by the United States are protectionist measures, going beyond simple technical practices. In this context, the obstacles imposed by the country on Brazilian meat end up damaging the sector's exports, especially of *fresh* meat. Silva, Triches and Malafaia (2011) add that Brazilian beef faces significant barriers to accessing certain countries and economic blocs, such as the European Union.



In addition, according to Silva, Triches and Malafaia (2011), the international market has become increasingly strict in relation to beef. In this context, Brazilian production has faced considerable challenges when trying to enter the US market, for example, which often imposes lax NTMs related to product quality, having a profoundly negative impact on Brazilian exports in the sector.

In addition, Bannwart (2019) points out that China has suspended imports of Brazilian meat on several occasions, citing a wide range of reasons, from Federal Police operations, such as Operation Weak Flesh, to health issues. The country is ranked as the sixth country with the most restrictions on this category of Brazilian meat. However, the measures adopted by the Chinese government are often pointed out as unreliable, since they lack relevant scientific evidence.

## **BRAZIL'S MEAT**

Brazil is one of the world's largest exporters of animal protein. According to data from Embrapa (2023), in 2016, 14% of total Brazilian exports were beef, while 10.5% were chicken and 2.7% pork. The Brazilian product serves more than 150 countries and is recognized as synonymous with quality and safety.

Brazil's meat complex is a benchmark on the world market. Its cheap labor and the vast amount of pasture available in the country make it a very efficient producer of cattle, as well as pork and chicken (Stal; Sereia; Da Silva, 2010). According to data from ABPA - Brazilian Association of Animal Protein (2023), in the first four months of 2023, pork exports reached 379.4 thousand tons, while in the first quarter of the year Brazilian chicken meat exports reached 1.314 million tons.

According to information collected on the Comex Stat portal (2023), the beef market was worth US\$867.9 million in 2022 and US\$343.4 million in the first months of 2023.

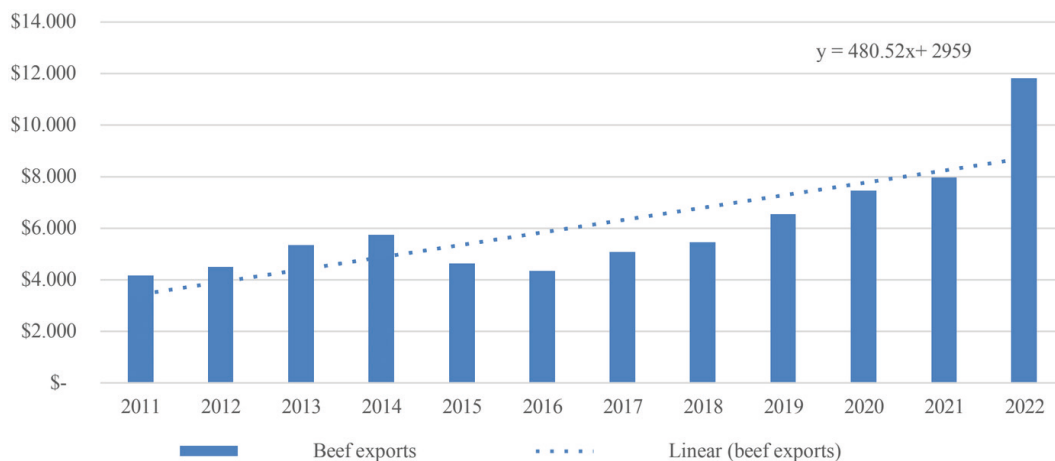
Investment in technology in this area of production has put the country at the forefront of the market, recording a considerable trade surplus in 2016, despite the existence of trade barriers that hinder the commercialization of this Brazilian product (Neto, 2018).

Another important aspect of the Brazilian herd is that it is capable of serving two very lucrative sectors: the meat and milk chain. It is a very relevant production both economically and socially, since it is capable of serving the most diverse markets around the world, from the highest standard to the most popular. Currently, Brazilian meat is considered to be healthier and to have a lower fat percentage than that of other countries, which has a lot to do with the environment in which the cattle are raised and with the sanitary controls carried out rigorously in the country (Pereira; Almeida; Oliveira, 2020).

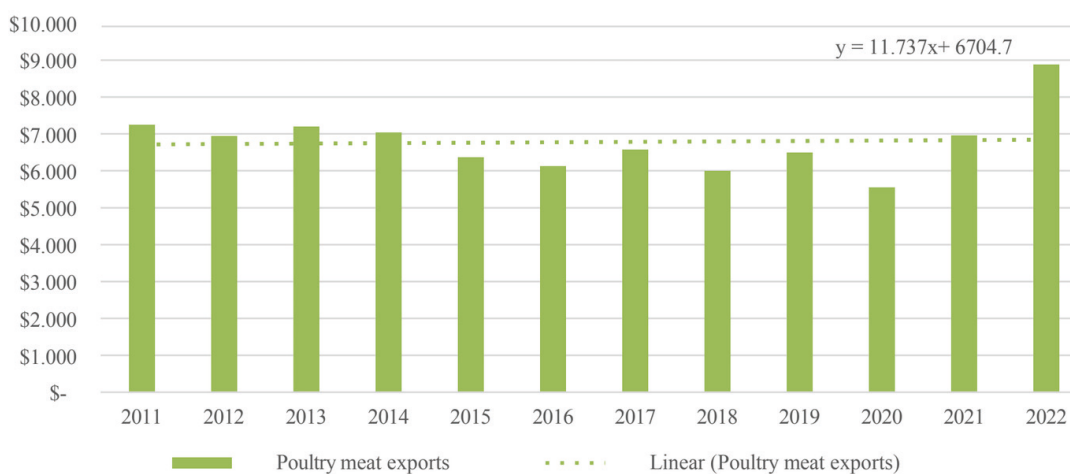
One of Brazil's competitors when it comes to beef is the United States, which is the world's largest beef producer and is also internationally renowned in this sector for receiving massive government subsidies for production that favor the local product. In However, even with this favor, Brazil still manages to export part of its production to the US, a process that has been growing in recent years (Dill *et al.*, 2013).

Graph 1 shows total Brazilian beef exports in millions of dollars from 2011 to 2022, according to data from Comex Stat (2023). It can be seen that, after a period of relative stability in exports in the first five years of analysis, there was a gradual increase which proved to be significant from 2021 to 2022. On average, Brazil's turnover from beef exports increased by US\$480.52 million each year.

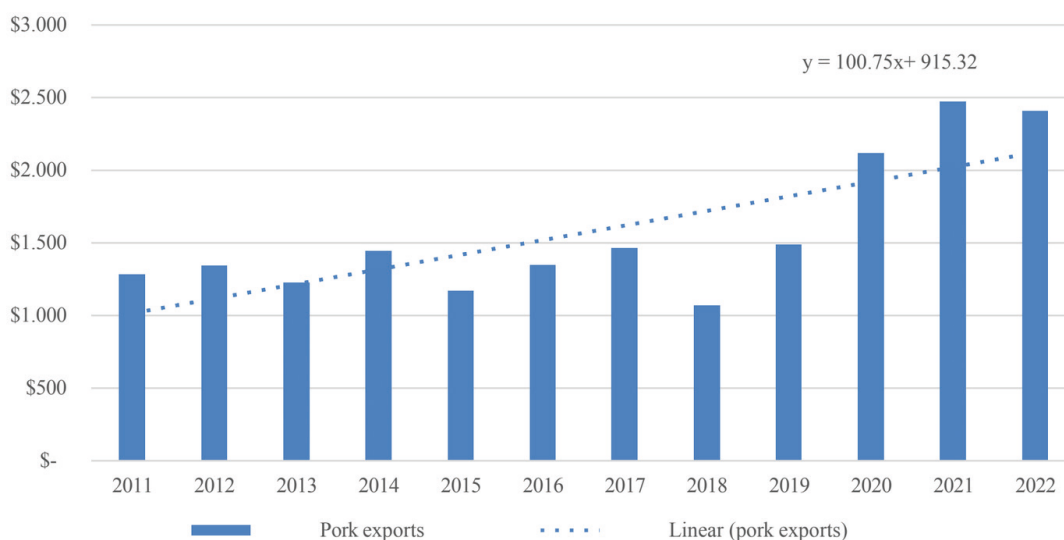
In addition to beef, Brazil has promising market prospects both chicken and pork production. The chicken market has grown exponentially in recent years, due to genetic improvements in this sector. With the growth of the segment in the world market, Brazil has



**Graph 1.** Brazilian beef exports between 2011 and 2022 - in millions of dollars  
Source: Own elaboration based on data from Comex Stat (2023).



**Graph 2 -** Brazil's poultry meat exports between 2011 and 2022 - in millions of dollars  
Source: Own elaboration based on data from Comex Stat (2023).



**Graph 3 -** Brazilian pork exports between 2011 and 2022 - in millions of dollars  
Source: Own elaboration based on data from Comex Stat (2023).

become one of the leaders in both production and exports, competing with Chinese and American products, given that together they account for 47% of world production (Favro *et al.*, 2021).

According to Forbes (2023), there was a 15% increase in chicken exports in the first months of 2023, with China as one of the main destinations, with an increase of 24.5% compared to the same period in 2022. In addition to China, other Asian countries have also started to import more from Brazil because, according to CNN Brasil (2023), in August 2023 alone, chicken exports amounted to US\$922.1 million. According to ABPA's annual report (2023), in 2021 China was responsible for importing 640,470 thousand tons of this segment and, in 2022, this figure was 540,555 thousand tons.

Graph 2 shows total Brazilian poultry meat exports in millions of dollars from 2011 to 2022, according to data from Comex Stat (2023). It shows a fairly stable market over the years, especially between 2011 and 2019. After that, there was a small drop in exports in 2020, but a relatively significant increase from 2021 to 2022. During the period analyzed, it is possible to see an average increase each year of US\$11.737 million in revenues from Brazilian poultry meat exports.

In pork production, according to Embrapa (2023), in 2022 Brazil was in fifth place among the largest consumers and in fourth place in the export ranking, showing a growth of 4.59% in the sector's exports compared to 2021. Graph 3 shows total Brazilian pork exports in millions of dollars from 2011 to 2022, according to data from Comex Stat (2023). It can be seen that, between 2011 and 2019, there was relative stability in the segment's exports until 2019, but in 2020 there was a 42.5% increase in these exports, which remained at a higher level in the following years.

In general, it can be seen that revenues from pork exports have increased by an average of US\$100.75 million every year. Rubin, Ilha and Lopes (2012) point out that Brazilian pork has average competitiveness in the international market, with the prospect of growth over time as long as tariff and non-tariff barriers are eliminated or reduced, which would consequently result in an increase in the sector's exports. In this context, Escher and Wilkinson (2019) highlight the importance of the Chinese market, which has been responsible for the consumption of 50% of the world's pig production.

## METHODOLOGY

To analyze the incidence of non-tariff measures imposed by China and the United States on Brazilian exports of its main meat products, the coverage and frequency indices developed by Laird (1996) will be used. Using data from UNCTAD (2023) and the Ministry of Development, Industry, Trade and Services - MDIC (2023), the NTMs applied by these countries on Brazilian beef, poultry and pork exports from 2011 to 2022 will be analyzed. As far as exports are concerned, the data source used is the Comex Stat portal (2023).

According to Ansanelli and Barros (2020) and Viegas, Jank and Miranda (2007), the coverage coefficient (CC) provides information on the amount of trade subject to NTMs in specific sectors or countries. Thus, the CC is calculated as follows

$$CC_{ij} = \left[ \frac{\sum_{i=1}^m (M_{jm} * N_{jm})}{\sum_{i=1}^m M_{jm}} \right] * 100$$

Where:

$CC_{ij}$  = Coefficient of coverage of barriers on selected products in Brazil's meat complex, made up of  $m$  tariff lines imposed by China or the USA;

$M_{jm}$  = value Brazil's exports to China and the United States;



$N_{jm} = 1$  if there is an incidence of notification about the product  $m$  (there is at least one notification) between 2011 and 2022;  
 $= 0$  no notifications.

The frequency coefficient (FC) shows the ratio between the number of products registered with the dispute settlement body and at least one notification of NTM practiced by the importer (Ansanelli; Barros, 2020; Viegas; Jank; Miranda, 2007). Thus, the CF is calculated follows:

$$CF_{ij} = \left[ \frac{\sum_{i=1}^m (L_{jm} * N_{jm})}{\sum_{i=1}^m L_{jm}} \right] * 100$$

Where:

$CF_{ij}$  = frequency coefficient of the barriers imposed by China or the USA on selected products in Brazil’s meat complex, made up of  $m$  tariff lines;

$L_{jm} = 1$  if the product  $m$  is exported by Brazil to China or the USA;  
 $= 0$  if the product  $m$  is not exported by Brazil to China or the USA;

$N_{jm} = 1$  if there is a penalty on the incidence of a barrier notification on the product  $m$  (there is at least one notification);  
 $= 0$  if there is no incidence of notification on the product  $m$  (no notification);

$\sum_{i=1}^m L_{jm}$  for all  $i = 1, \dots, m$ , represents the value of the goods that make up the group. $i$

In order to understand the results of the indices, Viegas, Jank and Miranda (2007) show how they are related and what interpretations are possible based on the diagnoses observed. Table 1 shows these relationships.

	Item	Low CF	High CF
Low CC	Non-tariff lines	Few	Many
	Export value	Bass	Bass
	Irrelevance of the products in the tariff or impediment to exports	Yes	Yes
	Degree of protection	Bass	Medium
High CC	Non-tariff lines	Few	Many
	Export value	High	High
	Irrelevance of the products in the tariff or impediment to exports	No	No
	Degree of protection	Medium	High

**Table 1** - Relationship between coverage coefficients (CC) and frequency coefficients (CF)

Source: Adapted from Viegas, Jank and Miranda (2007).

The literature contains a significant number of contributions applying this methodology. Viégas (2003), for example, used these methods to estimate the impact of US and EU trade barriers on Brazilian agricultural exports. Ansanelli *et al.* (2018) used the frequency and coverage indices to estimate the incidence of Chinese environmental non-tariff barriers on Brazilian exports between 2001 and 2014. Bellonia and Silva (2007) analyzed the coverage and frequency indices in relation to Brazilian meat exports (beef, pork and chicken) to its main trading partners in 2000.

From the perspective of the mango market, Mendes, Coelho and Campos (2009) applied the coverage and frequency coefficients to understand the incidence of non-tariff measures when analyzing Brazilian exports of four fruits (bananas, mangoes, pineapples and oranges) 2003 to 2008. Rubin, Ilha and Lopes (2012) used the coverage and frequency coefficients to understand the non-tariff measures applied to the main pork exporters between 1995 and 2010.

In light of these analyses, this paper seeks to add new evidence by applying the aforementioned indices to the exports of selected products from Brazil’s meat complex. The next section will present the results of this verification.

# RESULTS

During the period from 2011 to 2022, a detailed search was carried out for 12 non-tariff measures that were imposed in relation to five Harmonized System (HS4) codes in Brazil's meat complex. These items are listed in Table 1, while the sanitary and phytosanitary (non-tariff) measures analyzed are described in Table 2. In general, most of the trade barriers in Table 2 are linked to food safety, public health, product safety and environmental protection.

SH04	Discretion
0201	Meat from bovine animals, fresh or chilled;
0202	Frozen meat from bovine animals;
0203	Meat from swine, fresh, chilled or frozen;
0206	Edible offal of bovine animals, swine, sheep, goats, horses, asses and mules, fresh, chilled or frozen;
0207	Meat and edible offal of poultry (roosters, hens, ducks, geese, turkeys and guinea fowl), fresh, chilled or frozen;

**Table 1** - Description of the items that make up Chapter 02 - Meat and edible meat offal of the Harmonized System  
Source: Own elaboration.

Protecting biodiversity;
Protecting animal and plant life;
To protect human and animal health;
Protecting human health;
To ensure product safety;
To protect the legal rights and interests of consumers, producers and sellers;
To guarantee food safety and ensure public health and safety of life;
Automatic licensing requirements for certain products;
Ensure food safety;
Environmental protection;
To prevent the spread of animal diseases;
No objective specified.

**Table 2** - Non-tariff measures analyzed  
Source: Own elaboration.

Table 3 shows the total number of notifications applied, according to the NTMs in Table 2, by China and the United States for each SH4 code between 2011 and 2022, which represents a specific category within the pro-

duction of meat for export, and the penalties imposed by the OSC for each notification. Looking at Table 3, it is clear that both countries were involved in a large number of notifications, indicating great vigilance and regulation over Brazilian meat. However, in terms of penalties recorded, this is only true for item 0207, which refers to poultry meat and offal.

SH4	Notifications		Punishments	
	China	United States	China	United States
0201	601	238	0	0
0202	479	251	0	0
0203	482	241	0	0
0206	472	292	0	0
0207	476	201	1	1

**Table 3** - Notifications and penalties applied to China and the United States on each HS4 of Chapter 2 - Meat and edible meat offal - selected from Brazil between 2011 and 2022

Source: Own elaboration based on data from Unctad (2023).

The frequency and coverage coefficients calculated for the United States are shown in Table 4. In general, the results of the CC index show that there is a significantly large contingent of notifications applied to the US. This suggests that the Americans may have used more of these NTMs than is strictly necessary. Of particular note is the high magnitude of the indicator for item SH4-0207 (poultry meat), which registers a significant number of notifications to the US.

SH4	CC	CF
0201	16,27165	0
0202	418,5121	0
0203	358,39	0
0206	251,7396	0
0207	6552,514	0,001134112

**Table 4** - Coverage and Frequency Coefficients for non-tariff measures on exports of selected items from Brazil's meat complex to the United States from 2011 to 2022

Source: Survey results.

On the other hand, the CF index indicates that there are no punishments imposed on the Americans for unfair trade practices with regard to the Brazilian meats analyzed. There was only one non-zero index value for item SH4-0207 (poultry meat), possibly related to the number of notifications issued by the CSO to the US for this segment.

Thus, according to the relationships presented in Table 1, it is possible to infer that the combination of high CC and low CF reveal an average degree of protection practiced by United States on the Brazilian segments analyzed. In other words, it is likely that the NTMs imposed by the US on Brazilian beef, pork and poultry are acting as relevant barriers in this trade.

Table 5 shows the coverage and frequency coefficients calculated for China. Similar to what was observed for the US, the CC index suggests that the Chinese have received many notifications about possible unfair trade conduct in Brazilian meat products. In other words, the notifications indicate the existence of NTMs that can cause distortions in this market that are unfavorable to the entry of the Brazilian meats analyzed in this market.

SH4	CC	CF
0201	55,82441	0
0202	34,09413	0
0203	44,07452	0
0206	28,81444	0
0207	37,68079	6,92936E-06

**Table 5** - Coverage and Frequency Coefficients for non-tariff measures on exports of selected items from Brazil's meat complex to China from 2011 to 2022

Source: Survey results.

In contrast, the value of the CF indicator shows that China receives practically no penalties for the trade barriers it imposes on these Brazilian products entering its country, with the exception of item SH4-0207 (poultry meat), for which the Chinese received a pe-

nalty for trade barriers practiced on this segment between 2011 and 2022.

According to Table 1, the combination of high CC and low CF results in an average degree of protection practiced by the Asians on the items analyzed in the Brazilian meat complex. This scenario shows that there are no obstacles to Brazilian exports of these segments, but that there are trade barriers that make it difficult for these Brazilian products to enter the Chinese market.

The analyses in Tables 4 and 5 reveal a significant variation in the volumes of notifications in the coverage coefficients (CC) for each HS4 code studied, also fluctuating from one country to the next. This variation can be attributed to the differences in export values for each product selected from Brazil's meat complex.

Among the Brazilian products with the greatest market potential in the sector are beef, pork and chicken, according to data from Embrapa (2023). In exports to United States, for example, there is a tendency to buy more frozen beef (SH4 - 0202), which consequently generates more notifications for frozen meat. As for the Chinese market, the incidence of notifications for both fresh and frozen meat is relatively high, due to the volume of exports of these items to this destination.

In the case of pig production, the situation is similar: the lower volume of exports to the United States generates a lower number of notifications, while China, which imports a greater quantity of this product, sees an increase in notifications. As for HS4 codes referring to bovine and poultry offal (0206), which is consumed in a slightly larger volume in the United States, there has been a small increase in notifications.

Another plausible reason for these variations may be related to the fact that the United States and China are major meat exporters, especially in the case of beef. According to Silva, Triches and Malafaia (2011), the reference cou-

ntries for exports of a given product generally apply more non-tariff measures to these items in their customs. Thus, it can be inferred that the beef and veal sectors, specifically referring to the SH4 0202 codes for the United States and SH4 0201 and 0202 for China, are among the most affected by barriers to trade. This leads to more obvious variations in the coverage coefficient compared to other sectors. In all the SH4 codes analyzed, but especially with regard to beef, the most applied NTMs are those related to protecting human health and ensuring food safety, public health and life safety.

In addition, Silva, Triches and Malafaia (2011) highlighted the United States' restriction on Brazilian beef, something that the frequency and coverage indices estimated in this study showed, given the high magnitudes of these indicators for this segment. This behavior confirms the use of these NTMs by the Americans in order to protect their domestic market. In particular, there is a high number of restrictions on frozen beef for this country.

According to Neto (2018), although the United States is a major importer of industrialized beef, until 2016 it prohibited the entry of *fresh* beef. Similarly, even though China is a major beef importer, it was extremely restrictive to the sector, which reduced the competitiveness and profitability of Brazilian production due to Asian protectionist policies (Junqueira; Lírio; Gomes, 2007).

In addition to these points, Jank *et al.* (2020) warn that Brazil's high-volume export products are considerably impacted by production subsidies granted to US producers. Therefore, Brazilian meat, especially beef, is affected by both subsidies and NTMs. This situation is evident in Table 4, which shows fewer notifications for HS4 - 0201 (*fresh* beef) than for HS4 0202 (frozen beef). The explanation for this is the lower volume of *fresh* beef exports to the US, mainly due to the subsidies applied by the US market.

In the case of pork, Silva *et al.* (2011) identified that, between 1995 and 2010, the coverage and frequency indices were indeterminate due to zero exports, which could indicate the presence of barriers preventing the Brazilian product from entering China. However, the data presented in this study identifies notifications about Brazilian pork in the Chinese market, suggesting that this market has become more open to the national product in recent years.

In the context of the US pork market, it is common to see the application of non-tariff barriers, especially related to sanitary issues. The US market imposes strict standards imports of this product, which discourages Brazilian exports to this destination (Jank *et al.*, 2020).

In the simulation of a potential tariff elimination agreement between Brazil and China, Buchmann, Massuquetti and Azevedo (2021) found that the meat market could increase by 0.4% if tariffs were eliminated. This scenario would indicate, for example, a significant growth in Brazilian chicken meat exports to China, reaching 49.6%. This situation suggests that the Asian country applies a number of trade barriers which, if removed, could boost Brazil's exports. This pattern can be clearly seen in Table 5, which reveals a high number of notifications of these NTMs for most of the products analyzed.

Tables 4 and 5 also show that the poultry sector was the only one to face penalties due to the significant number of barriers imposed on both the US and Chinese markets. According to Bauermann *et al.* (2023), chicken meat has been highly demanded and subject to sanitary and phytosanitary barriers. In addition, the authors point out that Brazil is a superpower in this market, since their results identified that the country has significant advantages in the chicken market compared to the US, which could explain the high frequency of non-tariff barriers suffered by the Brazilian

product addressed to this destination. Furthermore, this situation could also justify the punishment suffered by China and the United States for their excessive use of barriers.

In this context, Aranda *et al.* (2017) point out that Brazil's poultry production sector has undergone a process of technological evolution over the years, resulting in a significant increase in its productivity. In , the country's poultry sector is widely recognized for its production efficiency and quality, making it a major competitor for United States and China. It's important to point out that Brazil's poultry production stands out for its excellence in animal health, which shows a certain contradiction in relation to the barriers that are applied to this complex, given its quality in production.

In short, the results presented emphasize the importance of a thorough and effective analysis of the non-tariff barriers implemented by a country. This aims to ensure that such NTBs are used appropriately and justifiably, while highlighting the need for the Dispute Settlement Body to be more effective in ensuring that excessive or inappropriate use is duly corrected or punished as necessary.

## FINAL CONSIDERATIONS

The main objective of this study was to analyze the incidence of non-tariff measures (NTMs) imposed by China and the United States, as well as the penalties applied to these countries by the Dispute Settlement Body (DSB), on Brazilian beef, pork and poultry exports to these destinations. By calculating the coverage and frequency indices, it was possible to identify the number of notifications and consequent penalties for NTMs applied to these Brazilian products.

In general, when analyzing the years 2011 to 2022, a series of sanitary and phytosanitary measures applied by these countries were detected, especially impacting the beef, pork and poultry sectors. In addition, significant

variations were observed in the volume of notifications, reflecting the dynamics of trade relations between Brazil, China and the United States over the years analyzed.

Through the calculations the coverage index, it was observed that both China and the United States received a significant number of notifications for the commercial practices adopted with regard the items of the Brazilian meat complex analyzed. On the other hand, the magnitudes of the frequency index showed that both countries received fewer penalties for the trade barriers they imposed in relation to the notifications.

In addition, the results of the study indicated the excessive use of non-tariff measures, especially in the poultry sector, a segment in which Brazil has shown itself to be a strong competitor in the international market. Even with many NTM notifications, only two punishments were recorded in the period analyzed, which raises questions about the effectiveness of the WTO's dispute settlement mechanisms in curbing the inappropriate use of barriers to trade.

Given that the meat market is extremely competitive, impacted not only by trade issues, but also by the internal policies of each country and the quality of the products involved, Brazil stands out as a major producer and exporter in this sector. However, the country faces significant challenges due to the barriers imposed by other countries, especially China and the United States, which negatively affects its exports.

In addition, this research identified the need for the Dispute Settlement Body to act effectively as an essential mechanism for resolving trade disputes, monitoring them in order to establish fairer and more equitable international trade. The excessive number of NTMs identified on items in the Brazilian meat complex imposed by China and the USA reveal the importance of the SCO in resolving unfair practices that generate significant distortions in international trade.



Finally, it is important to point out that this study has some limitations. Firstly, the temporal analysis restricted to a decade may not fully cover the nuances of long-term trends, while the limitation to just two countries may have left out other relevant trading partners, restricting the understanding of dynamics in a global context. In future research, it would

be interesting to extend the period analyzed or take a more comprehensive approach to the meat complex, considering a variety of other trading partners. Furthermore, a probabilistic or even deterministic assessment could provide more robust evidence of the real effects of NTMs on exports of selected items in the Brazilian meat complex.

## REFERENCES

- Associação Brasileira das Indústrias Exportadoras de Carnes – ABIEC. **Exportações**. Disponível em: <<https://www.abiec.com.br/exportacoes/>>. Acesso em: 5 jul. 2023.
- Associação Brasileira de Proteína Animal - ABPA - **Relatório Anual**. Disponível em: <<https://abpa-br.org/abpa-relatorio-anual/>>. Acesso em: 1 jul. 2023
- ANSANELLI, S. L. et al. A incidência de barreiras não tarifárias ambientais chinesas sobre as exportações brasileiras entre 2001 e 2014. **Revista Brasileira de Economia de Empresas**, v. 18, n. 1, 2018.
- ANSANELLI, S. L. DE M.; BARROS, G. S. DE. A incidência de barreiras não tarifárias chinesas e europeias sobre as exportações brasileiras de produtos agrícolas / The impact of chinese and european non-tariff barriers on brazilian exports of agricultural products. **Brazilian Journal of Development**, v. 6, n. 1, p. 4733–4751, 30 jan. 2020.
- ARANDA, M. A. et al. Panorama da avicultura: Balanço do comércio brasileiro e internacional. **Revista Espacios**, v. 38, n. 21, p. 1–8, 2017.
- BANNWART, G. A. [UNESP. **Barreiras comerciais na exportação de soja e carne do Brasil para a China e União Européia**. [s.l.] Universidade Estadual Paulista (Unesp), 20 nov. 2019.
- BAUERMANN, B. F. C. et al. Competitividade das exportações brasileiras da carne de frango frente às exportações americanas. **RDE-Revista de Desenvolvimento Econômico**, v. 2, n. 52, 2023.
- BELLONIA, C. C. P.; SILVA, O. M. DA. Indicadores de barreiras não-tarifárias nas exportações de carnes do Brasil. **Informe GEPEC**, v. 11, n. 1, 2007.
- BRUNO, F. M. R.; AZEVEDO, A. F. Z. DE; MASSUQUETTI, A. Os subsídios à agricultura no comércio internacional: as políticas da União Europeia e dos Estados Unidos da América. **Ciência Rural**, v. 42, p. 757–764, 2012.
- BUCHMANN, J. L.; MASSUQUETTI, A.; AZEVEDO, A. F. Z. DE. Análise de cenários do agronegócio brasileiro frente à China, aos EUA e à UE, utilizando um modelo de equilíbrio geral computável. **Revista de Economia e Sociologia Rural**, v. 59, p. e221493, 2021.
- CNN Brasil. **Receita de exportação de frango do Brasil bate recorde de US\$ 922,1 mi em agosto**. Disponível em: <<https://www.cnnbrasil.com.br/economia/receita-de-exportacao-de-frango-do-brasil-bate-recorde-de-us-9221-mi-em-agosto/>>. Acesso em: 1 jul. 2023.
- Comex Stat - **Exportação e Importação Geral**. Disponível em: <<http://comexstat.mdic.gov.br/pt/geral>>. Acesso em: 25 jun. 2023.
- DA SILVA, A. R. Direito internacional público e soberania na Constituição brasileira: aplicação de decisões do Órgão de Solução de Controvérsias da Organização Mundial do Comércio (OMC) no ordenamento jurídico brasileiro. **Revista Jurídica da Presidência**, v. 8, n. 80, p. 72–87, 2006.

DILL, M. D. et al. Análise comparativa da competitividade do Brasil e EUA no mercado internacional da carne bovina. **Revista Ceres**, v. 60, p. 765–771, 2013.

EMBRAPA - **Carne em números** -. Disponível em: <<https://www.embrapa.br/qualidade-da-carne/carne-em-numeros>>. Acesso em: 4 jul. 2023.

EMBRAPA - Estatísticas - Portal Embrapa. Disponível em: <<https://www.embrapa.br/suinos-e-aves/cias/estatisticas>>. Acesso em: 4 jul. 2023.

ESCHER, F.; WILKINSON, J. A economia política do complexo Soja-Carne Brasil-China. **Revista de Economia e Sociologia Rural**, v. 57, p. 656–678, 2019.

FALASQUE JUNIOR, R. **Práticas desleais de comércio: a defesa comercial no Brasil**. Trabalho de conclusão de curso. Especialização em Relações Internacionais – Universidade Federal de Brasília, 2018.

FAVRO, J. et al. Exportações de carne de frango. **Revista de Política Agrícola**, v. 30, n. 3, p. 78, 2021.

FORBES. **Brasil bate recorde em exportação de frango em março e fecha trimestre com alta de 15%**. Disponível em: <<https://forbes.com.br/forbesagro/2023/04/brasil-bate-recorde-em-exportacao-de-frango-em-marco-e-fecha-trimestre-com-alta-de-15/>>. Acesso em: 1 jul. 2023.

FORBES. **Exportação de carne suína do Brasil cai em 2022**. Disponível em: <<https://forbes.com.br/forbesagro/2023/01/exportacao-de-carne-suina-do-brasil-cai-em-2022/>>. Acesso em: 1 jul. 2023.

JANK, M. S. et al. O agronegócio nas relações comerciais Brasil-Estados Unidos. **Revista de Política Agrícola**, v. 3, 2020.

JUNQUEIRA, B. A.; LÍRIO, V. S.; GOMES, M. M. **Avaliação dos efeitos de barreiras não tarifárias sobre as exportações brasileiras de carne bovina**. . Em: XLV Congresso da Sociedade Brasileira de Economia, Administração E Sociologia Rural. Londrina/PR: 2007. Disponível em: <[https://www.academia.edu/download/42906533/AVALIAO\\_DOS\\_EFEITOS\\_DE\\_BARREIRAS\\_NO\\_TARI20160221-30670-j193ve.pdf](https://www.academia.edu/download/42906533/AVALIAO_DOS_EFEITOS_DE_BARREIRAS_NO_TARI20160221-30670-j193ve.pdf)>. Acesso em: 4 maio. 2024

KRUGMAN, P. R.; OBSTFELD, M. **Economia Internacional**. 10ª edição ed. [s.l.] Pearson Universidades, 2015.

LAIRD, S. **Quantifying commercial policies**. [s.l.: s.n.]. Disponível em: <<https://ideas.repec.org/p/fth/stante/96-001.html>>. Acesso em: 3 maio. 2024.

MARTINS, E. M. O. A sistemática de solução de controvérsias no âmbito da OMC. **Revista Jurídica da Presidência**, v. 4, n. 40, 2002.

Ministério do Desenvolvimento, Indústria, Comércio e Serviços – MDIC. **Investigações em curso e medidas em vigor contra exportações brasileiras**. Disponível em: <<https://www.gov.br/produtividade-e-comercio-exterior/pt-br/assuntos/comercio-exterior/defesa-comercial-e-interesse-publico/apoio-ao-exportador/investigacoes-em-curso-e-medidas-em-vigor>>. Acesso em: 12 jun. 2023.

MENDES, G. M.; COELHO, A. B.; CAMPOS, A. C. **Efeitos das barreiras não tarifárias impostas pela União Européia e pelos Estados Unidos sobre as exportações brasileiras de manga**. Congresso Sociedade Brasileira de Economia e Sociologia Rural. **Anais...**2009. Disponível em: <[https://www.researchgate.net/profile/Giovanna-Mendes/publication/255710581\\_Efeitos\\_das\\_Barreiras\\_Nao-Tarifarias\\_Impostas\\_pela\\_Uniao\\_Europeia\\_e\\_pelos\\_Estados\\_Unidos\\_sobre\\_as\\_Exportacoes\\_Brasileiras\\_de\\_Manga/links/00b495204dcc0d75bf000000/Efeitos-das-Barreiras-Nao-Tarifarias-Impostas-pela-Uniao-Europeia-e-pelos-Estados-Unidos-sobre-as-Exportacoes-Brasileiras-de-Manga.pdf](https://www.researchgate.net/profile/Giovanna-Mendes/publication/255710581_Efeitos_das_Barreiras_Nao-Tarifarias_Impostas_pela_Uniao_Europeia_e_pelos_Estados_Unidos_sobre_as_Exportacoes_Brasileiras_de_Manga/links/00b495204dcc0d75bf000000/Efeitos-das-Barreiras-Nao-Tarifarias-Impostas-pela-Uniao-Europeia-e-pelos-Estados-Unidos-sobre-as-Exportacoes-Brasileiras-de-Manga.pdf)>. Acesso em: 2 maio. 2024

MIRANDA, S. H. G. D. **Quantificação dos efeitos das barreiras não-tarifárias sobre as exportações brasileiras de carne bovina**. Piracicaba: 14 set. 2001. Disponível em: <<http://www.teses.usp.br/teses/disponiveis/11/11132/tde-12042004-145332/>>. Acesso em: 2 maio. 2024

NETO, O. A. O Brasil no mercado mundial de carne bovina: análise da competitividade da produção e da logística de exportação brasileira. **Ateliê Geográfico**, v. 12, n. 2, p. 183–204, 2018.

Organização Mundial do Comércio - OMC - **Règlement des différends - Carte des différends entre Membres de l'OMC**. Disponível em: <[https://www.wto.org/french/tratop\\_f/dispu\\_f/dispu\\_maps\\_f.htm](https://www.wto.org/french/tratop_f/dispu_f/dispu_maps_f.htm)>. Acesso em: 19 out. 2022.

Organização Mundial do Comércio - OMC - **Règlement des différends** - portail. Disponível em: <[https://www.wto.org/french/tratop\\_f/dispu\\_f/dispu\\_body\\_f.htm](https://www.wto.org/french/tratop_f/dispu_f/dispu_body_f.htm)>. Acesso em: 19 out. 2022.

PEREIRA, R.; NUNES ALMEIDA, A.; DA ROCHA GONÇALVES, R. Exportações de carne bovina brasileira: uma análise a partir de um modelo de equilíbrio geral computável. **Perspectiva Econômica**, v. 15, p. 31–50, 18 jun. 2020.

RAGE, P. H. T. **A defesa comercial e a proteção da concorrência no comércio internacional**. Belo Horizonte/Minas Gerais: Universidade Federal de Minas Gerais, 2013.

RUBIN, L.; ILHA, A.; LOPES, T. DE A. M. Exportações de carne suína: performance e possibilidades frente à eliminação de barreiras. **Organizações Rurais & Agroindustriais**, v. 14, n. 1, 2012.

SILVA, S. Z. DA; TRICHES, D.; MALAFAIA, G. Análise das barreiras não tarifárias à exportação na cadeia da carne bovina brasileira. **Revista de política agrícola**, v. 20, n. 2, p. 23–39, 2011.

SILVA, F. A. et al. Identificação e efeitos de medidas não tarifárias impostas aos principais exportadores de carne suína. **Revista de Economia Mackenzie**, v. 9, n. 3, 2011.

STAL, E.; SEREIA, V. J.; DA SILVA, R. C. Estratégias de internacionalização do setor agroindustrial brasileiro de carnes: exportação ou investimento direto no exterior. **Future Studies Research Journal: Trends and Strategies**, v. 2, n. 2, p. 132–161, 2010.

THORSTENSEN, V. H.; OLIVEIRA, L. **O Sistema de Solução de Controvérsias da OMC: uma primeira leitura**. [s.l.] Aduaneiras, 2014.

UNCTAD - **TRAINS Online**. Disponível em: <<https://trainsonline.unctad.org/detailedSearch?imposingCountries = 240>>. Acesso em: 12 jun. 2023.

VARELLA, M. D. Efetividade do Órgão de Solução de Controvérsias da Organização Mundial do Comércio: uma análise sobre os seus doze primeiros anos de existência e das propostas para seu aperfeiçoamento. **Revista Brasileira de Política Internacional**, v. 52, p. 5–21, 2009.

VIEGAS, I. F.; JANK, M. S.; MIRANDA, S. H. DE. Barreiras não tarifárias dos Estados Unidos e União Europeia sobre as exportações agrícolas brasileiras. **Informações Econômicas, São Paulo**, v. 37, n. 3, p. 27–38, 2007.

VIÉGAS, I. F. P. **Impactos das barreiras comerciais dos Estados Unidos e União Européia sobre a pauta de exportações agrícolas brasileiras**. Tese de doutorado —[s.l.] Universidade de São Paulo, 2003.