DISCUSSION PAPER

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CONTENTS

ABSTRACT

In this paper, we discuss the agricultural trade between Brazil and China. We select a set of key commodities and debate whether there are obstacles or opportunities to increase trade between the two economies. Following an institutional and historical analysis, we provide a statistical description of the recent history of Brazilian exports to China. We contrast the trade statistics with a set of indicators on the use of tariff and non-tariff measures and highlight which institutions are responsible to regulate the agricultural sector in Brazil. Our main findings support the relevance of the bilateral trade of agricultural products between Brazil and China. Still, a set of products can be classified as missed trade opportunities. We argue about the negative effects of preferential tariffs applied to other groups of countries. We can link the case of a subset of commodities to the incidence of non-tariff measures.

Keywords: agriculture; international trade; trade policy; Brazil; China.

SINOPSE

Este trabalho discute o comércio de produtos agrícolas entre Brasil e China. A partir de uma seleção de *commodities*, é levantado debate sobre a existência de obstáculos ou oportunidades não aproveitadas de incremento do comércio entre as duas economias. Após uma análise histórica e institucional, é proposta uma descrição estatística do histórico recente de exportações do Brasil para a China. Esses dados são contrastados com um conjunto de indicadores sobre a incidência de tarifas e medidas não tarifárias e, em seguida, é feita menção à institucionalidade que regula o setor de agricultura no Brasil. Os principais apontamentos deste trabalho dão suporte à relevância do comércio bilateral de produtos agrícolas entre os dois países. Ademais, é possível classificar um conjunto de produtos como oportunidades não aproveitadas de comércio. Nesse contexto, discutem-se os efeitos negativos de tarifas preferenciais aplicadas para alguns grupos de países. Ainda, é possível relacionar, ao menos fracamente, o caso de um pequeno subconjunto de produtos com a incidência de medidas não tarifárias específicas.

Palavras-chave: agricultura; comércio internacional; política comercial; Brasil; China.

1 INTRODUCTION

Since the 2000s, the relation between Brazil and China have grown substantially and an important aspect of the partnership between the two countries takes place through international trade. Approximately 80% of Brazil's exports to China are concentrated in agriculture – between 2001 and 2019, the average annual growth rate of Brazilian agribusiness exports to China is 16.1%. Brazilian exports are also strategic to the Chinese economy and its development goals.

Contextually, the economic growth and the structural changes that took place in China in the recent period have shown that one of the greatest challenges the country face is the need to transform its food security policies. In Brazil, agribusiness have thrived as a sector of intense dynamism, making Brazil one of the biggest exporters of the kind in the global economy. There are complementary paths that link the history and prospects of the two economies, and the agribusiness stands out as, arguably, the most important vector.

In this report, we discuss the trade relation between Brazil and China. We identify a set of key agricultural commodities that join both well-established products, with significant Market share, and a subset that, as we argue, are trade opportunities for Brazil and China for the next coming years. We debate whether there are obstacles or possibilities to increase agricultural trade between the two countries through an increase of Brazilian exports to China. For this purpose, we provide a statistical description of the recent history of Brazilian exports to China and analyze some of its determinants, specifically, the use of measures to trade and institutional development and regulation.

The remaining of this report is divided into seven other sections. First, we establish core assumptions and make methodological notes. In section 3 we review some of the key features of the Chinese agriculture. In section 4 we analyze the evolution of agribusiness trade between Brazil and China, focusing on the main products traded by the two countries in the recent period. Tariff barriers are discussed in section 5. In section 6, we provide a description of Non-Tariff Measures (NTMs) applied by China, comparing a sample of countries. Section 7 provides information, on institutional level, about the regulation of agribusiness production and trade in Brazil.

2 METHODOLOGICAL NOTES

This section establishes the main assumptions and provide a brief description of the main data sources.

First of all, comes a definition of agricultural or agribusiness products – a specific set of commodities. Based on the Agreement of Agriculture of the World Trade Organization (WTO), all commodities included in chapters 1 to 24 of the Harmonized System Nomenclature (HS) are included – the 2012 version of the nomenclature (H4) is used. Then, it is added to the previous subset codes 4703 ("chemical wood pulp") and 5201 ("cotton, not carded or combed"). Although not included in the first set, those are correlated commodities of great relevance to Brazilian exports and might be of interest. It is adopted as a standard the use of the four-digit level reference of the nomenclature (HS4) to describe commodities, but complementary analysis is based in six-digit level reference (HS6).

Additional criteria are applied when selecting products of interest for the analysis. in first place, it is made a rank of the four-digit references by the market share of Brazilian exports in the Chinese imports. Then, a subset of commodities is constructed only with products with a value of Chinese imports of at least US$ 300 million. The outcome is a set of commodities that represent the key Brazilian exports to China of reasonable value, which is well-suited for a concise description of trade between the two countries.

In this analytic scheme, the Brazilian exports of agribusiness goods to China were divided in three distinctive groups, according to the Brazilian share in the Chinese market, as will be further explained in section 4. The group with the smallest market share is referred as strategic or sensitive products. Those set of products are linked with missing trade opportunities of Brazilian exports to China. In the following sections some of the determinants that could explain the lowest share of those products are explored.

The analysis of trade flows (section 4) and tariffs (section 5) considered China as a cluster that includes China, Hong Kong and Macao, as sections 3 and 6 refer primarily to China (Mainland). Often in section 4, it was used the average of years 2016 to 2018 when presenting

trade statistics, as a correcting mechanism to avoid discrepancies of single periods. By the time this report was written, not all the data for 2019 was available at UN Comtrade.

A variety of datasets were used to compose this report. For the notes on Chinese agriculture and the evolution of the Chinese economy and demographics since the beginning of the century (chapter 2), two data sources were fundamental, the National Bureau of Statistics of China and China's Statistical Yearbook. The former provides a collection of social and economic statistics at national and regional level for the previous year. It also includes several major indicators for the recent period.

Chapter 3 explores trade statistics provided by Comtrade. The United Nations Commodity Trade Statistics Database (UN Comtrade) contains detailed imports and exports statistics reported by statistical authorities of almost 200 countries or areas, with continuous update.[1] The data on tariffs and preferential agreements (chapter 4) is available at the World Integrated Trade Solution (Wits) – A software that allows users to access and retrieve information on trade and tariffs.[2]

The Unctad Trains database is used to produce statistics about the incidence of Non-Tariff Measures (chapter 5). The Unctad Trains is a repository for NTMs data based on an active collection process, with yearly updates.[3] At last, the information about laws and regulation of agriculture in Brazil.

3 RECENT CHARACTERISTICS OF CHINESE AGRICULTURE AND ITS CHALLENGES

The main objective of this section is to present characteristics of the Chinese economy in the recent period, especially considering its economic growth, the expansion of its domestic market and the recent attributes of the Chinese agricultural sector. Thus, we intend to identify some characteristics of consumption and agricultural production in China, analyzing their perspectives on the dynamics of consumption and production of agricultural products.

1. See: <https://bit.ly/3i1n5Se>.
2. See: <https://bit.ly/3zDxQAg>.
3. See: <https://bit.ly/3721Nxw>.

It is relevant to identify these characteristics about China in order to understand how Brazil and China can deepen their commercial relations in agricultural products.

3.1 Recent evolution of Chinese economy

The Chinese economy experienced a unique process of economic growth in the last 40 years. In the first 30 years, the average rate of growth was around 10%, that decelerated to around 7% in the last 10 years. Along with the intense economic growth, the country also has the largest domestic market in the world economy by population criteria. The Chinese population in 2019 was 1.434 billion people, 18.5% of the world population. Since 2005, there is evidence of a convergence to a more steady population growth, combined with a downward trend of the share of China in world population. Still, in the year of 2019 there was substantial growth of 1.3%, what might be a late consequence of changes in the traditional institution of birth control.[4] The evidence above supports a strong consensus about China remaining an important market to the world economy.

When it comes to the distribution of the Chinese GDP growth per capita (table 1), there is evidence of an almost even effect on each income category (quintiles). The average growth rate between 2014 and 2018 is similar for all classes of income – close to 8%. By other means, the data supports the main argument that China's economic growth and GDP per capita expansions are strongly related to a more vigorous domestic market, thus consolidating the country as one of the largest importers of agricultural products.

4. The end of the one-child policy began in 2015, several measures to encourage families to have more children are discussed in the country, from expanding maternity leave to stimulating a second child through financial and tax incentives. See: <https://bbc.in/3BTd3KW>.

TABLE 1

Per capita disposable income of nationwide households by income quintile – China (2013-2018)

(In ¥)

Description	2013	2014	Growth rate (%)	2015	Growth rate (%)	2016	Growth rate (%)	2017	Growth rate (%)	2018	Growth rate (%)	Average growth rate
Low income households	4,402.40	4,747.30	7.8	5,221.20	10	5,528.70	5.9	5,958.40	7.8	6,440.50	8.1	7.9
Lower middle income households	9,653.70	10,887.40	12.8	11,894.00	9.2	12,898.90	8.4	13,842.80	7.3	14,360.50	3.7	8.3
Middle income households	15,698.00	17,631.00	12.3	19,320.10	9.6	20,924.40	8.3	22,495.30	7.5	23,188.90	3.1	8.2
Upper middle income households	24,361.20	26,937.40	10.6	29,437.60	9.3	31,990.40	8.7	34,546.80	8	36,471.40	5.6	8.4
High income households	47,456.60	50,968.00	7.4	54,543.50	7	59,259.50	8.6	64,934.00	9.6	70,639.50	8.8	8.3

Source: National Bureau of Statistics of China/China Statistical Yearbook, 2019.
Authors' elaboration.

Alongside the enhanced economic growth, China has experienced a process of structural change at social and economic level. First, there was a substantial increase in the share of urban population, that lead to a shift in the demographic profile of China, which is becoming a more urban country. The rural population in 2008 represented 53% of total population, as the number of 2018 is 40.4%. Despite the major shift, the size of rural population in China is still high compared to other emerging economies. The share of rural population in some of other BRICS countries is as follows (The World Bank, 2019):[5] Brazil – 13.2%; Russia – 25.4%; India – 65.5%.

5. Note: The information available in The World Bank Data database is the urban population. Subtracting the urban population from the total population of each country, we have a proxy of the rural population. See: <https://bit.ly/36ZETH0>.

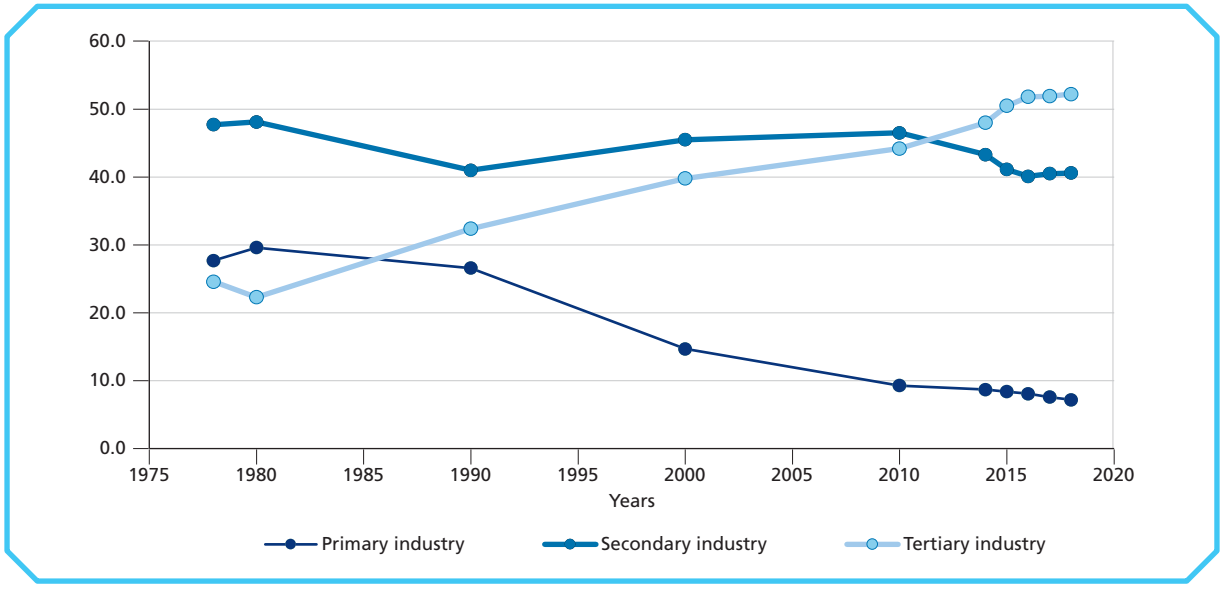
The reduction of the rural population happens simultaneously with the reduction of rural poverty, as can be perceived in graph 1. The decline in rural poverty between the 1970s and 2018 was substantial, from 97.5% in 1978 to 1.7% in 2018.

Significant changes in China's sectoral composition happened over that period. The share of agriculture in GDP, dropped from 27% in 1978 and to 7.2% in 2018. Along with the drop in agriculture, it is noteworthy the growth in the dynamics of the Chinese economy, with the industry and service sectors growing in relevance as a share of GDP.

GRAPH 1

Composition of gross domestic product – China

(In share %/GDP)



Source: China Statistical Yearbook.
Authors' elaboration.

3.2 Recent characteristics of the Chinese agricultural sector

It is worth looking at the outline of agricultural production in China. Considering the sown area in the last few years, the most relevant products are grains, with a share close to 70% of planted area and an average growth rate of 2.0% (table 2).

The most important (sown area) grains,[6] as of 2018, are: i) rice – with a share around 19% and an average growth rate of 0.2%; ii) wheat – close to 14% with an average growth rate of -2.3%; and iii) corn – with a growing participation over the period with 25% share and an average growth rate of 15.8%. In terms of planted area, all products, besides corn, have a low or negative average growth rate. Possibly, the growth in corn production is related to the subsidies that covered the market until 2016 and improved the profit margin of the product when compared to the other grains, including those which are also covered by subsidies – although to a lesser extent – and alternatives that are produced in the same provinces.

TABLE 2

Agricultural production basic conditions and sown area of farm crops – China

Products	2000	2010		2015		2017		2018		Average rate in growth
	Share percentage	Share percentage	Growth rate	Share percentage	Growth rate	Share percentage	Growth rate	Share percentage	Growth rate	
Grain crops	69.4	71	3	71.3	6.5	70.9	-0.8	70.5	-0.8	2
Rice	19.2	19.1	0.5	18.5	2.3	18.5	-0.1	18.2	-1.8	0.2
Wheat	17.1	15.5	-8.2	14.7	0.6	14.7	-0.4	14.6	-1	-2.3
Corn	14.8	22.2	51.7	27	28.6	25.5	-5.7	25.4	-0.6	18.5
Beans	8.1	7	-12.7	5.1	-23.7	6	19.2	6.1	1.3	-4
Tubers	6.7	5.1	-23.9	4.4	-8.9	4.3	-1.8	4.3	0.1	-8.6
Oil-bearing crops	9.9	8.7	-11.1	8	-2.8	7.9	-0.7	7.8	-2.7	-3.4
Cotton	2.6	2.8	8	2.3	-13.5	1.9	-15.4	2	5	-4
Fiber crops	0.2	0.1	-65.3	0.03	-40.7	0.03	7.4	0.03	-1.7	-25.1
Sugar crops	1	1.1	19.5	0.9	-13	0.9	-1.7	1	5	2.4
Tobacco	0.9	0.8	-8.9	0.8	-4.2	0.7	-9.8	0.6	-6.5	-7.3
Vegetable	9.7	10.3	6.3	11.8	21.1	12	1.9	12.3	2.3	7.9

Source: National Bureau of Statistics of China/China Statistical Yearbook, 2019
Authors' elaboration.

6. According National Bureau of Statistics of China, Grain Yield refers to the yield in the whole country including grains produced by state farms, collective units, industrial enterprises and mines. Grain includes rice, wheat, corn, sorghum, millet and other miscellaneous grains as well as tubers and beans. Output of beans refers to dry beans without pods. The output of tubers (sweet potatoes and potatoes, not including taros and cassava) was converted into that of grain at the ratio 4:1, i.e. 4 kilograms of fresh tubers was equivalent to 1 kilogram of grain up to 1963. Since 1964 the ratio for conversion has been 5:1. Tubers supplied as vegetables (such as potatoes) in cities and suburbs are calculated as fresh vegetables and their output is not included in the output of grain. Output of all other grains refers to husked grain. See: <https://bit.ly/3i9VTkq>.

Considering the physical production for the same set of products, in tons (table 3), between 2014 and 2018 there was a low average growth rate for the set of commodities. Grain harvest had an average growth rate of 0.9%, as cereal 0.8%, rice 0.8%, wheat 1.2 and corn average growth rate of 1.2.

TABLE 3

Agricultural production – China (2014-2018)

Product	2014		2015		2016		2017		2018		Average growth rate
	Outuput (tons)	Growth rate	Outuput (tons)	Growth rate	Outuput (tons)	Growth rate	Outuput (tons)	Growth rate	Outuput (tons)	Growth rate	
Grain	639.6	1.5	660.6	3.3	660.4	-0.03	661.6	0.2	657.9	-0.6	0.9
Rice	209.6	1.6	212.1	1.2	211.1	-0.5	212.7	0.7	212.1	-0.3	0.8
Wheat	128.3	3.7	132.6	3.4	133.3	0.5	134.3	0.8	131.4	-2.2	1.2
Corn	249.8	0.5	265	6.1	263.6	-0.5	259.1	-1.7	257.2	-0.7	0.7
Beans	15.6	1.4	15.1	-3.3	16.5	9.1	18.4	11.6	19.2	4.3	4.6
Tubers	28	-2	27.3	-2.5	27.3	-0.1	28	2.7	28.7	2.4	0.1
Oil-bearing crops	33.7	2.6	33.9	0.6	34	0.3	34.8	2.2	34.3	-1.2	0.9
Cotton	6.3	0.3	5.9	-6.2	5.3	-9.5	5.7	5.8	6.1	8	-0.3
Fiber crops	0.2	-6.3	0.2	-5.5	0.2	16	0.2	20.4	0.2	-6.9	3.6
Sugarcane	115.8	-2.9	107.1	-7.5	103.2	-3.6	104.4	1.2	108.1	3.5	-1.9
Tobacco	2.8	-11.6	2.7	-6	2.6	-3.8	2.4	-7.1	2.2	-6.3	-7

Source: National Bureau of Statistics of China/China Statistical Yearbook, 2019.
Authors' elaboration.

Regarding animal products (table 4), the main product is pork. Considering the period between 2013 and 2018, pork experienced moderate growth in its production, with an average growth rate of 0.2%. China is also one of the leading poultry producers in the world. The chicken output has grown 1.7% yearly between 2013 and 2018, offsetting the negative results of 2014 and 2015, and has exceeded 14 million tons in 2016.

Meanwhile, cattle had a growth rate of only 0.8% and sheep an average growth rate of 2.7%. Comparing the average growth rates for the types of meat in table 4, the main takeaway is that chicken and sheep have higher average growth rates than pork and beef.

TABLE 4

Production of meat and growth rate – China (2013-2018)

Year	Pork		Chicken		Cattle		Sheep	
	Production (tons)	Growth rate	Production (tons)	Growth rate	Production (tons)	Growth rate	Production (tons)	Growth rate
2018	55	-0.8	14.6	0.9	5.8	1.5	2.4	0.8
2017	55.5	0.4	14.5	7.2	5.7	2.9	2.4	2.4
2016	55.2	-3.8	13.5	6.7	5.6	0	2.3	4.6
2015	57.4	-0.4	12.6	-1.5	5.6	0.2	2.2	2.9
2014	57.7	3.1	12.8	-3.7	5.6	0.4	2.2	4.3
2013	55.9	2.7	13.3	1	5.5	-0.3	2.1	1.3
Average growth rate	0.2		1.7		0.8		2.7	

Source: Food and Agriculture Organization of the United Nations (FAOSTAT).
Authors' elaboration.

Concerning aquatic products, according to FAO (2017),[7] China has established itself as the world's largest fish producer. In 2015, China Mainland alone produced 65.2 million tons of fish (food), with 47.6 million tons (73%) of aquaculture and 17.6 million tons (27%) of catch. Chinese aquaculture had double-digit growth rates in the 1980s and 1990s. In recent years (2001-2015), the average annual growth was reduced to 5.4%, lower than the rest of Asia.

Table 5 present data on the production of aquatic products. The Chinese production of seawater products is almost equally divided between sea water products (51.1% in 2018) and freshwater products (48.9% in 2018). This is the result of changes in the production of aquatic products between 1970 and the 2000s, that is, it is a structural transformation. The average growth rate of the two types of seafood between 2011 and 2019 is close to 2%, more than the figures of pork, beef and chicken.

7. Available at: <https://bit.ly/3zDgOlM>.

TABLE 5

Output of aquatic products (tonnes), share percentage – China

Total aquatic products		Seawater aquatic products		Freshwater aquatic products	
Year	Value	Value	Share percentage	Value	Share percentage
2018	64,577,000	33,014,000	51.1	3,156.20	48.9
2017	64,453,000	33,217,000	51.5	3,123.60	48.5
2016	63,795,000	33,013,000	51.7	3,078.20	48.3
2015	62,110,000	32,323,000	52	2,978.70	48
2014	60,019,000	31,363,000	52.3	2,865.70	47.7
2013	57,442,000	29,924,000	52.1	2,751.90	47.9
2012	55,021,000	28,896,000	52.5	2,612.50	47.5
2011	56,032,000	29,080,000	51.9	2,695.20	48.1
2010	53,730,000	27,975,000	52.1	2,575.50	47.9
2000	37,062,000	22,039,000	59.5	1,502.30	40.5
1990	12,370,000	7,133,000	57.7	523.7	42.3
1980	4,497,000	3,257,000	72.4	124	27.6
1978	4,664,000	3,595,000	77.1	105.9	22.7
Average rate					

Source: National Bureau of Statistics of China/China Statistical Yearbook, 2019.
Authors' elaboration.

3.3 Consumption

China produces most of the agricultural products its internal market demands. As shown in tables 6, 7 and 8, the most consumed products are cereals, vegetables, pork, melons and other fruits, aquatic products, milk and dairy products, and vegetable oil.

There has been a continuous reduction in the per capita consumption of fresh grains and vegetables between 1990 and 2010 (tables 6 and 7). The reduction in per capita consumption of grains is a result of the contraction in the consumption of wheat and rice, especially in the rural sector between the 1990s and 2010, as shown in table 7. On the other hand, products with an upward trend in consumption are pork, melons and fruits, milk and dairy products, with perceived growth in both urban and rural areas.

For the most recent period – 2013 and 2018 –, the per capita consumption of grains continues to decrease (table 8). Regarding products that show a positive trend in consumption per capita, attention is drawn to the continued growth in pork, aquatic products, eggs, milk and dairy products, dried and fresh melons and fruits.

TABLE 6

Per capita annual purchases of major commodities of urban households

(In kg)

Products	1990	1995	2000	2005	2009	2010
Fresh vegetables	138.7	116.47	114.74	118.58	120.45	116.11
Grain	130.72	97	82.31	76.98	81.33	81.53
Fresh melons and fruits	41.11	44.96	57.48	56.69	56.55	54.23
Pork	18.46	17.24	16.73	20.15	20.5	20.73
Milk	4.63	4.62	9.94	17.92	14.91	13.98
Poultry	3.42	3.97	5.44	8.97	10.47	10.21
Fresh eggs	7.25	9.74	11.21	10.4	10.57	10
Edible vegetable oil	6.4	7.11	8.16	9.25	9.67	8.84
Beef and mutton	3.28	2.44	3.33	3.71	3.7	3.78
Aquatic products	7.69	9.2	11.74	12.55	-	-

Source: National Bureau of Statistics of China/China Statistical Yearbook, 2019.
Authors' elaboration.

TABLE 7

Per capita consumption of major foods by rural households

Products	1990	1995	2000	2005	2009	2010
Rice	135	129.3	126.8	113.4	105.7	101.9
Fresh vegetables	134	104.6	106.7	102.3	98.4	93.3
Wheat	80	81.5	80.3	68.4	59.6	57.5
Fruits and processed products	5.9	13	18.3	17.2	20.5	19.6
Pork	10.5	10.6	13.3	15.6	14	14.4
Vegetable oil	3.5	4.3	5.5	4.9	5.4	5.5
Aquatic products	2.1	3.4	3.9	4.9	5.3	5.2
Eggs and processed products	2.4	3.2	4.8	4.7	5.3	5.1
Poultry	1.3	1.8	2.8	3.7	4.3	4.2

(Continues)

(Continued)

Products	1990	1995	2000	2005	2009	2010
Milk and processed products	1.1	0.6	1.1	2.9	3.6	3.6
Soybeans	-	2.3	2.5	1.9	1.7	1.6
Sugar	1.5	1.3	1.3	1.1	1.1	1
Nuts and processed products	-	0.1	0.7	0.8	1.1	1
Mutton	0.4	0.4	0.6	0.8	0.8	0.8
Beef	0.4	0.4	0.5	0.6	0.6	0.6

Source: National Bureau of Statistics of China/China Statistical Yearbook, 2019.
Authors' elaboration.

TABLE 8

Per capita consumption of major foods nationwide – China (2013-2018)

(In kg)

Product	2013	2014	2015	2016	2017	2018
Ceral	138.9	131.4	124.3	122	119.6	116.3
Fresh vegetable	94.9	94.1	94.9	96.9	96.1	93
Fresh melons and fruits	37.8	38.6	40.5	43.9	45.6	47.4
Pork	19.8	20	20.1	19.6	20.1	22.8
Milk and dairy products	11.7	12.6	12.1	12	12.1	12.2
Aquatic products	10.4	10.8	11.2	11.4	11.5	11.4
Eggs	8.2	8.6	9.5	9.7	10	9.7
Poultry	7.2	8	8.4	9.1	8.9	9
Edible vegetable oil	9.9	9.8	10	10	9.8	8.9
Beans and the products	7.5	7.5	7.8	8.3	8	8.3
Tuber	2.3	2.2	2.4	2.6	2.5	2.6
Beef	1.5	1.5	1.6	1.8	1.9	2
Mutton	0.9	1	1.2	1.5	1.3	1.3
Sugar	1.2	1.3	1.3	1.3	1.3	1.3

Source: National Bureau of Statistics of China/China Statistical Yearbook, 2019.
Authors' elaboration.

Considering the last few years, the data on agricultural and meat production, in terms of planted area and production in tons, report a growth in production smaller than the growth in consumption. This may be suggestive of a potential growth of imports in the coming years.

3.4 Reforms in the agricultural sector

According to Huang and Rozelle (2018), faced with the possibility of expanded demand for food, the Chinese government has been working on institutional reforms to increase agricultural productivity and promote rural transformation. The Household Responsibility System (HRS)[8] has the purpose to guarantee the access to land and land income. To stimulate investments in the agricultural sector, the government also implemented a diverse set of incentive measures, such as increasing the average size of rural property, measures to improve agricultural efficiency, productivity and income.

Another recent innovation in land tenure institutions, with the purpose of stimulating agricultural production, is the so-called *San-quan-fen-zhi*, which separates three rights: i) collective rights of land tenure in the villages; ii) land contract rights for individual families; and iii) land exploitation rights. When the farmer's land exploitation rights are separated from the contract rights, the former can be transferred through the rental market, while the original contracted farmers continue to retain the contract rights.

This reform aims to achieve equity in the distribution of land and the efficient use of it, which is currently done through transfers of operating rights. In addition, since the late 2000s, a series of institutional reforms, in the form of new laws, have been tested and implemented to promote cooperatives of professional farmers and help farmers market their activities.

In addition to changes in the land dimension, other measures adopted by the government are investments in agriculture, in Research and Development (R&D) and in Science and Technology (S&T), with the purpose of increasing the productivity of agricultural production, mainly by building a public system of high quality and efficient agricultural R&D that is globally competitive, thereby consolidating an innovation system focused on technology in the public and private sector.

8. According Huang and Rozelle (2018, p. 492): "China's first rural reform, the household responsibility system (HRS), was implemented during the period 1978-84. This dismantled the people's communes and contracted cultivated land to individual households, mostly on the basis of the number of people and/or labourers in the household. Although the ownership of land remained collective, control and income rights belonged to individuals under the HRS. The first land contract term was 15 years. When this ended in the late 1990s, it was extended to 30 years for the second term. The government today is struggling with what to do when this contract period finishes".

For example, since 2007 there has been a substantial increase in funding for agricultural research and there has also been an expansion of public research institutes. The Technology Innovation System was created, with 50 subsystems for agricultural commodities, and in 2008 the National Transgenic Modified Variety Development Special Program. In 2010, the number of public sector agricultural researchers in China had reached 96,300 (Huang and Rozelle, 2018).

In 2017, China launched the Rural Revitalization Development Strategy to promote constant reviews of development policies for agriculture, to maintain the increase in agricultural productivity, in addition to seeking lessons from the development of agriculture in other developing countries.

One of the problematic issues related to the expansion of agricultural production in China is land, since the possibility of increasing the concentration of land to increase scale and scope might stimulate a greater rural exodus with consequences for the country's urban sector. In other words, there are structural limits for China in the search for an internal solution for its food security.

Some measures have been implemented by the Chinese government to address this structural limit. For example, the Chinese government has been investing in the construction of technological hubs to produce grains in strategic areas, with the goal of increasing agricultural productivity through technological resources. In addition, there is also the rural revitalization strategy, with measures to promote the development of infrastructure in the rural area, such as the construction and improvement of roads, water resources and basic sanitation. The overall goal of these measures is to reduce the gap in opportunities between the urban and rural areas, thus containing the exodus and stimulating competitiveness. It is important to remember that subsidies are also used to stimulate agricultural production in the country.

The concern about food security in the country has been the subject of a national campaign to prevent the increasing food waste in China. In August 2020, President Xi Jinping started a campaign called "Operation Empty Plate", with the purpose of improving awareness of food consumption. The campaign raised worries about the prospects of food supply, because many interpreted this campaign as a sign that the situation may be worse than the government

admits, creating a scenario of alert in the country, which can become even more intense in the case of a worsening geopolitical crisis between the USA and China.[9]

Food production in China may also have been affected by the strong floods in the Yangtze River basin – the source of most of China's rice production – which destroyed huge areas of cultivation, while the Covid-19 roadblocks at the beginning of this affected supply chains.

Furthermore, the domestic pig industry is still recovering from a devastating outbreak of African swine fever that killed or forced the slaughter of 100 million pigs.

That scenario, with conjunctural events, has contributed to increasing long-term structural problems, such as the decrease in arable land and an exodus of people from agricultural regions to cities, contributing to reduce the rural population and increasing the urban population.

According to Li Guoxiang,[10] a researcher at the Rural Development Institute, China's resources are not sufficient to support an advance of the entire structure of food consumption in the domestic market. The improving living standards of the Chinese population has increased the demands and the challenges faced by the entire agricultural and food production framework.

3.5 Prospects

The scenario discussed so far suggests that China will increase its international demand for agricultural products, as part of the strategy to guarantee the country's food security. From the perspective of trade relations between Brazil and China, the scenario stands out the need for Brazil to identify which products represent a potential market for Chinese demand.

On this matter, Figueiredo and Contini (2013) discuss that, in addition to the structural issues that limit domestic food production in China, there is also a greater presence of Western food on the Chinese menu, mainly because of the economic growth, urbanization and market liberalization, so that consumption habits such as milk, bread or coffee have become common

9. See: *"Don't waste food' edict spurs fear of China food crisis"*. Available at: <https://bit.ly/3735GSM>.
10. See: *"Don't waste food' edict spurs fear of China food crisis"*. Available at: <https://bit.ly/3735GSM>.

in large centers like Beijing, Nanjing and Chengdu, indicating an important positive trend for the demand of these products in the coming years.

Another study that contributes to identifying possible Chinese demands in relation to the agricultural products market is OECD and FAO (2018). In the report, China's concern for food security is highlighted when making projections on China's agricultural production and demand for food for the period between 2018-2027, with the country increasing its alignment with global markets as a strategy to ensure the country's food security.

From the production point of view, the Outlook of the OECD and FAO (2018) states that while the last decade has been characterized by robust demand and high agricultural prices, causing a strong growth of commodity production in the world, a slower growth in global agricultural production is expected to the next decade (2018-2027). This scenario will be associated with increased productivity, but without a large increase in the use of agricultural land in the global scenario, although this varies by commodity and by region, as is the case in China.

For meat production, the Outlook forecast is that China will have an even slower growth in pork production. Regarding aquatic animals, it is said that if China's 13th five-year plan is fully implemented, China's catch fisheries will decrease by 29% as of 2027, and aquaculture will expand by 20%, instead of 31% in the absence of the plan. With limited global capacity to fill China's production gap under the five-year plan, pressure of growing demand will affect global fish prices.

Regarding cereals, China's policies are likely to affect global markets through price movements, inventory and import regulations. The reduction in corn subsidies since 2016 had implications for domestic and global production of corn, soyabeans and other coarse grains. The example of this is that China bought expensive corn from producers and imported it cheaper, increasing its stocks.

Regarding consumption behavior in China, the Outlook of the OECD and FAO (2018) predicts that the feed demand will show a process of global slowdown, despite the intensification of cattle production. About 30% of the additional feed demand will come from China, with a 25% growth in feed demand expected over the forecast period.

Projections for protein bran, derived from the crushing of oilseeds, are influenced by developments in food systems and agricultural policies. For example, Outlook shows that the total demand from the Least Developed Countries for protein bran has grown because of the growth in beef production. To a large extent, China was responsible for the growth in demand for this product, since the expansion of meat production coincided with a high price of support for grains. This discouraged the use of corn as food. The reduction in supported corn prices in China since 2016 may mean that corn will play a more important role in the mix of Chinese feed in the next decade.

Asian countries will account for 71% of the increase in consumption of fish as food, and per capita consumption of fish will increase on all continents except Africa. Fish and fishery products will continue to be highly commercialized. In addition to consumers, Asian countries will continue to be the main exporters of fish for human consumption, while OECD countries will continue to be the main importers. In this scenario, an essential point is the Chinese demand for meat and fish. China remains responsible for a large part of the growth in demand for meat and fish. From the point of view of the global economy, total meat and fish consumption is expected to increase by 15% during the forecast period, while per capita consumption of meat and fish by only 3%, with relevant variations between regions in the world. For China, the forecast is a 13% growth for the next decade. Furthermore, per capita poultry consumption in China is expected to increase by 5.5% (OECD and FAO, 2018).

Chen and Tian (2020) refer to China as the world's largest producer of fish products and their production is equivalent to 61.5% of the world's total. However, the Food and Agriculture Organization points out that the global demand for fish products exceeds one hundred million tons per year. In this case, for the authors, Brazil has the potential to become the largest global producer of fish products, as long as it advances in fish farming technology and development, becoming an import partner of the Chinese economy.

Sheep will continue to be a market niche in most countries, despite forecasting only 8% growth in consumption per capita over the next ten years. This growth will happen mainly in China and other Asian countries, especially with the diversification of diets in the region.

As previously mentioned, OECD and FAO (2018) also shows that China is the world's largest producer and importer of pork. However, China's role in the growth of global pork consumption is expected to decrease because the per capita consumption of pork in the country is already considered high. While China accounted for 65% of the increase in the previous decade, it will contribute only to 45% of the expansion in the next ten years. In 2017, China produced more than 53 million tons – about 45% of global production – and imported about 1.6 million tons.

Chen and Tian (2020) show that some weaknesses in China's agricultural structure have raised the country's production costs of some commodities. Problems such as the intense use of pesticides and fertilizers, pesticide residues, food additives and poor hygiene conditions in production, in an attempt to raise productivity, have become frequent problems, causing agricultural products exported by China to be constantly rejected and returned because of quality and safety factors. In addition, the low efficiency of circulation and transportation has contributed to an increase in prices in the domestic market for some products, making imports a more feasible alternative, especially considering the possibility of partnership with Brazil. For example, the authors claim that the costs of producing wheat, corn, soybeans, rice and cotton in China are relatively high and may increase even more, causing a higher price level for these products to the consumer.

Along with these problems, Chen and Tian (2020) argue that the rising level of China's income, the growing urbanization and the great changes in consumption patterns provide an increasing range of opportunities for Brazil. The Chinese urban middle class has growing demands for high-value meats, milk, oils and processed food, products that Brazil could benefit from exports to China. Furthermore, the authors argue the outlook is also encouraging for cotton producers. Although China is the world's largest producer of cotton, cotton production in Brazil can play an important role on supplying Chinese demand.

3.6 Agricultural policies and impacts on Brazilian exports

There is a gap between domestic production and demand for food in China and the international trade is a doable alternative for solving this issue. As a strategy to guarantee its food security, China has established trade agreements, purchased land in other countries, or increased direct investment on agribusiness companies.

However, when it comes to China and its insertion in world trade, many issues discussed are related to its policy of tariff or non-tariff measures, especially the subsidy policy for the national agricultural sector.

Huang and Rozelle (2018) say that the subsidy policy in China has intensified a lot, especially since the 2008 crisis, as almost all rural families with land contracts started to receive subsidies. This includes the suspension of taxes and fees and the introduction of direct subsidy programs, such as the direct grain subsidy, quality seed subsidy and machinery subsidy. When, in 2006, domestic prices of chemical fertilizers and other agricultural inputs increased, there was also an expansion of the direct subsidy program for the aggregate of inputs. Since 2012, agricultural subsidies also include those for agricultural insurance, credit, land consolidation and soil conservation and improvement.

According to Miranda, Jank and Soendergaard (2020), comparing the 1995/1997 three-year average with the 2014/2016 average, Chinese support for rural producers as a percentage of their gross agricultural revenue – the Producer Subsidy Equivalent (PSE) – increased from 3% to 15%, approaching the OECD average. In addition, subsidies linked to the volume produced and the variation of inputs during the period in question increased from 64% to 74% of the total PSE.

Nonetheless, according to Huang and Rozelle (2018), there are several empirical studies on the impact of subsidies in China, which state that the impact of subsidies on agricultural production is limited and, consequently, limits the results of conducting the national food security policy, mainly because subsidies were being given more to the landowner (who was frequently not even producing), and not to the farmer, so the subsidies did not affect the level of production of agricultural products.

In addition to the use of subsidies to increase farmers' incomes and promote agricultural production, Huang and Rozelle (2018) show that China's agricultural authorities also implement price support policies. The most important policy was the minimum purchase price initiative, launched for rice in 2004 and wheat in 2006. There was also the Temporary Storage Program (TSP), whose purpose was to increase the market prices of some products, initially for corn and soybeans in 2008, then for cotton in 2011 and sugar cane in 2012.

Huang and Rozelle (2018) claim that the Chinese government has been reviewing its subsidy and price policies, considering that these policies have had a moderate effect on farmers' income and no increase in grain production. As a result, in place of the subsidy and market intervention programs, several new policies have been implemented and the subsidy targets have been changed. The objective of the government policy is now to support more investments that increase productivity. In 2016, China merged all subsidies on grains, seeds and aggregate inputs into a single general income support program.

In addition, China has also begun to reduce the intensity of market interventions and to clear most price-distorting policies. In 2013, the government lowered the minimum purchase price for agriculture, before completely ending sugar cane and soybean acquisition programs. The purchase of corn – which most distorted relative prices – was abolished in 2016. Currently, the target price policy is being implemented only for cotton in Xinjiang. Although rice and wheat are still subject to the minimum price acquisition program, acquisition prices and grain levels have been reduced since 2015.

According to Miranda, Jank and Soendergaard (2020), production chains of strategic interest to Brazil – such as soya and coffee and, to a lesser extent, cellulose – are negatively affected by tariff escalation barriers, as tariffs on imports increase gradually according to its level of processing, regardless of its end use. It is not just agricultural products that face this policy, but also minerals and, especially, iron ore.

Moreira, Soares and Li (2016) show that the majority of technical difficulties related to market access in China are related to the rules of the Agreement on Sanitary and Phytosanitary Measures (SPS), particularly because of the lack of clarity and prolonged periods for producers to obtain certification. An example of this is the operation of the China Food Safety Law, the Law on the Entry and Exit of Animals and Plant Quarantine and the Regulations on the Administration of Agricultural Genetically Modified Organisms Safety. The law determines the mode of official inspection and approves imports, including the farms and industrial facilities from which they originate. This regulatory tool also establishes quarantines and restrictions in the event of illness and is applied by the General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ).

In that scenario of deepening trade relations between Brazil and China, it is also important to take into account the dynamics of Hong Kong's imports and re-exports, since many imports from the continent are made through these routes, as shown by Figueiredo and Contini (2013). In the case of bilateral agricultural trade with Brazil, the interface with Hong Kong occurs mainly in the meat trade. Another product that stands out in this trade dynamic is chicken meat, mainly considering Brazilian imports by Hong Kong and the re-exports of this product to the Chinese market. In the case of pork, despite the Chinese market being closed to Brazil until October 2012 for health reasons, the product presented substantial Brazilian imports to Hong Kong.

4 TRADE IN AGRIBUSINESS GOODS – BRAZIL AND CHINA

4.1 Introduction

It is important to notice that the Chinese Market is the most important one for Brazil and Brazil is the most important supplier to the Chinese Market in agribusiness goods. In the rest of this chapter, whenever we refer to China, we mean the sum of China, Hong Kong and Macao.[11] Also, to avoid disturbances, data refer to the average of 2016-2018. Bilateral flows may differ depending on the reporter. For this reason, Brazilian exports to China may be, and normally are, different from Chinese imports from Brazil. For sake of simplicity, we use Brazilian exports to China, Hong Kong and Macao as the basis for analysis.[12]

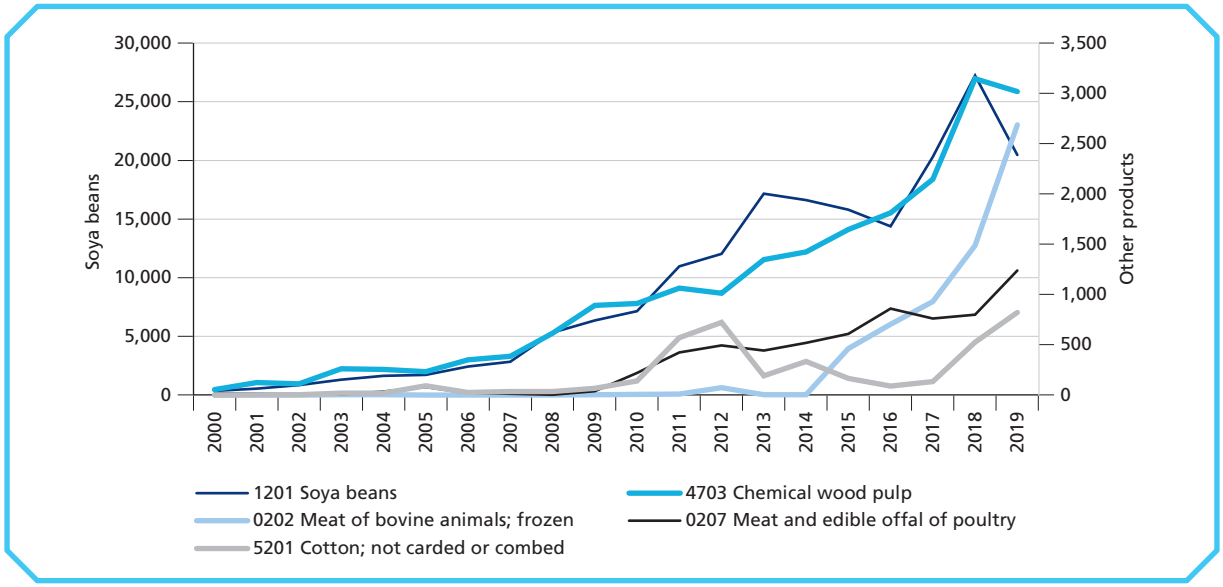
Brazilian exports of agribusiness goods to China increased manyfold in the last twenty years. From 2001 to 2019, the average yearly rate of growth of Brazilian agribusiness exports to China is 16.1%. In absolute values, the most relevant growth in the same period was soya beans, whose value increased from US$ 337 million to US$ 20,452 million, after reaching US$ 27,233 million in 2018, or 68% of total agri-exports from Brazil to China. But in relative terms, other goods have reached a more astonishing performance. For example, exports of meat of bovine animals, which were near zero until 2014, jumped from US$ 461 million in 2015 to US$ 2,685 million in 2019 (graph 2).

11. A great share of foreign trade flows involving Hong Kong is related to China (Mainland).
12. In Comtrade queries, Brazil as the reporter and China, Hong Kong or Macao as partners.

GRAPH 2

Exports of agricultural goods to China – selected products – Brazil (2000-2018)

(In US$ million)



Source: Comtrade. Available at: <https://bit.ly/3f2x87G>.
Authors' elaboration.

As of the average of 2016-2018, imports from Brazil represented around 19% of total Chinese imports of these goods as can be seen in table 9. Brazil, in this period, has been responsible for 58% of total Chinese imports of soya beans, and more than 20% in other goods, like wood pulp, meat of bovine animals, and more than 10% in fish.

By the same token, Brazilian exports of agricultural goods to China represented 34% of total exports of these goods in the same period. In the case of soya beans, it reaches 79%, 38% in chemical wood pulp and 47% in meat of bovine animals, frozen. But, on the other hand, it must also be noticed that in many other agribusiness goods Brazilian share is very small or even near zero. Anyway, in agribusiness goods, Brazil is a very important supplier to the Chinese Market as China is a very important destination of Brazilian exports.

TABLE 9

China's imports, value (in MM USD), by product (HS4-2012) and partners – Brazil first partner (average 2016-2018)

Code	Products	World	Brazil	Brazilian exports (%)	P1	P2	P3
1201	Soya beans	37,252.10	21,770.30	58.4	Brazil	USA	Argentina
					21,770.30	11,588.70	2,178.00
4703	Chemical wood pulp	12,300.60	3,162.80	25.7	Brazil	Canada	Chile
					3,162.80	1,995.50	1,544.80
0202	Meat of bovine animals; frozen	5,231.50	1,920.40	36.7	Brazil	USA	Australia
					1,920.40	695.7	675.2
0207	Meat and edible offal of poultry; fresh, chilled or frozen	2,604.10	1,351.40	51.9	Brazil	USA	China
					1,351.40	442.5	371.4
1701	Cane or beet sugar	1,197.00	432.4	36.1	Brazil	Cuba	Rep. of Korea
					432.4	179.7	145.4
0305	Fish, dried, salted or in brine; smoked fish, flours, meals and pellets of fish	528.2	76.8	14.5	Brazil	Uganda	India
					76.8	58.1	49.8
1507	Soya-bean oil and its fractions	506.9	216.8	42.8	Brazil	Russian Federation	Ukraine
					216.8	105.7	56.2
Total		**158,922.3**	**30,857.20**	**19.4**	**Brazil**	**USA**	**Canada**
					30,857.20	**25,951.20**	**8,950.10**

Source: Comtrade. Available at: <https://bit.ly/3f2x87G>.
Authors' elaboration.

TABLE 10

Brazil's exports of agribusiness products, value (in MM USD), by product (HS4-2012) and key partners – Chinese first partner (average 2016-2018)

Code	Products description	World	China	Chinese imports (%)	P1	P2	P3
1201	Soya beans	26,080.0	20,679.6	79.3	China	Spain	Netherlands
					20,679.6	698.6	565.0
4703	Chemical wood pulp	6,364.6	2,406.4	37.8	China	USA	Netherlands
					2,390.8	969.4	776.5
0202	Meat of bovine animals; frozen	4,177.3	1,972.2	47.2	China	China, Hong Kong SAR	Egypt
					1,039.5	932.7	518.8

(Continues)

(Continued)

Code	Products description	World	China	Chinese imports (%)	P1	P2	P3
0206	Edible offal of animals, fresh, chilled or frozen	450.7	366.2	81.3	China, Hong Kong SAR	Russian Federation	Angola
					365.4	12.7	9.5
0504	Guts, bladders and stomachs of animals (other than fish)	362.7	262.9	72.5	China, Hong Kong SAR	Russian Federation	Ukraine
					262.6	13.1	11.4
2308	Vegetable materials and vegetable waste, vegetable residues and bi-products	77.0	30.5	39.6	China	Netherlands	Belgium
					30.4	17.1	6.0
1302	Vegetable saps and extracts	103.0	21.3	20.6	China	USA	Thailand
					21.1	17.1	14.2
Total		**84,891.2**	**28,743.0**	**33.9**	Argentina	USA	Chile
					26,496.9	4,530.0	4,342.2

Source: Comtrade. Available at: <https://bit.ly/3f2x87G>.
Authors' elaboration.

TABLE 11

Brazil's exports of agribusiness products, value (in MM USD), by product (HS4-2012) and key partners – Chinese second and third partner (average 2016-2018)

Code	Products description	World	China	Chinese imports (%)	P1	P2	P3
0207	Meat and edible offal of poultry; of the poultry of heading no. 0105, (i.e. fowls of the species Gallus domesticus), fresh, chilled or frozen	6,238.00	1,169.90	18.8	Saudi Arabia	China	Japan
					994.1	806.6	779.6
0203	Meat of swine; fresh, chilled or frozen	1,295.30	415.2	32.1	Russian Federation	China, Hong Kong SAR	China
					405.7	217.1	198
2401	Tobacco, unmanufactured; tobacco refuse	1,983.00	248.8	12.5	Belgium	China	USA
					414.2	239	210.7
5201	Cotton; not carded or combed	1,386.80	236.9	17.1	Indonesia	China	Viet Nam
					249.5	236.9	220.6

(Continues)

(Continued)

Code	Products description	World	China	Chinese imports (%)	P1	P2	P3
1507	Soya-bean oil and its fractions; whether or not refined, but not chemically modified	984.9	195.5	19.8	India	China	Bangladesh
					430.1	194.5	89.5
1521	Vegetable waxes (other than triglycerides), beeswax, other insect waxes and spermaceti; whether or not refined or coloured	103.8	15.7	15.1	USA	Japan	China
					28.6	16.8	15.6
0303	Fish; frozen, excluding fish fillets and other fish meat of heading 0304	88.6	7.1	8.1	USA	Viet Nam	China
					33.1	7.4	7.1

Source: Comtrade. Available at: <https://bit.ly/3f2x87G>.
Authors' elaboration.

The purpose of this chapter is to analyze the weight and market share of China in Brazilian exports of agribusiness goods in order to identify possible opportunities for increase in these bilateral flows.

4.2 Brazilian exports to China – present situation and possible opportunities

Considering the average for 2016-2018, total Chinese imports of agribusiness goods amount to US$158.9 billion,[13] from which 19.4 % or US$ 30.9 billion, comes from Brazil (table 9). In second place comes USA, with US$ 25.9 billion, or 16.3%, and in a distant third place comes Canada, with only 5.6%. Brazil is the biggest exporter in soya beans, chemical wood pulp, meat of bovine animals, meat of poultry and sugar cane among the 50 most important goods. Brazil is the second one in edible offal of animals and tobacco, and the third one in meat of swine. Of course, being an average of 3 years, this list is constantly modified.

On the other hand, for the same period, Brazilian exports of agribusiness goods amount to US$ 84.9 billion and the Chinese Market is the most important one, with total imports of US$ 28.7 billion or 33.9%. In second place comes Argentina, with US$ 26.5 billion and USA

13. In this part of the chapter, we consider data from Chinese imports, instead of Brazilian Exports.

comes in a distant third place, with only US$ 4.5 billion. Of course, soya beans is by far the most important good, with US$ 26.1 billion, followed by sugar cane, chemical wood pulp and meat of poultry.

The growth of Brazilian exports of agribusiness goods to China is very impressive. They jumped from US$ 495 million in 2000 to US$ 10,324 million in 2010 to US$ 30,125 million in 2019. In absolute terms, the most pronounced increase was observed in soya beans, that increased from US$ 337 million in 2000 to US$ 20,452 million in 2019, reaching 68% of total exports of these goods, according to graph 2. In second place, comes chemical wood pulp, from US$ 54 million in 2000 to US$ 3,017 million in 2019 and meat of bovine animals, frozen, from zero to US$ 2,685 million in the same years. The other most important goods are, in order, meat of poultry, cotton, meat of swine, sugar cane, tobacco and soya bean oil.

Although Brazil is the biggest supplier considering the sum of agribusiness goods, the picture is very different at the goods level. In some of them, as noted above, Brazil has a solid share, as the case of soya beans. In other cases, even if the total amount of Chinese imports is small, Brazilian share is still large. But what is more interesting to notice are the goods at which Brazilian share is not very big, especially when the Chinese import value is relatively large.

4.3 Share of Brazil in Chinese imports

It is important to analyze Brazilian exports of agribusiness goods to China according to its market share in China, dividing them in three main groups.

Tables 12, 13, and 14 presents a comparison between total Chinese imports, the market share of Brazilian exports in China, the value of Brazilian exports to China,[14] the total value of Brazilian exports and the share of Brazilian exports of each good as a percentage of total Brazilian exports of agribusiness goods – by product, average of 2016-2018 and exports to and from China, Hong Kong and Macao. We have selected only goods with Chinese imports higher than US$ 300 million.

14. Conceptually, the value of Brazilian exports to China, for each good, should be exactly the same as Chinese imports from Brazil. This should apply to every pair of countries. But, as anyone familiar with international trade statistics is aware, very often they differ, for many reasons. We adopted Brazilian exports as the data available in the tables.

TABLE 12

Comparison between total Chinese imports, order by the market share of Brazilian exports in China higher than 20%

Code	Products	Chinese imports from world	Brazil exports to China	Brazil exports to world	Brazilian market share in China (%)
0504	Guts, bladders and stomachs of animals (other than fish)	353.4	262.9	362.7	74.4
1201	Soya beans	37,252.10	20,679.60	26,080.00	55.5
0207	Meat and edible offal of poultry; fresh, chilled or frozen	2,604.10	1,169.90	6,238.00	44.9
1507	Soya-bean oil and its fractions	506.9	195.5	984.9	38.6
0202	Meat of bovine animals; frozen	5,231.50	1,972.20	4,177.30	37.7
1701	Cane or beet sugar	1,197.00	391.8	9,457.80	32.7
2401	Tobacco	1,190.90	248.8	1,983.00	20.9

Source: Comtrade. Available at: <https://bit.ly/3f2x87G>.
Authors' elaboration.

TABLE 13

Comparison between total Chinese imports, order by the market share of Brazilian exports in China higher between 20% and 10%

Code	Products	Chinese imports from world	Brazil exports to China	Brazil exports to world	Brazilian market share in China (%)
4703	Chemical wood pulp	12,300.60	2,406.40	6,364.60	19.6
2009	Fruit juices and vegetable juices	381	66.8	2,200.40	17.5
0203	Meat of swine; fresh, chilled or frozen	3,371.40	415.2	1,295.30	12.3
5201	Cotton; not carded or combed	2,306.10	236.9	1,386.80	10.3

Source: Comtrade. Available at: <https://bit.ly/3f2x87G>.
Authors' elaboration.

TABLE 14

Comparison between total Chinese imports, order by the market share of Brazilian exports in China under 10%

Code	Products	Chinese imports from world	Brazil exports to China	Brazil exports to world	Brazilian market share in China (%)
0206	Edible offal of bovine animals chilled or frozen	4,019.50	366.2	450.7	9.1
0901	Coffee, whether or not roasted	508.4	24.2	4,613.50	4.8
1602	Prepared or preserved meat, meat offal or blood	763.8	20.4	1,031.30	2.7
1005	Maize (corn)	680.6	15	4,160.30	2.2
2207	Ethyl alcohol	314.2	5.4	865.2	1.7
2101	Extracts, essences, concentrates of coffee, tea or mate	427.2	2.2	622.5	0.5
2309	Preparations of a kind used in animal feeding	539	2	256.7	0.4
0303	Fish; frozen, excluding fish fillets and other fish meat of heading 0304	4,150.10	7.1	88.6	0.2
2106	Food preparations not elsewhere specified or included	3,075.60	5.3	354.7	0.2
0306	Crustaceans; in shell or not, live, fresh, chilled, frozen, dried, salted or in brine	3,714.90	4.9	73.8	0.1
1704	Sugar confectionery (including white chocolate), not containing cocoa	420.4	0.5	136.8	0.1
2008	Fruit, nuts and other edible parts of plants	772.1	0.5	75.9	0.1
1806	Chocolate and other food preparations containing cocoa	820.3	0.2	116.7	0
1905	Bread, pastry, cakes, biscuits, other bakers' wares, whether or not containing cocoa	1,298.70	0.2	114	0
2203	Beer made from malt	913.3	0.1	88.4	0
0804	Dates, figs, pineapples, avocados, guavas, mangoes and mangosteens; fresh or dried	629.3	0.1	207.3	0
2301	Flours, meal and pellets, of meat or meat offal, of fish or of crustaceans, molluscs or other aquatic invertebrates	2,228.40	0	72.7	0
0805	Citrus fruit; fresh or dried	966.7	0	100.4	0
1006	Rice	1,956.00	0	321.5	0
0806	Grapes; fresh or dried	1,143.30	0	83.2	0
1001	Wheat and meslin	873.4	0	86.2	0

Source: Comtrade. Available at: <https://bit.ly/3f2x87G>.
Authors' elaboration.

Chinese imports from Brazil in agribusiness goods represented 18% of total imports in these goods. The first group of goods includes Guts, bladders and stomachs; Soya bean; Meat of poultry; Soya bean oil; Meat of bovine; sugar cane and Tobacco. In all these goods, Brazilian share for the period under analysis is higher than 20%, reaching 75% in the case of Guts and bladders. The value of Chinese imports varies a lot, from US$ 353 million in the case of Guts, to US$ 37,252 million in the case of Soya bean. So, in these cases, it is not very credible that Brazilian share can increase significantly, although desirable. Exporters must have a profound knowledge of the market but there are other competitors also with a high comparative advantage in Chinese market. And it must be kept in mind that these values reflect the average of 2016-2018 and may have already increased. In sum, Brazilian exports may eventually increase, along with market share, but they do not represent a real opportunity.

The second group of products is smaller and includes only Chemical wood pulp, Fruit juices, Meat of swine and Cotton. These goods present a smaller market share, between 10% and 20%. In all four but fruit juices, Chinese imports amounts are above US$2,000 million, or a significant market. Of course, they could very well be increased. But it is reasonable to assume that in these cases, too, Brazilian exporters have a very good knowledge of the market and if they do not export a bigger share it must be due to comparative advantages of Brazil and the other suppliers. But it remains to be seen if tariffs and non-tariff barriers may play a role. Anyway, exports of chemical wood pulp have jumped from US$ 1.6 billion in 2016 to US$ 3 billion in 2019.

The third group is comprised of 21 goods. In all of them, Brazilian market share is less than 10%. But there is a very big heterogeneity among them. In some of them, especially coffee and maize, the value of Brazilian exports is relatively high, but exports to China are very small, and Chinese imports are also small. In these cases, even a large increase in the Brazilian market share in China would not represent a big share of total Brazilian exports of them. Take the case of maize. Even if Brazil could supply half of Chinese imports instead of 15%, the increase would not surpass 8% of Brazilian exports of maize.

In other cases, like Prepared meat, ethyl alcohol, extracts and essences and some others, both Brazilian exports and Chinese imports are of substantial amount, but our market share is very small. In these cases, it is worth analyzing what are the obstacles to a stronger presence

of Brazilian exports. This is the case of rice. Brazil exports US$ 321 million to the world and China imports US$ 1,956 million, but Brazilian exports to China are virtually zero. Of course, the biggest rice exporters in the world are located in Asia, like Thailand, but there could be room for bigger Brazilian exports.

Then, there is the case of goods with a high value of Chinese imports and a very small level of total Brazilian exports but in goods where there is a real opportunity of increasing comparative advantage. This is the case of citrus fruit, fish, fruits and nuts and crustaceans. Brazil is a big producer of these goods and there maybe real opportunities in the Chinese market. But it is important to analyze these goods at the six-digit level, as they are very diversified.

The next section is devoted to a more thorough analysis of each of these goods.

4.4 Obstacles and opportunities for Brazilian exports

We have, then, identified 21 products at the four-digit level that have a very low value of Brazilian market share. But some of them deserve a more thorough attention and will be analyzed at the six-digit level. Table 15 presents these goods at this level with Chinese imports higher than US$ 50 million. As can be seen, in many of them, Brazilian exports are zero or near zero. But in many others, like 210690, 030389, 030390, 080450, 200899, 230110, 080550, Brazil exports a substantial amount to other countries but exports to China are virtually zero. So, it is interesting to see if there are tariff or non-tariff barriers harming the exports of these goods.

TABLE 15

China's imports higher than US$ 50 millions, value (in MM USD), by partners (average 2016-2018)

Code	Products	World	Brazil	Brazilian exports (%)	P1	P2	P3
210690	Food preparations; n.e.c. in item No. 2106.10	3047.3	11.3	0.4	USA	Australia	Japan
					662.5	568.4	198
030389	Fish; frozen, n.e.c. in heading 0303, excluding fillets, livers, roes, and other fish meat of heading 0304	750.4	4.8	0.6	Indonesia	China	USA
					98.4	91.7	85.9

(Continues)

(Continued)

Code	Products	World	Brazil	Brazilian exports (%)	P1	P2	P3
030621	Crustaceans; not frozen, rock lobsters and other sea crawfish (Palinurus spp., Panulirus spp., Jasus spp.), in shell or not, smoked, cooked or not before or during smoking; in shell, cooked by steaming or boiling in water; edible flours, meals, pellets	654.9	1.1	0.2	Australia	New Zealand	USA
					231.9	219.5	63.8
030622	Crustaceans; not frozen, lobsters (Homarus spp.), whether in shell or not, smoked, cooked or not before or during smoking; in shell, cooked by steaming or by boiling in water; edible flours, meals, and pellets	390.7	0	0	Canada	USA	Australia
					220.9	142.5	7.3
030614	Crustaceans; frozen, crabs, in shell or not, smoked, cooked or not before or during smoking; in shell, cooked by steaming or by boiling in water	342.1	0	0	Canada	China	Chile
					121.1	52.8	47.9
130219	Vegetable saps and extracts; n.e.c. in item No. 1302.1	95.3	0.2	0.2	China	Rep. of Korea	France
					38.1	12.4	11.5
030390	Fish; frozen, livers and roes	77.6	0.9	1.1	USA	Russian Federation	Iceland
					23.6	22	10.8
130220	Pectic substances; pectinates and pectates	70.8	20	28.2	Brazil	Denmark	Mexico
					20	14.9	8.8

Source: Comtrade. Available at: <https://bit.ly/3f2x87G>.
Authors' elaboration.

Tariffs will be analyzed only for goods with a clear potential to grow, identified in the previous paragraph.

Goods 030389 and 030390 (fish) have a MFN tariff of 10%, the same as the other major partners, like Russia, USA and Norway. Only Chile has free trade agreement with China, with a zero tariff. In this case, there could be some potential increase in trade between China and Brazil in the case of a trade agreement.

Goods 080450 (fruits) face a difficult scenario, as Brazilian exports pay a tariff of 15% and almost all the other major competitors, like Thailand, Philippines and Chile have trade agreements with a zero tariff. Again, these goods could benefit from a free trade agreement.

200899 (prepared or preserved fruits) face a relatively high tariff of around 16%, the same as some of the main competitors like USA and Korea. But Thailand and Vietnam have trade agreements and tariffs near zero.

Goods 210690 (food preparations) face a very high tariff, of 17%, and all the other major suppliers except Australia do not have trade agreements. As Brazil is a big exporter, it could benefit a lot from a trade agreement.

Finally, 230110, face a relatively low tariff, of 4% but some of the major suppliers, like Vietnam and Chile have free trade agreements.

In sum, considering the situation of these 7 goods, with a strong Brazilian presence in the world market, a high level of Chinese imports but almost zero Brazilian exports to China, the level of tariffs, compared with some competitors which have free trade agreements, may be appointed as an obstacle that could be circumvented by a bilateral free trade agreement.

When it comes to Non-Tariff Measures (NTM), it is interesting to note that the prevalence index in every good in the third group above is much higher than the average index. For all goods, the prevalence index for China for General Measures is 31.8 and for specific measures is 13.6. In both cases, the majority of them consists of chapters A (SPS) and B (TBT). But for the goods in the list for these 15 goods, the prevalence index is much higher, ranging from 29, in the case of cotton (5201) to 55 in the case of rice (1006). Although the comparison of any index regarding NTM involves some imprecision, the difference is astonishing, suggesting that these goods are object of a greater protectionist approach from China than the other goods. In all of them, it is very likely that Brazilian exports could benefit a lot from a revision of these measures. Especially in the cases of meat of swine, maize, rice, vegetable extracts and oil cake, where the index is above 40. It must be noticed that these indexes cannot be calculated at the six-digit level.

5 TARIFFS

5.1 Introduction

Tariff barriers are the traditional measures adopted by governments to regulate trade. This type of instrument concerns the direct applications of constrains that can take different forms and affect trade between countries in different ways. Although tariffs can also be considered a fiscal debate, they are usually discussed as an arguably expression of economic protective behavior. The Agreement on Agriculture of the World Trade Organization recommends that governments support agricultural sector through policies that are less harmful to trade. The openness to trade is a key issue of the agreement, as it stands as an institutional reference against trade and import restrictions that characterize as barrier to entry. Mutual agreements with preferential tariffs, on the other side, often come as a way to overcome such restrictions. In this section, we discuss tariff barriers applied by China to Brazilian exports of Agricultural goods.

5.2 Tariffs applied by China to Brazilian exports of sensitive products

We the use the MFN Tariff level within a product-line to further argue about the existence of restricted trade opportunities between Brazil and China. The logic behind the Most Favored Nation tariff (MFN) establishes that any tariff benefit should be extended to all WTO members, with few exceptions. As China does not join Brazil in any free-trade agreement or custom union, the MFN can serve as an input to evaluate the impact of tariff barriers to the Brazilian Exports.

26 commodities were selected as the most relevant (value, 2016-2018 average) agricultural goods exported by Brazil and that China apply any tariff to it.[15] This set of products is further split into two groups, based on a criterion that compare the share of Brazilian exports in the imports of China. Then, it is verified if any of the key partners in each product-line have preferential tariffs applied to it.[16]

15. It was considered the simple average between 2016 and 2018, of the "Simple Average" of each tariff.

16. The WTO states that Preferential Tariffs are mutual agreements: All parts agree to provide to each other the benefit of lower tariffs. Some of the agreements specify that the members will enjoy a percentage reduction of the MFN reference, but not necessarily null tariffs. In some cases, usually of advanced economies to emerging markets, it is applied a single-way preferential treatment. Thus, those special terms may vary in form.

This exercise seeks to identify whether there is a tariff gap between the reference applied to Brazil and what is practiced with other key partners of China in the imports of each of the selected products.[17] Finally, we evaluate based on the share of Chinese Imports in the Brazilian exports if there is room to increase exports to China. In the case of small shares, we propose that a reduction in the tariff level might be a possible driver to increase exports.

It is worth mentioning that, during the period of interest, China had free-trade and economic integration agreements with The Association of Southeast Asian Nations (ASEAN),[18] as of this date, a part of the partial scope and economic agreements of The Asia-Pacific Trade Agreement (APTA)[19] and had bilateral agreements with Australia, Chile, Costa Rica, Hong Kong, Korea, Macao, New Zealand, Iceland, Pakistan, Peru and Switzerland.

First, we analyze the subset of the 10 commodities[20] in which the Brazilian market share in the Chinese imports is greater than 10% (table 16).

TABLE 16

Commodities which the Brazilian market share in Chinese imports is greater than 10%

Code	Product	Market share Brazil (%)	Market share China (%)	MFN-Tariff Brazil	Key partners with preferential tariffs
1201	Soya beans	55.5	83.5	3	-
0207	Meat and edible offal of poultry; fresh, chilled or frozen	44.9	21.7	5.7	China and Chile
1507	Soya-bean oil and its fractions	38.6	22	12	-
0202	Meat of bovine animals; frozen	37.7	46	12	Australia
1701	Cane or beet sugar	32.7	4.6	32.5	Rep. Korea, Thailand and Australia

(Continues)

17. The key partners are the most important (value) partners which China, Hong Kong and Macao, considered together, import from, what can explain the presence of China as a key partner for some commodity codes.

18. Membership: Brunei; Cambodia; Indonesia; Laos; Malaysia; Myanmar; Philippines; Singapore; Thailand; Vietnam; Papua New Guinea (observer); and East Timor (observer).

19. Membership: Bangladesh; China; India; Korea; Laos; Sri Lanka; and Mongolia.

20. It includes the first and second group of products identified in subsection 4.3, except the commodity 0504, where the tariff applied to Brazil is 17.3 and New Zeeland is one of the key partners of China, Hong Kong and Macao with preferential tariffs. It was not added to the former table due to discrepancies in the data base related to market share.

(Continued)

Code	Product	Market share Brazil (%)	Market share China (%)	MFN-Tariff Brazil	Key partners with preferential tariffs
2401	Tobacco	20.9	11.9	10	-
4703	Chemical wood pulp	19.6	49.7	0	Chile and Indonesia
2009	Fruit juices and vegetable juices	17.5	3.8	18.6	Rep. Korea
0203	Meat of swine; fresh, chilled or frozen	12.3	36.5	12	-
5201	Cotton; not carded or combed	10.3	14.7	13.7	Australia and India

Sources: Comtrade (available at: <https://bit.ly/3f2x87G>); Wits (available at: <https://bit.ly/2V8Xq0V>). Authors' elaboration.

Six of the commodities selected above (0207; 0202;1701; 4703; 2009; 5201) have preferential tariffs applied to, at least, one of the top-5 partners. Those are the cases in which the tariff gap could be interpreted as a barrier. Hence, the Brazilian products might figure as less attractive when compared to the products of such favored partners.

Nevertheless, even in the presence of preferential tariffs applied to other partners, Brazil still is the main partner in the imports of commodities 0207; 0202; 1701; and 4703. All the mentioned products have great relevance to the agribusiness trade between Brazil and China, being in the Top-7 of most important (value) commodities exported by Brazil and in the list of 27 most important (value) agricultural goods imported by China. Except for commodity 4703, where the MFN tariff is 0, a reduction of the tariffs applied to Brazil could contribute to the increase in the exports of Brazil to China. On the one hand it could bring prices of Brazilian exports down, and on the other hand the share of Chinese imports in the Brazilian exports is significantly low.

The same logic applies to commodities 2009 and 5201. Even tough Brazil is not the main partner, it is included in the Top-5 and might take advantage of a reduction in the tariff level to increase its exports. It would ease the competition with partners that use trade agreements as the share of China in the Brazilian exports is still low (<15%).

The commodities 1201; 1507; 2401; and 0203 do not have preferential tariffs applied to any of the five key partners. Assuming a similar composition within the 04-digit reference, the tariff-level should be the same for all partners. Except for commodity 1201, where the share

of China in the Brazilian exports is already larger than 80%, a reduction in the tariff could also be the driver of an increase in exports from Brazil to China.

Thus, for the subset of products that have a market share greater than 10%, only commodities 1201 and 4703 may not be significantly influenced by a reduction in the tariff level – the former because the share of China in the Brazilian exports is already high; and in the case of commodity 4703 the MFN is already zero.

Table 17 presents similar data with reference to the subset of 16 products[21] with less expression in the Chinese imports (10%). Commodities 0901; 2207; 2008; and 1905 have MFN tariffs that exceed 12%, 2207 being the one with the larger tariff-level (37.5%), and four of the key partners have special tariffs applied by China. In such products, the Chinese share in the Brazilian exports is quite low, especially when compared to the overall result presented in table 16. So, a lower tariff-level can contribute to increase competitiveness of the Brazilian exports in face of the exports of other key partners.

TABLE 17

Commodities which the Brazilian market share in the Chinese imports is less than 10%

Code	Product	Market share Brazil (%)	Market share China (%)	MFN-Tariff Brazil (%)	Main partners with preferencial tariffs
0206	Edible offal of bovine animals chilled or frozen	9.1	138.5	13.5	-
0901	Coffee, whether or not roasted	4.8	0.4	12.3	Viet Nam, China, Malaysia and Indonesia
1602	Prepared or preserved meat, meat offal or blood	2.7	3.1	12	China and Thailand
1005	Maize (corn)	2.2	0	18	Lao PDR, Myanmar
2207	Ethyl alcohol	1.7	0.1	37.5	Pakistan, Indonesia, Malaysia and Costa Rica
2101	Extracts, essences, concentrates of coffee, tea or mate	0.5	0.4	26.3	Viet Nam, China and Malaysia

(Continues)

21. It includes the third group of products identified in subsection 4.3, except the two following sets: i) 2301 and 0805, commodities which tariffs are no updated in the database; and ii) 1006; 0806 and 1001, commodities which have no tariffs registered in the database.

(Continued)

Code	Product	Market share Brazil (%)	Market share China (%)	MFN-Tariff Brazil (%)	Main partners with preferencial tariffs
2309	Preparations of a kind used in animal feeding	0.4	3.4	10.4	Thailand
0303	Fish; frozen, excluding fish fillets and other fish meat of heading 0304	0.2	6.5	10	China and Chile
2106	Food preparations not elsewhere specified or included	0.2	3.2	17.4	Australia and China
0306	Crustaceans; in shell or not, live, fresh, chilled, frozen, dried, salted or in brine	0.1	7.4	9.6	Australia, China and New Zealand
1704	Sugar confectionery (including white chocolate), not containing cocoa	0.1	0.3	11	China, Thailand and Malaysia
2008	Fruit, nuts and other edible parts of plants	0.1	40.8	16.8	Thailand, Rep. Korea, Viet Nam and China
1806	Chocolate and other food preparations containing cocoa	0	0.3	9.4	-
1905	Bread, pastry, cakes, biscuits, other bakers' wares, whether or not containing cocoa	0	0.1	17	Indonesia, China, China HK SAR* and Malaysia
2203	Beer made from malt	0	0.1	0	Rep. Korea
0804	Dates, figs, pineapples, avocados, guavas, mangoes and mangosteens; fresh or dried	0	0.1	20	Thailand, Philipines and Chile

Sources: Comtrade (available at: <https://bit.ly/3f2x87G>); Wits (available at: <https://bit.ly/2V8Xq0V>).
Authors' elaboration.

The remainder of the subset have products with three,[22] two[23] or one[24] of the key partners with preferential tariffs and, thus, figure as products where the Brazilian exports might be restricted by the special conditions applied to other partners. Commodities 0206 and 1806 do not have any of the main partners with preferential tariffs, and Chinese market share in the Brazilian Exports of the former one is already high.

22. 2101; 0306; 1704; 0804.
23. 1602; 1005; 0303.
24. 2309; and 2106. Commodity 2203, although being part of the group have MFN-tariff equals zero.

To most products discussed here, there is evidence of a difference between the tariffs applied by Brazil and the tariff applied to at least one of the other key partners. It suggests that some of Brazilian exports may be restricted due to the existence of trade agreements with other partners or the lack of an agreement with Brazil. The subset of commodities in which the share Brazilian exports in Chinese imports is less than 10% is of special interest. First because of the lower share and the embedded potential. Lastly due to the evidence that most of commodities have, even more than one, key partners taking advantage of preferential tariffs.

6 NON-TARIFF MEASURES IN THE TRADE OF AGRIBUSINESS BETWEEN BRAZIL AND CHINA: AN EXPLORATORY ANALYSIS

6.1 Introduction

The regulation of international trade has experienced big changes in the past decades and the decline in the overall level of trade tariff levels is one the most relevant facts of this major structural change. At the same time, there has been an increase of other regulation mechanisms that do not involve taxation. These, which are generally referenced as Non-Tariff Measures (NTMs), represent a wide set of policy tools that is much broader than ordinary custom tariff and embody greater complexity.

NTMs differ significantly from tariffs since it is expected a linear relation between the intensity of its use and other key trade variables like trade cost – the results are mixed and can be very case/market specific. Its recent convergence as a main trade policy instrument turns it into an issue of great relevance to most trade studies. Additionally, agriculture is one the most NTM-intensive sectors of the economy and, therefore, where such mechanics are expected to play a major role.

This chapter discuss the incidence of NTMs in agricultural trade and, specifically, what relates to the use of this instrument by China to regulate trade with Brazil. Hence, we dealt only with the side of Brazilian exports to China. The paper also aims to contribute to the literature on NTMs, international trade and agribusiness by providing a set of description measures of NTMs for a specific set of the products.

We explore how is the incidence of NTMs in agricultural trade, to identify the main resources used by China and provide a prognosis of cases where the incidence of NTMs could explain the recent trade with Brazil, or what we called earlier, missing trade opportunities. The Unctad Trains database on the incidence of NTM is the main data input of this chapter. A set of NTM description statistical measures, based on an inventory approach, was constructed according to three distinctive pivots: reporter; partner; and products.

The remainder of this section is organized in three other subsections. In the methodological section, a set of key concepts are defined, followed by brief comments about the Unctad Trains database. The third subsection presents and discusses the results of the exploratory exercise. Finally, we make concluding remarks.

6.2 Data

6.2.1 Non-Tariff Measures classification

The definition of Non-Tariff Measure is better captured by the contrast with the mechanism of traditional tariff-based instruments. Precisely, they are "generally defined as policy measures other than ordinary custom tariffs that can potentially have an economic effect on international trade in goods, changing quantities traded, or prices, or both" (Unctad, 2019).

The recent effort to better understand how NTMs can affect trade is intrinsically connected with the development of an evolving taxonomy of the measures – The international Classification of Non-Tariff Measures. The system was first published in 2012 and is updated on irregular basis. It classifies each measure using a four-digit code, the first being the reference of what is called the NTM chapter. Then, the different commercial policy instruments are organized in three fundamental blocks, which have a direct link with the trade flow applied and the scientific content behind it. Usually, such measures, as ordinary custom tariffs, are requirements applied to all countries where imports come from. Box A.1 presents a tree structure of the NTM classification.[25]

25. Unctad (2019) provide further detailed information about intra-chapter categories.

Technical measures are those commonly associated with a higher scientific content in the criteria that supports the respective measure, such as minimum sanitary requirements and it includes the chapters A (SPS), B (TBT) and C (Pre-Shipment Inspections) of the NTM nomenclature. The rest of the chapters are included in the Non-technical measures group, which deals with measures of diverse content, some economic-related, such as subsidies or price controls. The contrast of the two types is usually followed by an intuition that chapters A, B and C primarily express the "rational requirements" of trade regulation, as the non-technical barriers would function as a platform to discretionary or protective behavior, what cannot always be the case.

For example, import quotas, a type of measure that is included in chapter E, might be considered an instrument that almost directly imply objections to trade. Still, it is necessary to contextualize the previous relation with other key factors, such as the set of products/section of the economy that is of interest. In the case of agricultural goods, by the very nature of most goods, is empirically perceivable the prominence of technical measures, especially chapter A. Hence, it should be expected that this dominance incorporates not just the most rational use of NTMs but also any other arbitrary protocols.

6.2.2 Unctad Trains and description of NTMs

One of the most persistent challenges when studying NTMs in the past was the lack of a comprehensive dataset. This limitation was overcome with the dissemination of two key sets of data, one being the inclusion of notifications on Non-Tariff Measures in the WTO Integrated Trade Intelligence Portal (I-TIP) and the other is the Unctad Trains data. The major difference between the two datasets is the data collection process. The WTO data is based on the self-notification of members about the use of policy instruments, while the Trains data is based on an active data collection process, annually updated with an irregular panel of countries.

This exercise exploits the Unctad Trains dataset, specifically, the "Unctad NTM database for researchers", which provides information about the incidence of NTM measures for every combination of reporter, partner, HS6 code and NTM code. We focus on data collected for the

reference year of 2016,[26] which capture the ongoing measures in that year, that has a sample of 38 reporters.[27] Since the product classification system can be local specific, and the methods with which countries are used to regulate trade vary, the arrangement of data in the six-digit level of the harmonized system is the outcome of data manipulation procedures that allow enhanced compatibility with trade data and enable us to make comparison between reporters.

Thus, the identification key of a line in the base is the incidence of an NTM code in a commodity (HS6) for a specific pair of reporter-partner. Another distinction, between two types of measures, is based on the partner dimension. General Measures are those applied to all countries in the economy and have the world as a partner. Specific Measures are those that are applied to a unique or an arbitrary set of partners.

The reasoning behind the use the discrimination is usually related to the purpose of applying NTMs. General Measures can be associated with requirements that should be primarily defined in the reporter context, while Specific Measures highlights case specific needs, that are bilateral by default. The former measures can be associated with protective or discretionary behavior. Again, the matter is of intricacy and the previous reasoning can be affected by the institutions of trade regulation in each country.

The complexity embedded in the use of NTMs and the general setting of the database supports an exploratory analysis of mainly qualitative content, in which it is privileged, here, the use of an inventory approach to describe the incidence of NTMs. Statistics regarding the

26. The year of 2016 was chosen because it is the only date reference that information about China wasw collected. It is worth to mention that, as an active data collection process, it registers the ongoing measures at the dates of collecting process. Thus, one limitation of this dataset is that is not possible to precisely replicate a time series to a set of measures based on the reference of start date, since it would lack the measures that have expired or were abolished before the colleting date process. A/B type comparisons between dates becomes a challenge.

27. The 38 reporters listed on the sample, what we called "All countries" are the followings: Argentina; Australia; Bolivia (Plurinational State of); Brazil; Chile; China; Colombia; Costa Rica; Cuba; Algeria; Ecuador; European Union; Guatemala; China, Hong Kong SAR; Honduras; Israel; Jordan; Japan; Rep. of Korea; Lebanon; Sri Lanka; Morocco; Mexico; Nicaragua; New Zealand; East and West Pakistan; Panama; Peru; Papua New Guinea; Paraguay; Qatar; Russian Federation; Saudi Arabia; El Salvador; Tunisia; Turkey; Uruguay; Venezuela. The European Union is treated as a single reporter and has only general measures (to world applied).

number of regulations can become problematic when making comparisons between countries, since the outcomes can be easily misinterpreted by the diversity in the regulation preferences for each reporter. The inventory approach partially deals with the heterogeneity of the problem since it is based on the incidence of any or distinguishing NTM codes, not pieces of legislation.

The description of the NTM data is based on the reproduction of two indices through different perspectives:[28] the frequency index (*FI*) and the prevalence score (*PV*). The first one captures the percentage of selected products that are exposed to any NTM, providing information about the section of products that is covered by at least one type of requirement. The prevalence score (*PV*) focus in the diversity of NTM codes that are applied to every product in the nomenclature – it is the average number of NTM codes applied to a set of products. The first index is a measure that is well-suited to analysis considering the whole selection of agricultural products handled here, but it becomes less appropriate when dealing with smaller sets of products – especially in the case of agriculture, a sector intensive in NTMs, the results lacks the variance needed to be insightful.

6.3 Brazil, China and NTM on the agricultural trade

6.3.1 Incidence by reporters

TABLE 18

Frequency index (FI) and prevalence (PV), by reporter and NTM chapter

	Brazil		China		Hong Kong		All countries	
	FI (%)	PV	FI (%)	PV	FI (%)	PV	FI (%)	PV
All measures	99.6	14	100	36	96.5	6	81.7	10.2
Chapter A	99.2	7	99.6	12.8	93	4.2	78.4	5.7
Chapter B	99.4	6.1	100	11	55.9	0.8	62.5	1.7
Chapter C	32.5	0.3	39.4	0.5	15.9	0.2	27.2	0.3
Chapter E	98.9	1	100	1.1	20.2	0.2	34.7	0.4
Chapter F	0	0	88.8	1	2.1	0	24.7	0.4

(Continues)

28. Nicita and Gourdon (2013) and Unctad (2018) are some of the key references about the use of incidence of measures as the basic statistical analysis and exploratory method of NTMs. A methodological appendix in the end of this paper provides formalism on how to compute the indicators that follows.

(Continued)

		Brazil		China		Hong Kong		All countries	
		FI (%)	PV	FI (%)	PV	FI (%)	PV	FI (%)	PV
Chapter	G	0	0	0	0	0	0	2.3	0
Chapter	H	0	0	2.8	0	0	0	1.2	0
Chapter	I	0	0	0	0	0	0	0	0
Chapter	P	3	0	100	9.4	48.8	1	53.3	1.6

Source: Unctad.
Authors' elaboration.
Obs.: 1. Sample of 38 reporters.
2. Unit: HS6 codes.
3. Reference: 2016.

Table 18 considers both types of measures and presents the two indices, Frequency and Prevalence, by NTM chapter and selected reporters. The table enables us to discuss some stylized facts about the incidence of NTMs in the agricultural sector. The results regarding the sample of all countries indicates that more than 80% of the selected commodities have, at least, one NTM applied to it (*FI*). The distribution between chapters suggests that the most common chapters are included in the set of technical measures – chapters A, B and C.

For All countries, SPS measures (chapter A) are applied to, approximately, 78% of commodities, as TBT measures (chapter B) are applied in more than 62% of the selection. Chapter P comes in third covering close to 53% of the selected section of the nomenclature. Other than chapter P measures, in the non-technical type, it outstands the incidence of measures of chapter E, which are linked with restrictions of economic content, such as quotas or price controls. On the other hand, the results indicate there is a significant intersection of chapters. One product might have more than one NTM chapter applied to it.

The prevalence index (*PV*) for the sample of countries reinforces the prominence of technical measures, remarkably SPS. The All Countries data show that, on average, each commodity in the selection have more than 10 unique NTM codes applied to it. More than 50% of those unique codes are of chapter A. Not only those chapters are the most common ones, but they are also more intensively applied. TBT measures and export-oriented measures, chapters B and P, comes right after.

With respect to the set of specific reporters, the evidence suggests how NTMs are strategic to China. The reporter is both more extensive and intensive in the use of NTMs than the average of the sample. Concerning the extensive margin, China covers the whole selection of commodities with at least one NTM. All commodities have NTM codes of chapters B, E and P applied to it, and chapter A in more than 99% of commodities. Chapter F, related to price-control measures is another highlight of China, being applied to almost 90% of the products in the nomenclature.

Although Brazil stands out only as a key exporter of agricultural goods, the frequency index results are similar with those of China and Hong Kong – covering almost all the selection with at least one NTM. The three selected reporters present a prominence in chapters A and B. A feature that sets Brazil and China aside the average of all countries is the greater coverage of chapter E, applied to almost all selected products in Brazil and to all commodities in China, compared to less than 35% for the average of countries.

The most characteristic result of China is captured by the prevalence index. On average, every product on the nomenclature have 36 different NTM codes applied to it, a major difference compared to results of All Countries. Brazil have, on average, less than 15 measures and Hong Kong, close to 6 unique codes. The most intense-used ones are chapters A, B and P, like the average of All countries. However, the proportion between chapters differs from the average of the sample. There is almost an even distribution between chapters A, B and P, still being chapter A the most used.

TABLE 19

Frequency index and prevalence, by reporter and NTM chapter – General and specific measures

	Brazil		China		Hong Kong		All countries	
	FI (%)	PV	FI (%)	PV	FI (%)	PV	FI (%)	PV
General measures	99.6	14.3	100	31.8	96.3	6.2	79	9.8
Chapter A	99.2	6.8	99.6	9.7	92.7	4.1	75.7	5.4
Chapter B	99.4	6.1	100	11	55.9	0.8	62.3	1.7
Chapter C	32.5	0.3	37.1	0.4	15.9	0.2	23.4	0.3
Chapter E	98.9	1	100	1.1	20.2	0.2	33.6	0.4

(Continues)

(Continued)

	Brazil		China		Hong Kong		All countries	
	FI (%)	PV	FI (%)	PV	FI (%)	PV	FI (%)	PV
Chapter F	0	0	88.8	1	2.1	0	24.3	0.4
Chapter G	0	0	0	0	0	0	2.3	0
Chapter H	0	0	2.8	0	0	0	0.8	0
Chapter I	0	0	0	0	0	0	0	0
Chapter P	2.8	0	99.4	8.7	48.8	1	50.3	1.5
Specific measures	20.9	0.4	100	13.6	8.8	0.1	20.3	1
Chapter A	20.7	0.4	99.6	8.2	5.9	0.1	17.2	0.7
Chapter B	0.3	0	50.6	1.3	0	0	2.2	0
Chapter C	0	0	11.6	0.1	3.2	0	5.9	0.1
Chapter E	0	0	15.9	0.2	0	0	1.9	0
Chapter F	0	0	0	0	0	0	0.4	0
Chapter G	0	0	0	0	0	0	0	0
Chapter H	0	0	0	0	0	0	0.4	0
Chapter I	0	0	0	0	0	0	0	0
Chapter P	0.2	0	85.7	3.8	0	0	7.7	0.2

Source: Unctad.
Authors' elaboration.
Obs.: 1. Sample of 38 reporters.
2. Unit: HS6 codes.
3. Reference: 2016.

Nevertheless, it is in the difference between general and specific measures that rely the biggest indicators of the distinctive behavior of China in the use of NTMs. Table 19 selects measures by type, general or specific, and chapter. The key takeaway is that general measures statistics, mainly the Frequency Index (*FI*), suggests that the overall results are aligned with the incidence of measures applied to the world, being specific measures of marginal use. Even the diversity of NTM chapters is affected when considering specific measures – less chapters are applied in the case of partner-related measures. Regarding All countries, there is no specific measures applied of chapters G and I.

The average result for all reporters is that 20% of the commodities in the nomenclature have at least one specific measure applied to it and, on average, there is one NTM code applied to each commodity. Chapter A is, still, the most used – as mentioned before, an expected

outcome due to the very nature of most agricultural goods. Brazil follows the average result, with a Frequency Index close to 21%, when considering only specific measures. Hong Kong sits quite below the average, with only 8% of the selected commodities with specific measures applied to. Both reporters also concentrate almost all its specific measures in chapter A, chapter C being relatively important to Hong Kong. The intensity of All countries is close to one, as the Prevalence of Brazil and Hong Kong are, respectively, 0.42 and 0.14.

In comparison, China has the entire selection of commodities with at least one specific measure applied to it – a very distinctive result, when comparing to the previous results. The difference considering the prevalence score is even more remarkable. On average, there is more than 13 different NTM codes applied to each product, considering only specific measures. The distribution between chapters, already accounting for the previous comment about the lack of chapters G and I, is quite different. The frequency index considering only chapter A is the same for both General and Specific measures (99.56) and the incidence of chapter P is still quite high, although less than the case of General Measures. The major drops are in the coverage of chapter B, a change of almost -50% and in the coverage of chapter E, with a difference close to 84%.

The previous evidence suggests how the use of NTMs can differ between countries, regarding extend, intensity and the focus on measures that are world-applied or destined to specific partners. The empirical data provides support that China have a specific regime that can be resumed as an enhanced practice of NTM as a regulatory mechanism of trade. A leading indicator is the practice of specific measures. This is evidence on how this set of instruments can play a major role as a driver of trade and justifies further analysis related to the commodity level.

6.3.2 Incidence on selected products

Table 20 shows statistics on Prevalence of NTM by reporter to the specific collection of commodities we called sensitive. The data on each case refers to the size of the subset of HS6 codes inside the HS4 reference. When dealing with such small subsets of commodities, there is less appeal to use the frequency index. As the data presented in the previous section supports, almost the entire range of selected products, if not all of it, have measures applied. Here, we essentially decrease the probability of a set of products have one product that it is not covered by any NTM – there is great recurrence of HS4 codes with 100% of frequency (*FI*).

First, there is evidence of a "commodity-effect", as the prevalence between products vary between goods. The results of the three reporters separately displayed tends to follow the same pattern of the All Countries average, when it comes to the level of prevalence between commodities. With respect to the average of All Countries, meats-related, as can be expected, are the commodities with greater intensity on the use of NTMs – close to 14 different NTM codes, on average. Flours and oilcake, cereal based commodities, are the goods with the smallest intensity.

The numbers concerning specific reporters follows the overall outcome of the previous sections, when considering the entire set of commodities. Precisely, for every product, the prevalence in China is greater than the average of All countries – there is a diversity of NTM codes in China that is between 3 and 4 times larger. Rice is the commodity in which there is the greater intensity, followed by Maize (corn) and Wheat and Meslin. The greater intensity of this set of products may be explained by the importance of Chinese domestic production, that should play an important role in food security goals and other social and political institutions of the country.

As mentioned above in the case of all products, the results of Brazil usually stand above the average of All Countries, as the results of Hong Kong are just below the average. The results suggest that, for the set of sensitive products, Brazil is more intense in the use of NTMs, as Hong Kong is less intense than the average.

TABLE 20

Prevalence index, by reporter and selected commodities

Code	Product	Brazil	China	Hong Kong	All countries
0206	Edible offal of bovine animals chilled or frozen	18	45	10	13.4
0303	Fish; frozen, excluding fish fillets and other fish meat of heading 0304	17	38	5	12.1
0306	Crustaceans; in shell or not, live, fresh, chilled, frozen, dried, salted or in brine	17	38	4	13
0804	Dates, figs, pineapples, avocados, guavas, mangoes and mangosteens; fresh or dried	12	40	7	11.4
0805	Citrus fruit; fresh or dried	17	38	8	12.1
0806	Grapes; fresh or dried	13	43	7	12
0901	Coffee, whether or not roasted	17	33	6	10.7

(Continues)

(Continued)

Code	Product	Brazil	China	Hong Kong	All countries
1001	Wheat and meslin	15	47	4	10.9
1005	Maize (corn)	12	49	4	11.3
1006	Rice	12	55	10	11.9
1602	Prepared or preserved meat, meat offal or blood	15	35	8	12
1704	Sugar confectionery (including white chocolate), not containing cocoa	16	32	6	9.1
1806	Chocolate and other food preparations containing cocoa	15	31	6	9.3
1905	Bread, pastry, cakes, biscuits, other bakers' wares, whether or not containing cocoa	16	30	7	8.9
2008	Fruit, nuts and other edible parts of plants	16	30	6	9.2
2101	Extracts, essences, concentrates of coffee, tea or mate	16	34	6	8.6
2106	Food preparations not elsewhere specified or included	16	30	6	9.1
2203	Beer made from malt	11	32	8	9.6
2207	Ethyl alcohol	10	36	14	7.6
2301	Flours, meal and pellets, of meat or meat offal, of fish or of crustaceans, molluscs or other aquatic invertebrates	12	38	0	6.2
2309	Preparations of a kind used in animal feeding	16	41	0	7.4

Source: Unctad.
Authors' elaboration.
Obs.: 1. Sample of 38 reporters.
2. Unit: HS6 in HS4 codes.
3. Reference: 2016.

6.3.3 China: incidence by partners and selected products

The partners in which specific measures are applied to is the last pivot of interest. Since specific measures can be loosely connected with discretionary or protective behavior of trade, a greater incidence on a certain partner may be one of the drivers of higher trade costs or smaller level of trade. Table 21 presents data of Frequency and Prevalence indices taking as reporters China, Hong Kong and both of them, for key partners.[29]

29. Those the key import-partners (value) of China, Hong Kong and Macao, considering the average value of 2016-2018.

Regarding China, the Netherlands stands as the key partner with the biggest coverage of specific measures in the set of key partners, the second one being France. This noteworthy result may not be directly related to the country, but primarily to the property of it as the main harbor in the European Union. The agreement makes it easier to commodities of a variety of countries to be exported from such location. In a way, there might be a spill-off effect of NTMs from the countries where the commodities are produced to these cases.

The results for Brazil, considering the entire selection of products, suggests that incidence of NTMs that are applied to the country are not distant to the average of key partners. Still, being the biggest trade partner of China in agricultural goods, close to 15% of products in the nomenclature are the object of specific measures applied to the country. This supports the intuition that trade with Brazil is mainly regulated, when it comes to NTMs, with the use of world-applied measures and, hence, there is little to no evidence of discretionary behavior with the country.

New Zealand, followed by Chile and Indonesia, the greatest regional partner in agriculture, are the partners where there is the smallest percentage of the nomenclature of selected commodities with specific measures applied by China. The numbers of Indonesia contrasts with those of Thailand, the second-best Asian country.

TABLE 21

Frequency index and prevalence of China or Hong Kong, by partner (specific measures)

		China		Hong Kong		China and Hong Kong	
		FI (%)	PV	FI (%)	PV	FI (%)	PV
General measures		100	31.8	96.3	6.2	100	35.9
Specific measures							
Key partner							
1	Brazil	15.4	0.2	7.9	0.1	20.5	0.3
2	United States	18.5	0.4	8.3	0.1	23.9	0.5
3	Canada	15.9	0.6	7.9	0.1	20.7	0.7
4	Australia	11.9	0.2	7.5	0.1	17.7	0.3
5	Indonesia	6	0.1	7.5	0.1	11.9	0.2
6	New Zealand	2.1	0	7.5	0.1	9.3	0.2

(Continues)

(Continued)

		China		Hong Kong		China and Hong Kong	
		FI (%)	PV	FI (%)	PV	FI (%)	PV
7	Thailand	12.6	0.5	7.5	0.1	17.7	0.6
8	Chile	2.9	0.1	7.6	0.1	10.2	0.2
9	France	19.2	0.2	7.5	0.1	24	0.3
10	Netherlands	43.8	1.2	7.5	0.1	48.7	1.3
Average of selection		14.8	0.4	7.7	0.1	20.5	0.5

Source: Unctad.
Authors' elaboration.
Obs.: 1. Unit: HS6 codes.
2. Reference: 2016.

Table 22 complements the previous comments about the possibilities of discretionary behavior and provides an impression on the hypothesis related to the use of specific measures as drivers of trade restriction. The table directly compares the Prevalence of General and Specific measures applied to Brazil and to the Top-5 key partners of imports for the same selection of commodities presented in table 20.

TABLE 22
Prevalence index of China, by partners and selected products

Code	World	Brazil	P1	P2	P3	P4	P5
Total	31.8	0.2	Brazil	United States	Canada	Australia	Indonesia
			0.2	0.4	0.6	0.2	0.1
0206	41.4	1	Brazil	United States	Canada	Australia	Indonesia
			1.6	2	0.6	0.6	0.6
0303	36.5	0	Russia	United States	Norway	New Zealand	Chile
			1	0	0	0	0
0306	34.6	0	Canada	United States	New Zealand	Ecuador	Australia
			0	0	0	0	0
0804	34.2	0	Thailand	Philippines	Taiwan	Chile	Mexico
			8.4	0.4	0	2.4	0
0805	34.4	0	South Africa	Australia	United States	Egypt	Spain
			8	0	0	0	0
0806	36.5	0	Chile	Peru	Australia	United States	South Africa
			1	0	1	2	8

(Continues)

(Continued)

Code	World	Brazil	P1	P2	P3	P4	P5
0901	27	0	Vietnam	Malaysia	Italy	Indonesia	United States
			0	0	0	0	0
1001	37.8	1	Australia	Canada	United States	Kazakhstan	Russia
			9	10	3	14	9
1005	41	11	Ukraine	United States	Laos	Myanmar	Russia
			10	2	9	1	4
1006	46.5	1	Vietnam	Thailand	Pakistan	Cambodia	Laos
			6.3	7.8	1	1.8	9.3
1602	32.8	0.7	Mongolia	Spain	China	Korea	Denmark
			2.7	0.1	0	1	0.4
1704	30	0	Thailand	Malaysia	Taiwan	United States	Japan
			0	0	0	0	4
1806	29	0	Italy	Belgium	Russia	United States	Germany
			0	0	0	0	0
1905	28.2	0	Indonesia	Hong Kong	Malaysia	Denmark	Taiwan
			0	0	0	0	0
2008	28	0	United States	Thailand	Korea	Vietnam	Brazil
			0.2	0	0	0	0
2101	31	0	Vietnam	Malaysia	China	Indonesia	United States
			0	0	0	0	0
2106	28	0	United States	Australia	Germany	Thailand	Taiwan
			0	0	0	0	0
2203	30	0	Germany	Mexico	Netherlands	Belgium	Korea
			0	0	0	0	0
2207	33.5	0	United States	Pakistan	Indonesia	Malaysia	Costa Rica
			0	0	0	0	0
2301	35	0	Peru	United States	Vietnam	Chile	Russia
			0	1	0	0	1
2309	36	0	United States	Thailand	Canada	Netherlands	France
			0	0	0	0	4
Aver-age of selection	33.9	0.7	2.3	1.1	0.7	1.1	1.9

Source: Unctad.
Authors' elaboration.
Obs.: 1. Unit: HS6 codes in HS4 code.
2. Reference: 2016.

The overall results align with the comments made above. There is a clear variance of prevalence between commodities. The general outcome is coordinated by the incidence of world applied measures. On most codes, as the overall results of the selection, the results for the main partners indicates the lack of specific measures or an incidence of small intensity.

In any case, the incidence of Rice (1006) and Maize (1005) and Wheat and Meslin (1001), the two most intense regulated commodities by China, with respect to the restrictions binding here, stands out as the commodities with the higher prevalence between key partners. The argument also connects with the concepts on how China tends to use an intersection of general and specific measures as instruments.

Maize is the only commodity in which Brazil do not figure as a key partner to Chinese imports and, at the same time, the intensity of NTMs applied is bigger than on those partners that figure in the top 5 of commodities. The prevalence for Brazil is 11, a little more than Ukraine, the greatest partner of China regarding the commodity, and much more than the United States, the biggest exporter of maize.

Only in this case, the data suggests that NTMs could be associated with discretionary and protective behavior and figure as an insight of an answer to the limited trade of Maize between Brazil and China. The data on international trade analyzed in the previous chapter is aligned with the hypothesis and provides evidence about the relevance of Maize as a central export of Brazil, but the share exported to China is, impressively, less than 1%. Also, the size of the Maize Imports by China is not questionable. Still, the evidence provided by the indices is quite restrict and needs to be backed up by further analysis, that exhausts the scope of this paper. Nevertheless, it is possible to identify a case of missing opportunity that could be addressed to the incidence of NTMs.

6.4 Concluding remarks

This section aimed to explore, based on an exploratory exercise using inventory statistics, the incidence of NTMs in the agricultural trade. Our goal was to provide insight on how they vary between countries and how the regulation scheme of China differs from others. We also

tried to address if there were any signs of discretionary behavior of the country with Brazil and specifically with respect to the set of sensitive products, to raise questions about missing export opportunities. We provide a set of concluding remarks bellow.

1) There is evidence that the NTMs are distinguishing regulation tools practiced in the trade of agricultural goods.
2) General measures coordinate the overall results of incidence, as specific measures tend to have marginal contribution to the incidence index.
3) China stands out as a country that uses NTMs in both more extensive and intensive way, what can be related to a strategic behavior regarding the instrument. A distinctive feature is the wider use of specific measures, applied to arbitrary countries.
4) Considering the entire selection of commodities, there is no evidence of discretionary behavior of China with Brazil, as the incidence of specific measures applied to the country do not deviate significantly from the results for other key partners.
5) With respect to what we called sensitive goods, Rice, Maize and Wheat figure as overregulated commodities, when it comes to the instrument of specific measures.
6) Regarding Maize, there is evidence of greater intensity of NTMs applied specifically to Brazil, what suggest the need of further analysis if the missing opportunity in this product line can be addressed to the practice of NTMs by China.

7 CONCLUSION

The purpose of this report was to describe the trade relations between Brazil and China in the agribusiness international market, focusing on the Brazilian exports to China. We have started our discussion by mapping the recent history of the Chinese agriculture and evaluating its current challenges. After the identification of a set of key commodities, we have a conducted a descriptive statistical analysis of the Brazilian exports and Chinese imports. We constructed a set of sensitive products that, as we argue, can be interpreted as missing trade opportunities. Focusing on this subset, we debate whether there are clear obstacles to Brazilian exports through the analysis of two key determinants – Tariff levels and the incidence of Non-Tariff Measures. In both cases, we have looked for discrepancies in the conditions applied to Brazil and other partners. We finish by providing a brief description of the legal institutions responsible for regulating agricultural trade in Brazil.

We summarize some of the main contributions of each chapter in the list underneath.

1) The recent relationship between the Brazilian and Chinese economy is primarily defined by the trade in agribusiness. In the past 20 years it has grown with annual rates higher than 16%.
2) China is one of the most relevant players in agriculture, as a producer and both as an exporter and importer. And there is a strong consensus that supports the continuity of growth in its domestic market. China is an important consumer of grains and animal products, such as meat, and already the most relevant partner of Brazil in such products.
3) Expectations over their food security goals are aligned with prospects of an increase of the country's demand for agricultural goods in the international market – what comes as an opportunity for Brazil. There are clear structural limits for an entirely internal solution on the Chinese food security issue, such as natural constraints, the change in consumers habits and changes in the rural social and economic structure, besides conjectural matters. Subsidies and other trade regulation measures might also be a setback.
4) As the average of 2016 – 2018 shows, imports from Brazil are almost 20% of all Chinese imports of agricultural goods. On the same hand, Brazilian exports of agricultural goods to China represented 34% of the total Brazilian exports of agricultural goods. Soya beans is the main commodity traded, as Brazil is responsible for close to 60% of the total Chinese imports of the good. Other products which the share of Brazilian exports in Chinese imports is more than 20% are wood pulp and bovine meat.
5) Although the expressive lead in selected products, there is a variety of commodities where the Brazilian share is quite low or almost insignificant. These, which we called sensitive products, are a set of commodities that might represent missing trade opportunities. In this heterogenous group, the most notorious pieces are products that both the Chinese total imports and the Brazilian total exports are significant, but the trade between the two countries is irrelevant. There is a special alert on Maize, in which the Brazilian share in China's imports is less than 1%, although the commodity is one of the top exports of Brazil.
6) When analyzing the discrepancies between tariff levels applied by China to Brazil and to other key partners, we looked for the existence of special conditions, such as preferential tariffs and mutual trade agreements. To most of the commodities analyzed, there is evidence of such gap – and the differences in the set of sensitive products is of special interest. Brazil might take advantage of preferential tariffs or trade conditions as a way to increase the share of this subset of commodities in the Chinese market.

7) Non-Tariff Measures are important regulation mechanisms in agriculture. In most cases, general measures, regulation applied to the world, coordinate the overall incidence of NTMs, as specific measures have marginal contribution. There is evidence of a strategic use of NTM by China. Compared to a sample of countries, the practice of NTMs in China is both more extensive and intensive, and a distinctive feature is the wider use of specific, country related, measures. Still, there is no evidence of discretionary behavior of China with Brazil. With respect to sensitive goods, Rice, Maize and Wheat figure as overregulated commodities by China. Regarding Maize, there may be evidence of greater intensity of NTMs applied directly to Brazil – what suggest the need for further analysis of the issue.

8) The regulation of the agricultural sector as a whole and the ultimate supervision of all public policies related is a responsibility of The Ministry of Agriculture, Livestock and Supply (Mals).

REFERENCES

CHEN, H.; TIAN, Y. Opportunities and challenges to strengthen bilateral agri-food trade: the Chinese perspective. In: JANK, M. S.; GUO, P.; MIRANDA, S. H. G. de. **China-Brazil partnership on agriculture and food security**. Piracicaba: ESALQ/USP, 2020. p. 300-324.

FIGUEIREDO, E. V. C.; CONTINI, E. China: gigante também na agricultura. **Revista de Política Agrícola**, v. 22, n. 2, p. 5-29, 2013.

HUANG, J.; ROZELLE, S. The role of agriculture in China's development and reform. In: GARNAUT, R.; SONG, L.; FANG, C. **China's 40 years of reform and development**: 1978-2018. Canberra: ANU Press, 2018. p. 487-506.

MIRANDA, S. H. G.; JANK, M. S.; SOENDERGAARD, N. Opportunities and challenges to strengthen bilateral agri-food trade: the Brazilian perspective. In: JANK, M. S.; GUO, P.; MIRANDA, S. H. G. de. **China-Brazil partnership on agriculture and food security**. Piracicaba: ESALQ/USP, 2020. p. 326-364.

MOREIRA, M. M.; SOARES, A.; LI, K. **Uncovering the barriers of the China-Latin America and Caribbean trade**. [n.l.]: IDB, 2016.

NICITA, A.; GOURDON, J. **A preliminary analysis on newly collected data on non-tariff measures**. New York; Geneva: Unctad, 2013.

OECD – ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT; FAO – FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS. **OECD-FAO agricultural outlook 2018-2027**. Paris: OECD; Rome: FAO, 2018.

UNCTAD – UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT. **Unctad Trains**: the global database on Non-Tariff Measures. New York; Geneva: UN, 2018.

_____. **International classification of Non-Tariff Measures**. New York: UN, 2019.

COMPLEMENTARY BIBLIOGRAPHY

HUANG, J. et al. Agricultural and rural development in China during the past four decades: an introduction. **The Australian Journal of Agricultural and Resource Economics**, v. 64, n. 1, p. 1-13, 2020.

APPENDIX A

Here, we present some formalism on how to compute the Frequency and Prevalence indices of NTMs, organized by the perspectives used on text.

1 BY REPORTER – GENERAL INTUITION

(1) and (2) presents the general indicator, the overall results for a reporter i, considering all selected products when there is no differentiation between NTM type or chapters. Where: D_s is a dummy variable that controls the presence of an NTM on product for all s products defined at six-digit level; N_s is the number of unique NTM codes applied to product s; H is the number of selected products – unique six-digit codes in the selection.

$$FI_i = \frac{\sum_s D_s}{H} \, x \, 100 \tag{1}$$

$$PV_i = \frac{\sum_s D_s \, N_s}{H} \tag{2}$$

2 BY REPORTER, MEASURE TYPE, AND CHAPTER

The first adjustment restricts and qualifies the sample of NTMs codes by the type of measure (t), general measures ($t = 1$) or specific measures ($t = 2$) or a specific chapter of interest (c). Thus, it captures the choice of using each a type or chapter. Subject to a type t and a chapter c, (3) and (4) adapts (1) and (2).

$$FI_i^{(t,c)} = \frac{\sum_s D_s^{(t,c)}}{H} \, x \, 100 \tag{3}$$

$$PV_i^{(t,c)} = \frac{\sum_s D_s^{(t,c)} N_s^{(t,c)}}{H} \tag{4}$$

3 BY REPORTER, PRODUCT, AND MEASURE TYPE

A second qualifier is the addition of a grouping mechanisms of the selected products. Measures (1) to (4) focus on in the nomenclature of selected commodities. (5) and (6) turns (H) in a subset of commodities, based on the three structure of the harmonized system. It aggregates the HS6 codes into 04-digit levels references (x), thus restricting the subset of

products. The measures are for each reporter i, differentiating between types of measures t; s_x is the identifier of a HS6 code in the 4-digit level code x; S_x stands for the number of distinguish 06-digit products in the 04-digit reference x.

$$FI_i^{(x,t)} = \frac{\sum_{s_x} D_{s_x}^t}{S_x} x\ 100 \quad (5)$$

$$PV_i^{(x,t)} = \frac{\sum_{s_x} D_{s_x}^t N_{s_x}^t}{S_x} \quad (6)$$

4 BY REPORTER, PARTNER AND PRODUCT

Finally, the last condition exploits the use NTM specific measures ($t = 2$) applied to arbitrary partners (p) of interests. Hence, it is a measure of a reporter i and it is applied to a specific partner (p). Further specification considers the possibility of computing measures for the entire set of commodities (H) or specific subsets of the sample (x), (7) and (8) represents the general case, as (9) and (10) specify the case for a specific commodity x.

$$FI_i^p = \frac{\sum_s D_s^p}{H} x\ 100 \quad (7)$$

$$PV_i^p = \frac{\sum_s D_s^p N_s^p}{H} \quad (8)$$

$$FI_i^{(p,x)} = \frac{\sum_{s_x} D_{s_x}}{S_x} x\ 100 \quad (9)$$

$$PV_i^{(p,x)} = \frac{\sum_{s_x} D_{s_x} N_{s_x}}{S_x} x\ 100 \quad (10)$$

BOX A.1

Classification of Non-Tariff Measures by chapter

Trade flow	Type (content)	Chapter	Description
Imports	Technical measures	A	Sanitary and phytosanitary measures (SPS)
		B	Technical barriers to trade (TBT)
		C	Pre-shipment inspection and other formalities
Imports	Non-technical measures	D	Contingent trade-protective measures
		E	Non-automatic import licensing, quotas, prohibitions, quantity-control measures and other restrictions not including sanitary and phytosanitary measures or measures relating to technical barriers to trade
		F	Price-control measures, including additional taxes and charges
		G	Finance measures
		H	Measures affecting competition
		I	Trade-related investment measures
		J	Distribution restrictions
		K	Restrictions on post-sales services
		L	Subsidies and other forms of support
		M	Government procurement restrictions
		N	Intellectual property
		O	Rules of origin
Exports		P	Export-related measures

Source: Unctad.
Authors' elaboration.

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