IMPACT ASSESSMENT OF A CHINA-BRAZIL FREE TRADE AGREEMENT TARIFFS ON GOODS

中国－巴西自由贸易协定货物贸易影响评估

中国商务部国际贸易经济合作研究院

Chinese Academy of International Trade and Economic Cooperation

Ministry of Commerce of the People's Republic of China

巴西经济部应用经济研究院

Instituto de Pesquisa Econômica Aplicada

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KOU Zhun [①] XU Man [②] Fernando J. Ribeiro [③] ZHOU Mi [④]

① KOU Zhun, Research fellow of Chinese Academy of International Trade and Economic Cooperation (CAITEC), China.
② XU Man, Research fellow of Chinese Academy of International Trade and Economic Cooperation (CAITEC), China.
③ Fernando J. Ribeiro, Coordinator of International Economic Studies at Research Institute of Applied Research (IPEA), Brazil.
④ ZHOU Mi, Senior Research fellow of Chinese Academy of International Trade and Economic Cooperation (CAITEC), China.

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Introduction

China and Brazil are both "BRIC countries" and both are important emerging economies. The economic and trade cooperation between the two countries has developed rapidly, and the trade between the two countries is highly complementary. There is a solid foundation for mutual cooperation and huge development potential. As China's economy remains sound and sustainable, achieving steady and healthy development, and Brazil's economy is expected to recover its market vitality on years ahead, the prospects for further strengthening of economic and trade cooperation between the two countries are broad. One important way to assess this is to establish a free trade zone and reduces tariffs on trade in goods between the countries, which would be beneficial to make full use of the huge market capacity, resource availability and international market influence, achieve complementary advantages, strengthen the division of labor and collaboration to open up a broader space for practical cooperation between the two parties.

This paper aims to assess the impacts on Brazilian and Chinese economies of a free trade agreement between them, considering 3 scenarios: full liberalization, an FTA similar to the one signed between China and ASEAN countries, and one similar to the MERCOSUR-EU FTA. Full liberalization means the removal of all distortions in bilateral trade between Brazil and China, while the other two correspond to duty elimination on 93% and 91% of goods on both sides. The paper is organized as follows. Section one presents an overview of current bilateral trade between China and Brazil. Section 2 details the modelling approach, based on a recursively dynamic computable General Equilibrium (CGE) model using GTAP 10 database, which has 2014 as the reference year. In the simulations shown in this paper, 141 regions and 65 sectors are aggregated into 3 regions and 24 sectors model. The GTAP-Dyn model preserves the framework of the standard GTAP model, while extending it to include international capital mobility, capital accumulation and an adaptive expectations theory of investment. Section 3 shows the results of the simulations, covering the 2020-2031 timeframe, with five bi-annual rounds of tariff reductions. The results consider macroeconomic and sectoral effects and shows the deviation of the variables from the baseline scenario, say, the scenario where there is no change on tariffs. Finally, section 4 presents the conclusions and some suggestions to enhance the bilateral trade relations, not only concerning tariffs, but on matters like trade facilitation measures and e-commerce.

I. Overview of bilateral trade between China and Brazil

In recent years, the economic and trade relations between China and Brazil has developed rapidly. China has been Brazil's largest trading partner and largest export market for ten consecutive years. Brazil is China's largest source of imports and the second largest export market in Latin America. According to the statistics of China Customs, the growth of China-Brazil trade has doubled in the past ten years and has now exceeded the US$100 billion mark. In 2019, the bilateral trade between China and Brazil increased by 3.7% year-on-year, accounting for 35% of the total trade volume between China and Latin America. And in 2020, data up to August show that the volume of Brazilian exports is growing exclusively because of the rise of exports to China. However, from a global perspective, China-Brazil trade still has huge potential to grow, not only on volume terms, but also in terms of product diversification.

1.1 Trade in goods between China and Brazil

During the ten years from 2010 to 2019, the bilateral trade in goods between China and Brazil has grown rapidly, and the Chinese trade deficit has continued to expand. In 2010, China's imports and exports with Brazil was 62.560 billion U.S. dollars, and China's trade deficit was 13.639 billion U.S. dollars. By 2019, the bilateral trade in goods between China and Brazil has increased significantly to 115.342 billion U.S. dollars, of which China's exports to Brazil were 35.544 billion U.S. dollars and imports were 79.798 billion U.S. dollars. The trade deficit widened to 44.254 billion U.S. dollars, three times the amount in 2010 (See Figure 1.1).

Data from Brazilian customs service shows somewhat different numbers. Total bilateral trade in 2019 was of 98.628 billion U.S. dollars, with 63.357 billion U.S dollar of Brazilian exports and 35.270 billion U.S. dollar of Chinese exports, and a trade surplus of 28.086 billion U.S. dollars. Anyway, the big picture is the same: a very fast growing bilateral trade with huge and growing surpluses to Brazil. In 2020, up to August, this surplus have also reached 25.548 billion U.S. dollars. [①]

Figure 1.1 China-Brazil bilateral trade - 2010-2019
(billion USD)

Source: China Customs statistics 2010-2019.

① All the data are in FOB values.

1.1.1 China's exports to Brazil

Brazil is the largest and most populous country in Latin America, with the largest economic scale and market size in the area. Brazil is China's the second largest export market in Latin America and the 20th largest export trading partner in the world. According to Chinese customs statistics, in 2019, China's exports to Brazil amounted to 35.544 billion U.S. dollars, accounting for about a quarter of total exports to Latin America. However, globally, it only accounted for 1.42% of China's total exports. (See Figure 1.2)

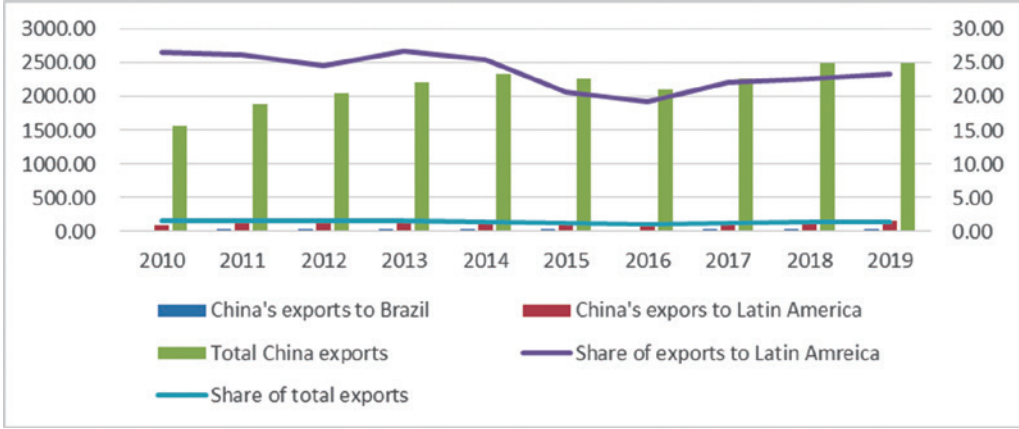

Figure 1.2 China's exports to Brazil and its share - 2010-2019 (billion USD and %)

Source: UN Comtrade 2010-2018, China Customs statistics 2014-2019, China Statistical Yearbook 2011-2014.

1.1.2 China's imports from Brazil

As the most populous country in the world, China has become the world's second largest economy and the world's second largest importer and consumer. This must gain momentum as China now entered a new stage of sustained growth in consumption with huge potential for imported products and services and growing demand for high-quality products.

Brazil is China's largest source of imports in Latin America and seventh largest import trading partner in the world. In 2019, China's imports from Brazil were US$79.798 billion, accounting for nearly half of China's total imports from Latin America, but only 3.84% of the total global imports. (See Figure 1.3)

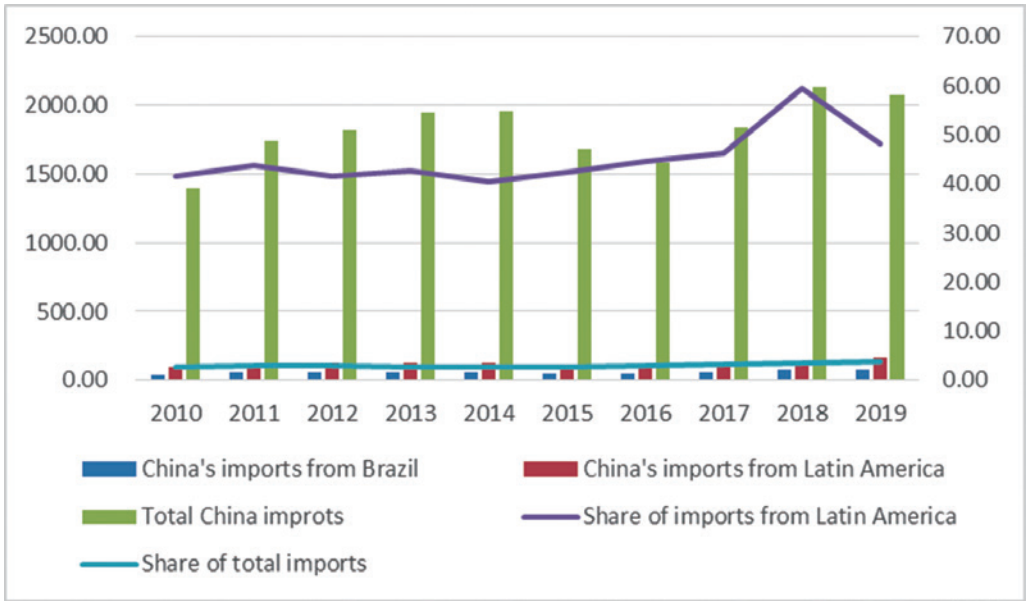

Figure 1.3 China's imports from Brazil and its share
(billion USD and %)

Source: UN Comtrade 2010-2018, China Customs statistics 2014-2019, China Statistical Yearbook 2011-2014.

1.1.3 Trade balance between China and Brazil

China have maintained a long-term trade deficit with Brazil, and the deficit continues to expand. In 2019, China's imports from Brazil almost doubled its exports, with a trade deficit of US$44.254 billion. (See Figure 1.4)

Figure 1.4 China-Brazil trade deficit and year-on-year change - 2010-2019
(billion USD and %)

Source: UN Comtrade 2010-2018, China Customs statistics 2014-2019.

1.2 Structure of China-Brazil trade

The bilateral trade between China and Brazil is highly complementary. China mainly exports industrial products such as mechanical and electronic products and optical instruments to Brazil. Brazil has become the largest supplier of soybeans, chicken, beef and other agricultural products in the Chinese import market.

1.2.1 China's main export products to Brazil

In 2019, the top 20 commodities exported by China to Brazil accounted for 85.82% of the total exports to Brazil. Among them, the key commodities are electrical machinery and equipment, machinery and mechanical appliances, organic chemicals, ships and boats and optical, photographic, medical or surgical instruments. They accounted for 25.41%, 13.56%, 7.19%, 4.80% and 4.63% of the total exports to Brazil, respectively (See Table 1.1).

Table 1.1 China's main export commodities to Brazil in 2019 (billion USD and %)

Ranking	HS	Major export commodities	Amount	Share
1	85	Electrical machinery and equipment	9.031	25.41
2	84	Machinery and mechanical appliances	4.819	13.56
3	29	Organic Chemicals	2.555	7.19
4	89	Ships, boats and floating structures	1.707	4.80
5	90	Optic, photographic; Med Instr	1.644	4.63
6	87	Vehicles, Not Railway	1.443	4.06
7	39	Plastic	1.14	3.21
8	54	Man-made Filament, Fabric	0.795	2.24
9	95	Toys and Sports Equipment	0.752	2.12
10	94	Furniture and Bedding	0.735	2.07
11	38	Misc. Chemical Products	0.705	1.98
12	73	Iron/Steel Products	0.703	1.98
13	42	Leather Art; Saddlery; Bags	0.678	1.91
14	61	Knit Apparel	0.664	1.87
15	72	Iron and Steel	0.595	1.67
16	31	Fertilizers	0.592	1.67
17	55	Man-made Staple Fibers	0.534	1.50
18	40	Rubber	0.507	1.43
19	62	Woven Apparel	0.485	1.36
20	76	Aluminum	0.413	1.16
Total				85.82

Source: China General Administration of Customs, December 2019, Exports by Selected Countries (Regions) and by HS Divisions (USD Value): http://www.customs.gov.cn/customs/302249/302274/302277/302276/2851466/index.html.

From a global perspective, although China's exports of fertilizers, ships and boats products to Brazil accounted for 8.26% and 6.97% of China's global exports, on the whole, China's exports to Brazil accounted for a relatively low percentage of global exports. Taking China's first and second largest export commodities—electrical machinery and equipment, machinery

and mechanical appliances as examples, in 2019, China's exports of these two products to Brazil accounted for about 1/4 and 1/7 of the total exports to Brazil, but only accounted for 1.35% and 1.16% of total China exports respectively.(See Figure 1.5)

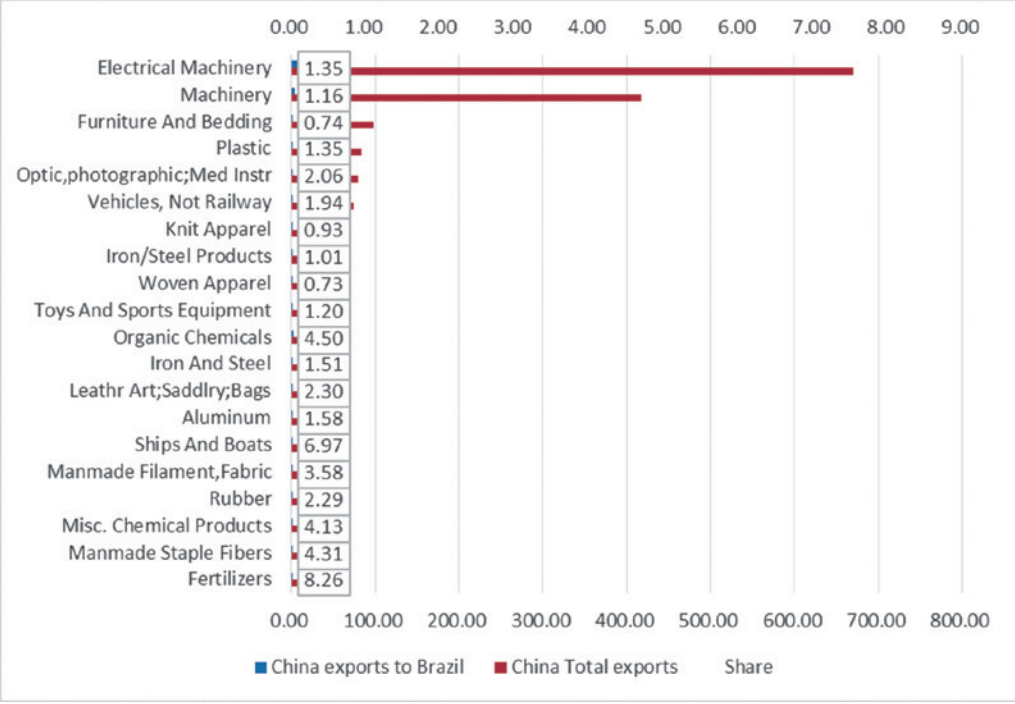

Figure 1.5 China's main exports commodities to Brazil and shares in 2019 (billion USD and %)

Source: China General Administration of Customs, December 2019, Exports by Selected Countries (Regions) and by HS Divisions: http://www.customs.gov.cn/customs/302249/302274/302277/302276/2851466/index.html. Imports and Exports by HS Section and Division: http://www.customs.gov.cn/customs/302249/302274/302277/302276/2851406/index.html.

According to Brazilian statistics, the numbers are different but the structure and pattern of bilateral trade is the same. China is Brazil's largest source of imports, so that Brazil imported 35.271 billion U.S. dollars from the partner, a year-on-year increase of 2%, accounting for 21% of Brazil's total imports. The top 20 products imported by Brazil from China accounted for 88.09% of total imports from China. (See Table 1.2)

Table 1.2 Brazil's main import commodities from China in 2019 (billion USD and %)

Ranking	HS	Major imports commodities	Amount	Share
1	85	Electrical Machinery and Equipment	10.708	30.36
2	84	Machinery and Mechanical Appliances	4.973	14.10
3	29	Organic Chemicals	3.003	8.51
4	89	Ships and Boats	2.116	6.00
5	87	Vehicles, Not Railway	1.111	3.15
6	39	Plastic	1.028	2.92
7	90	Optic, photographic; Med Instr	0.871	2.47
8	54	Man-made Filament, Fabric	0.761	2.16
9	38	Misc. Chemical Products	0.728	2.06
10	72	Iron and Steel	0.724	2.05
11	31	Fertilizers	0.708	2.01
12	73	Iron/Steel Products	0.678	1.92
13	40	Rubber	0.553	1.57
14	94	Furniture and Bedding	0.509	1.44
15	61	Knit Apparel	0.478	1.35
16	95	Toys and Sports Equipment	0.46	1.30
17	55	Man-made Staple Fibers	0.451	1.28
18	62	Woven Apparel	0.438	1.24
19	76	Aluminum	0.424	1.20
20	60	Knit, Crocheted Fabrics	0.352	1.00
Total				88.09

Source：SECEX-Foreign Trade Secretariat.

From a global perspective, mechanical and electrical products, mechanical equipment, organic chemicals and ships and boats are not only the main commodities imported by Brazil from the world, but also the main commodities it imported from China. In 2019, Brazil's imports of the above-mentioned products from China accounted for 30.36%, 14.10%, 8.51% and 6.00% of its imports from China, and accounted for 48.49%, 23.35%, 27.39% and 46.07% of its global imports, respectively. In addition, Chinese furniture, toys, bedding products and textile products are also competitive in the Brazilian market, each of which accounts for more than 50% of its global imports.

On the other hand, medicines, fertilizers, and miscellaneous base metal products are Brazil's main imported products. However, in 2019, Brazil's imports of these products from China only accounted for 0.40%, 7.74% and 4.76% of its global import shares respectively, indicating that the above products have room for development in the Brazilian market. (See Figure 1.6)

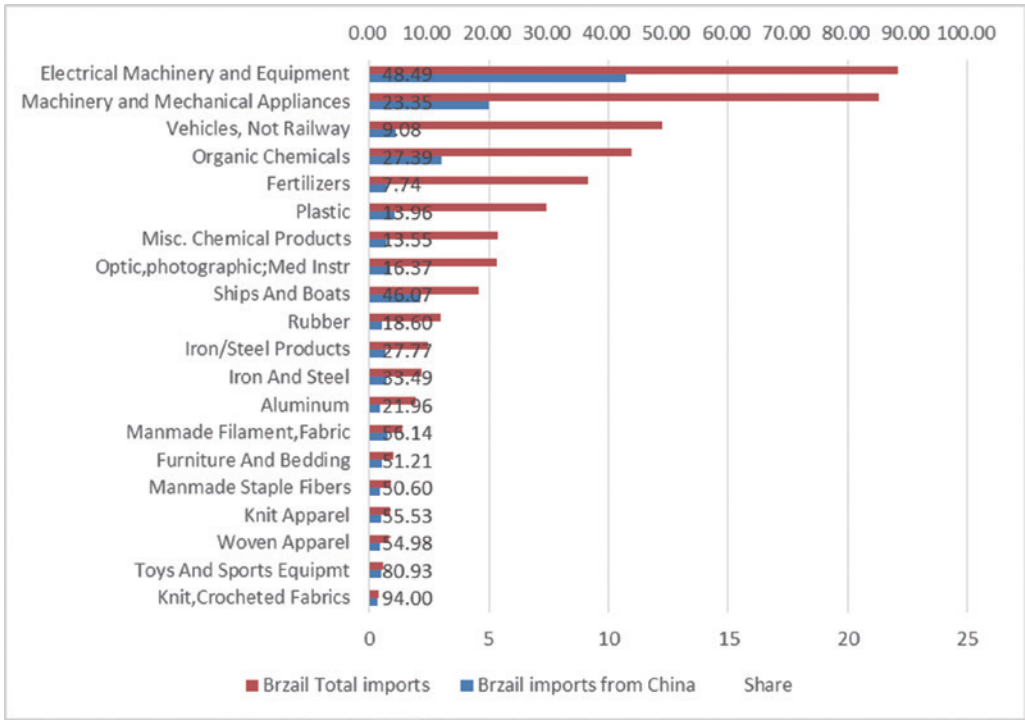

Figure 1.6 Brazil's main import commodities from China and shares in 2019 (billion USD and %)

Source: SECEX-Foreign Trade Secretariat.

1.2.2 China's main import products from Brazil

Brazil is rich in resources such as petroleum, minerals, and forestry, and has unique agricultural and animal husbandry conditions. The output of coffee, cocoa, soybeans, sugar cane, corn, beef, chicken and other agricultural and animal husbandry products ranks among the top in the world. China's imports from Brazil are mainly concentrated in mineral products, soybeans, meat and other products. Brazil has become the largest supplier of soybeans, chicken, beef and other agricultural products in the Chinese import market. In 2019, the top 20 commodities imported by China from Brazil accounted for 99.28% of the total imports from Brazil. Among them, the key commodities are ore, slag and ash, oil seeds, mineral fuels, meat and wood pulp, accounted for 29.53%, 28.85%, 23.86%, 5.04% and 4.97% of the total imports from Brazil respectively. (See Table 1.3)

Table 1.3 China's main import commodities from Brazil in 2019 (billion USD and %)

Ranking	HS	Major import commodities	Amount	Share
1	26	Ores, Slag, Ash	23.563	29.53
2	12	Oil seeds and oleaginous fruits;Misc Grain,Seed,Fruit	23.019	28.85
3	27	Mineral Fuel, Oil Etc	19.039	23.86
4	02	Meat	4.025	5.04
5	47	Wood pulp, Etc.	3.964	4.97
6	72	Iron and Steel	1.327	1.66
7	52	Cotton	0.93	1.17
8	24	Tobacco	0.505	0.63
9	17	Sugars	0.437	0.55
10	41	Hides and Skins	0.408	0.51
11	74	Copper and Articles Thereof	0.314	0.39
12	84	Machinery and Mechanical Appliances	0.293	0.37
13	15	Fats and Oils	0.292	0.37
14	44	Wood	0.24	0.30
15	29	Organic Chemicals	0.212	0.27
16	39	Plastic	0.211	0.26
17	25	Salt; Sulfur; Earth, Stone	0.189	0.24
18	20	Preserved Food	0.131	0.16
19	71	Precious Stones, Metals	0.06	0.08
20	48	Paper, Paperboard	0.059	0.07
Total				99.28

Source: China General Administration of Customs, December 2019, Imports by Selected Countries (Regions) and by HS Divisions (USD Value): http://www.customs.gov.cn/customs/302249/302274/302277/302276/2851472/index.html.

From a global perspective, China's major imports from Brazil account for a relatively high proportion of global imports. China is the largest importer of Brazilian agricultural products, especially oil seeds products. In 2019, China's imports of Brazilian oil seeds products accounted for 57.44% of China's total imports of this product. In addition, in 2019, China's imports of sugar and tobacco products from Brazil accounted for more than 1/4 of global imports, and imported Brazilian wood pulp and meat products accounted for more than 1/5 of global imports. Products such as ore, slag and ash, leather and cotton all accounted for more than 1/10 of global imports, indicating that the above products have strong competitiveness in the Chinese market. (See Figure 1.7

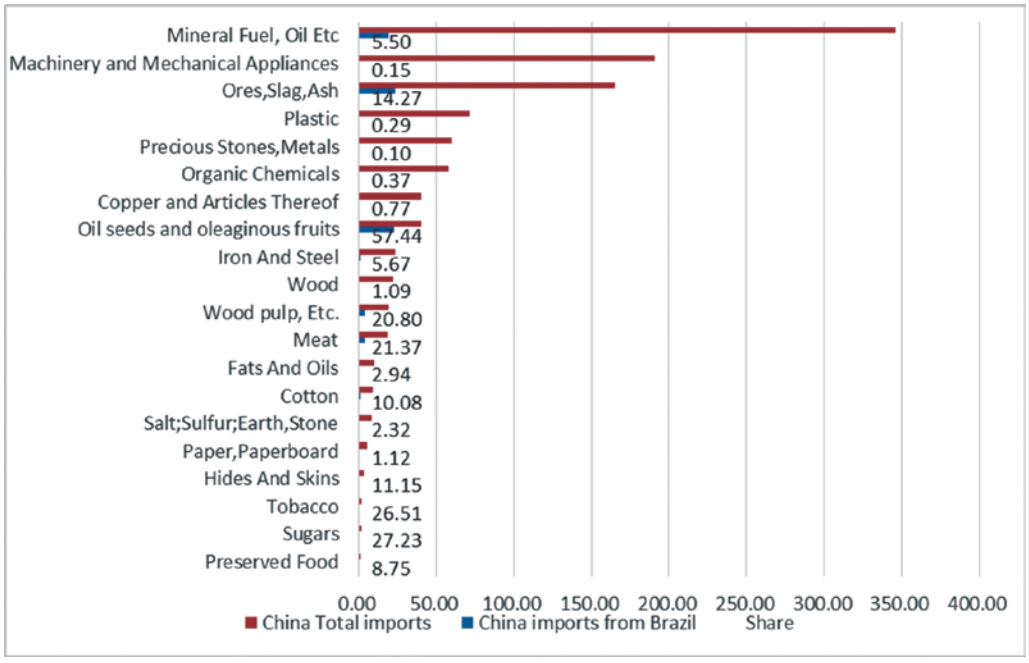

Figure 1.7 China's main imports commodities from Brazil and shares in 2019 (billion USD and %)

Source: China General Administration of Customs, December 2019, Imports by Selected Countries (Regions) and by HS Divisions: http://www.customs.gov.cn/customs/302249/302274/302277/302276/2851472/index.html. Imports and Exports by HS Section and Division: http://www.customs.gov.cn/customs/302249/302274/302277/302276/2851406/index.html.

According to Brazilian statistics, China is Brazil's largest export market. In 2019, Brazil exported 63.358 billion U.S. dollars to China, accounting for 28.11% of Brazil's total exports. And the numbers of 2020 up to August shows that Chinese share is growing fast. The top 20 products exported by Brazil to China accounted for 99.23% of total exports to China. (See Table 1.4)

Table 1.4 Brazil's main export commodities to China in 2019 (billion USD and %)

Ranking	HS	Major export commodities	Amount	Share
1	12	Oil seeds and oleaginous fruits; Misc Grain,Seed,Fruit	20.453	32.28
2	27	Mineral Fuel, Oil Etc.	15.519	24.49
3	26	Ores, Slag, Ash	14.398	22.73
4	02	Meat	4.545	7.17
5	47	Wood pulp, Etc.	3.250	5.13
6	72	Iron and Steel	1.227	1.94
7	52	Cotton	0.821	1.30
8	17	Sugars	0.391	0.62
9	24	Tobacco	0.386	0.61
10	41	Hides and Skins	0.290	0.46
11	74	Copper and Articles Thereof	0.275	0.43
12	15	Fats And Oils	0.256	0.40
13	84	Machinery and Mechanical Appliances	0.214	0.34
14	39	Plastic	0.187	0.30
15	44	Wood	0.175	0.28
16	25	Salt; Sulfur; Earth, Stone	0.141	0.22
17	29	Organic Chemicals	0.141	0.22
18	20	Preserved Food	0.077	0.12
19	85	Electrical Machinery and Equipment	0.063	0.10
20	48	Paper, Paperboard	0.056	0.09
Total				99.23

Source：SECEX-Foreign Trade Secretariat.

From a global perspective, oil seeds, mineral fuels, ore, slag and ash, meat and wood pulp are not only Brazil's major exports to the world, but also major exports to China. In 2019, Brazil's exports of the above products to China accounted for 32.28%, 24.49%, 22.73%, 7.17%, and 5.13% of its total exports to China, accounting for 77.42%, 51.20%, 55.73%, 29.70% and 43.47% of global exports respectively.

On the other hand, Brazil's industrial strength ranks first among Latin American countries, and its industrial foundations such as steel and automobiles are relatively solid. However, Brazil's major export products such as machinery and vehicles do not account for a high proportion of exports to China, and may have great potential in the Chinese market. In 2019, Brazil's exports of the aforementioned products to China accounted for only 1.7% and 0.9% of its global exports, and there is still a lot of room for development. (See Figure 1.8)

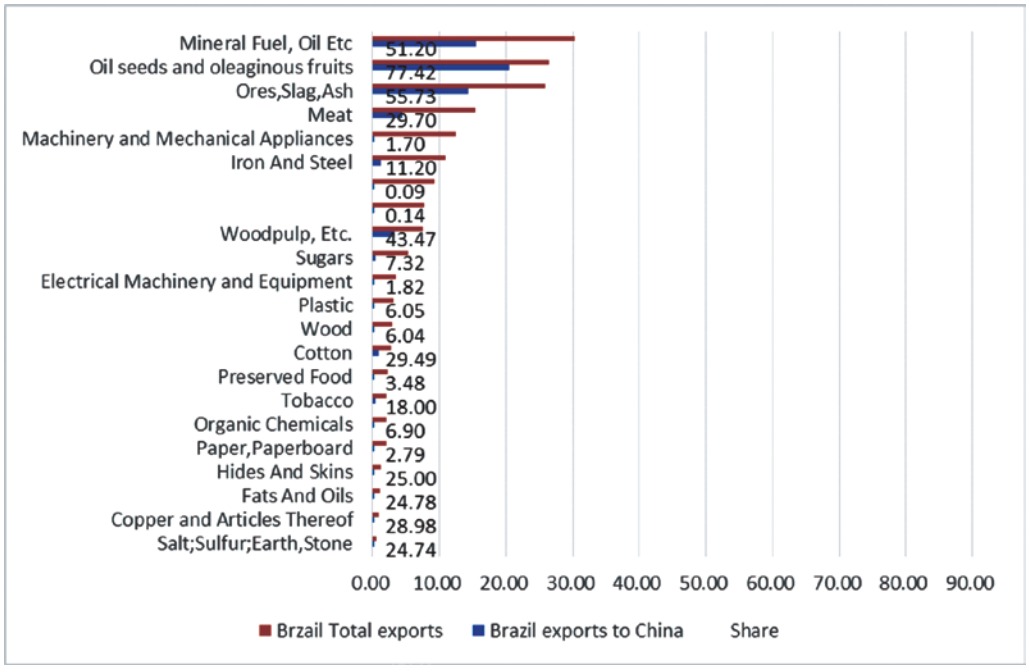

Figure 1.8 Brazil's main export commodities to China and shares in 2019 (billion USD and %)

Source: SECEX-Foreign Trade Secretariat.

II. Modeling analysis

To capture the dynamic effects of the China-Brazil FTA, we utilize the recursively dynamic CGE model (GTAP-Dyn or Gdyn) developed by Ianchovichina and McDougall[①]. The GTAP-Dyn model preserves the framework of the standard GTAP model[②], while extending it to include international capital mobility, capital accumulation and an adaptive expectations theory of investment. In combination with the Gdyn model, we use GTAP 10 database, which has a reference year of 2014, aggregating its 141 regions and 65 sectors into 3 regions (China, Brazil and Rest of the World) and 24 sectors (See Appendix 1).

2.1 Model description

2.1.1 Overall advantages of the GTAP model

The GTAP model was developed by Purdue University in the United States. It is a multi-regional, multi-sector computable general equilibrium model designed according to neoclassical economic theory. General equilibrium theory regards the economic system as a whole, and studies the interaction and interrelationship among its various elements.

The GTAP model is the most recommended among the current global trade analysis models for three main reasons: First, it contains and sorts out a large amount of data such as input-output and tariff data of different countries to help researchers save time; Second, compared with the general econometric analysis method, GTAP is a method that can comprehensively consider various economic policy variables and examine the effects of simultaneous implementation of various policies through the policy variables set for each department in the economic system, which is lacking in other research methods. Third, the GTAP model is effective for quantitative analysis of policies, and can provide specific and accurate suggestions for policy selection and decision-making.

2.1.2 GTAP model applications in other countries

Foreign scholars have extensively used the GTAP model to conduct general equilibrium studies on the effects of bilateral trade liberalization. The research objects are mostly developed countries, and the purpose of the research is to quantitatively analyze the impact of free trade zones on the overall economy and individual sectors of member countries. Foreign scholars have conducted a lot of research on the policy effects of establishing free trade areas in the European Union, Japan, South Korea and other regions, and the research results have been fruitful.

Stephan Von Cramon-Taubadel, Sebastian Hess and Bernhard Brummer (2010) conducted

① Ianchovichina, E., & McDougall, R. (2012). Theoretical structure of Dynamic GTAP. Dynamic modeling and applications for global economic analysis, 13-70.

② Hertel, T. W. (1997). Global trade analysis: modeling and applications. Cambridge university press.

a preliminary analysis on the EU-Ukraine Free Trade Area. Empirical analysis shows that after the establishment of the free trade zone, Ukraine's resource allocation efficiency has increased, and the output of wheat, other food crops and oil crops has increased. Ukraine's exports to Russia have increased, prices have fallen, and terms of trade have deteriorated. Ukraine's agricultural imports have also increased.

Joseph F. Francois (2005) and others used the GTAP model to evaluate the economic effects of trade liberalization between the EU and developing countries. The results of the study show that after the establishment of the free trade zone, the existing export levels of developing countries have only slightly changed, and the existing export levels of developed countries in the European Union have increased significantly. Moreover, the EU has obtained more welfare effects from the free trade area.

Inkyo Cheong (2002) and Tomoyoshi Nakajima (2002) studied the impact of the Japan-Korea Free Trade Area on the overall economy of the two countries and the impact on the trade balance of various industries. The former simulation proves that after the establishment of the free trade zone, the national welfare of Japan and South Korea will increase significantly, and the industrial structure of South Korea will not be destroyed. The latter is based on a sectoral perspective. The analysis proves that after the establishment of the free trade zone, the biggest improvement in Japan's trade balance is in the machinery and equipment sector, followed by metal products, other manufactured products, and electronic equipment, while other sectors have deteriorated. The biggest improvement in South Korea's trade balance is in the processed food sector, followed by textiles and apparel, where machinery and equipment have the greatest degree of negative distortion.

Boot Sumran Tawan (2005) analyzed the economic impact of Thailand's establishment of free trade areas with Japan, Australia, New Zealand, China and ASEAN, EU, North America and other countries or regions. Empirical analysis shows that all countries that have established a free trade area (FTA) with Thailand will benefit. In addition, the establishment of free trade zones can also increase production efficiency and accelerate economic growth.

The above studies all use a comparative static analysis method, that is, to compare the different effects that different policies may have on the economy without considering how the economy will develop. The analysis results are only static changes relative to the simulated base period.

Thomas W. Hertel, Terrie Walmsley, and Ken Itakura (2001) used the dynamic GTAP model (GDyn Model) to capture the impact of the FTA between Japan and Singapore over both the short run and the longer run and found the impact of the FTA on investment, capital accumulation and economic growth is significant, particularly in Singapore.

Brian Mureverwi1(2016) used the Dynamic GTAP model to simulate the welfare effects of full tariff liberalisation of The Continental Free Trade Area (CFTA), and found out the establishment of the CFTA will culminate in improved welfare in many African economies, at varying degrees. The continental initiative will result in more jobs, investment and competitiveness, as indicated

in the GTAP simulations. However, many African countries will experience revenue losses from full tariff liberalisation on intra-African trade.

Martin H. Thelle and Eva R. Sunesen (2011) used the GTAP model to evaluate the impact of the EU-Mercosur Free Trade Area on EU trade and investment. The research results show that the establishment of the free trade zone will have a positive impact on the EU economy as a whole, but the large differences between industries are especially beneficial to its globally competitive industries and can greatly increase the development potential of its high-tech industries.

2.1.3 GTAP model application in China

Chinese scholars have conducted extensive empirical research on the policy effects of bilateral free trade agreements signed between China and trading partner countries. Most of the related studies adopt the recursive dynamic method, that is, considering that trade policies and economic variables are constantly changing dynamic processes. Most of the researches upgrade the changes in variables such as population, GDP, unskilled labor, skilled labor, and natural endowments in the GTAP database to the target year, and use this as a new benchmark to conduct policy simulations to make the simulation program closer to reality.

Wei Wei and Wei Chao (2009) believe that the China-ROK (Republic of Korea) Free Trade Area is a breakthrough point for the realization of the future China-Japan-Korea Free Trade Area. Using the dynamic GTAP model for empirical simulation, the results show that the China-Korea Free Trade Area will have a positive impact on the GDP, economic welfare, terms of trade and total import and export volume of the two countries.

Li Li et al. (2008) conducted a quantitative analysis on the impact of the establishment of the China-New Zealand Free Trade Area on the economies of both sides. Empirical research shows that after the establishment of the Free Trade Area, the products of China and New Zealand have complemented each other's advantages and the scale of trade between China and New Zealand has expanded. China's exports have increased significantly, and New Zealand's imports have increased significantly. The trade balance and terms of trade between the two countries have reversed changes. At the same time, they did research on the impact of the establishment of China-India Free Trade Zone on China and the world economy, and simulated four possible scenarios. By comparing GDP, welfare level, import and export volume, trade balance and terms of trade, they believed that China should strive to establish a China-India free trade zone or a China-India-Australia free trade zone.

Yang Jun, Huang Jikun, and Qiu Huanguang (2005) used the GTAP model to analyze the policy effects of the China-Australia Free Trade Area. They believe that the establishment of this FTA can promote the development of bilateral trade, improve the economic welfare of the two countries, and adjust the industrial structure of both sides. Both industry and agriculture in Australia will benefit, with the agricultural sector gaining more benefits than the industrial sector. In China, only the labor-intensive industrial sector will benefit, and the agricultural sector will be affected to a certain extent.

2.2 Scenarios for a China-Brazil FTA on tariff reductions

To capture the dynamic effects of the China-Brazil FTA, we utilize the Gdyn model combined with GTAP 10 database, and aggregate its 141 regions and 65 sectors into 3 regions and 24 sectors (See Appendix 1).

Table 2.1 shows bilateral import tariffs estimated from the GTAP 10 database. In China, the highest tariffs on imports from Brazil are noted in wearing (15.9%), food (10.5%) and other manufacturing (10.6%). In Brazil, the tariff level is relatively high compared with China. The highest tariffs on Brazil's imports from China are recorded for wearing (34%), leather (28.1%), textiles and clothing (24.6%). China's tariff rates for imports from Brazil are typically below 10%, whereas Brazil's tariff rates are above 10% in 13 out of the 24 sectors. In the simulations, linear tax cuts were applied: distortions are gradually reduced by equal shares every two years in 5 rounds (2021-2031).

Two baselines (normal growth case and low growth case [①]) were constructed with the following variables included: real GDP, population and skilled/unskilled labor. For each baseline, 3 scenarios were developed: full liberalization (S1), China-ASEAN FTA level (S2) and MERCOSUR-EU FTA level (S3), where full liberalization means the removal of all distortions in bilateral trade between Brazil and China from the reference year 2014, while the other two correspond to duty elimination on 93% and 91% of goods on both sides. Since pandemic is likely be lengthy, we only keep 4 out of 6 scenarios for discussion. (See Table 2.2). It´s needed to say that the usage of the two baselines don´t make a very significant difference in the results, as they´re evaluated as deviations from the baseline. But they make a difference if one is focused on the absolute levels of some variables.

① Maliszewska et al. (2020) predicts that an amplified global pandemic would shock all countries uniformly: A baseline global pandemic scenario sees GDP of the world fall by 2 percent below the baseline, of developing countries by 2.5 percent, and of industrial countries by 1.8 percent. And pandemics tend to appear in waves and last 12–36 months.

Table 2.1 Existing bilateral tariffs of China-Brazil merchandise trade (%)

Sector	China[a]	Brazil[b]
Agricultural	2.97	11.1
Food commodities	10.5	9.84
Mineral extraction	0.004	3.59
Chemical, rubber and plastic	5.36	6.71
Basic pharmaceutical products	5.01	4.91
Rubber and plastic products	8.59	15
Electronical equipment	7.24	15.7
Machinery and equipment	7.06	10.9
Oil and gas	0	0
Oil derivatives	4.02	0.269
Electronic equipment	2.18	9.09
Transportation equipment	3.15	15.4
Textiles and Clothing	8.92	24.6
Ferrous metal	1.25	12.2
Motor vehicles and parts	6.72	19
Pulp and paper	0.226	11.4
Metal products and nec	1.02	15.1
Wood products	0.497	12.4
Wearing products	15.9	34
Leather products	5.15	28.1
Other Manufacturing	10.6	19.7
Utilities and Construction	0	0
Transport and Communication	0	0
Other Services	0	0

[a] Chinese tariffs on Brazil Imports.

[b] Brazil's tariffs on imports from China.

Source: Purdue University (2019), GTAP database version 10.

Table 2.2 Simulation design for China-Brazil FTA in GTAP

	Baseline	
Scenario	Normal Growth(B1)	Low Growth(B2)
I [a]	B1S1	
II [a]		B2S1
III [b]		B2S2
IV [c]		B2S3

[a] Full liberalization.

[b] China-ASEAN FTA level: duty elimination on 93% of goods.

[c] MERCOSUR-EU FTA level: duty elimination on 91% of goods.

2.3 Data

Historical and projection data (Table 2.3) used to construct the baselines were collected primarily from Economist Intelligence Unit (EIU) [①] and Center for International Prospective Studies database (CEPII) [②].

Table 2.3 Projection of GDP growth (%)

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
I	China	6.0	6.3	6.3	6.3	6.3	6.1	6.1	5.9	5.9	5.7	5.7
	Brazil	2.7	2.7	2.7	2.6	2.6	2.5	2.5	2.4	2.4	2.4	2.4
II	China	3.5	3.8	6.3	6.3	6.3	6.1	6.1	5.9	5.9	5.7	5.7
	Brazil	0.2	0.2	2.7	2.6	2.6	2.5	2.5	2.4	2.4	2.4	2.4

Source: CEPII and author's calculation

2.4 Modeling process and results

This section uses Dynamic GTAP model to evaluate the potential economic effects of the China Brazil Free Trade Agreement for the next ten years. This section reports results from the GTAP simulation of the China-Brazil FTA (CBFTA) in 4 categories: macroeconomic effects, sectoral impacts, bilateral trade effects and welfare change. The results are shown as deviations from the baseline scenario, so as to consider the specific effects brought about by the tariff reductions.

We find that the impact of the CBFTA is positive and significant on economic growth, sector performance, trade expansion and welfare gain, and substantial in exports and imports expansion. The gains of the agreement are captured by both China and Brazil. Although China's welfare gain is 4 times larger than Brazil's, they are of about the same proportion with respect to the economic size of each country.

① https://eiu.bvdep.com/frame.html
② http://www.cepii.fr/cepii/en/bdd_modele/bdd.asp

III. Result Analysis

3.1 Impact on macroeconomic and sector variables

3.1.1 Macroeconomic Effects

The macroeconomic effects of the CBFTA are summarized in Table 3.1. First, the results demonstrate that the CBFTA should have a positive impact on economic growth in Brazil and China, with Brazil enjoying a higher real GDP growth by about 0.5% and China having less than 0.1% gain. As expected, the relative gain is lower in the bigger economy. Besides, the increment in GDP growth with full liberalization (Scenario I & II) is slightly higher than those with partial liberalization (Scenario III & IV) for both countries.

Table 3.1 Macroeconomic effects of CBFTA under four scenarios

Macroeconomic variables	China				Brazil			
	Scenario I	Scenario II	Scenario III	Scenario IV	Scenario I	Scenario II	Scenario III	Scenario IV
Real GDP (%)	0.09	0.09	0.09	0.08	0.57	0.55	0.51	0.48
Export volume (%)	0.29	0.27	0.23	0.21	7.03	6.93	5.96	5.15
Import volume (%)	1	1.02	0.9	0.82	10.68	10.34	9.09	8.15
Terms of trade (%)	0.27	0.27	0.25	0.23	0.3	0.31	0.33	0.32
Trade balance (US$ million)	-10277.6	-11914.3	-10751.5	-9874.4	-21865.7	-19869.5	-17987.5	-16993.3
Welfare -equivalent variation								
(US$ million)	23639.1	22359.8	23528.5	18813.6	5153.9	4761.2	5309.9	5012.0
(% of GDP)	0.14	0.14	0.12	0.11	0.1	0.09	0.11	0.12

Source: Rundynam software simulation.

Second, the CBFTA affects Brazil's trade performance more than China's. Brazil experiences export expansion ranging from 5.15% to 7.03% in the different scenarios, while its import expands more, by 8.15% to 10.68%. The impact on China's trade volume is relatively smaller (export expansion ranging from 0.21% to 0.29%, import from 0.82% to 1%) in the four scenarios. Both China and Brazil get more increase in import growth than export, and enjoy improvements in their term of trade in all scenarios. However, overall trade balance in both Brazil and China are negatively affected.

The net welfare gains are generally measured by equivalent variation (EV) [①] . Table 3.1 shows that both Brazil and China have positive EVs gains which indicates economic welfare improvements (about 0.1% of GDP in both countries) resulting from the CBFTA. The discrepancy between scenario I and II in EV suggests a (not so high) loss in welfare due to the drop in output caused by the pandemic. Notably, Scenario III, instead of II, has the most

① The welfare decomposition in GDyn model involves a comparative static simulation depicted in Walmsley et al. (2012).

welfare gains among the three low-growth scenarios. Of all four scenarios, China's net welfare gains are about 3.75~4.7 times the amount of Brazil's counterpart, what´s natural considering the difference in size of the economies.

3.1.2 Sectoral Impact

Output effects of CBFTA by sector in China and Brazil are shown in Table 3.2 as a percentage change in volumes relative to initial output levels in 2021. In Brazil, transportation equipment appear to have the greatest improvement in output, followed by utilities and construction, motor vehicles and parts, pulp and paper, and leather products in all scenarios, while electronical equipment, wearing, textiles and clothing face major declines in output. According to the simulation results, 14 sectors out of 24 in Brazil see gains. There is a clear pattern of output gains in commodity-related sectors (motor vehicles and parts is an exception) and output losses in labor intensive sectors, as well as electronical and electronic equipment sectors.

Table 3.2 Estimated change in output by sector under 4 scenarios(%)

Sector	Scenario I		Scenario II		Scenario III		Scenario IV	
	China	Brazil	China	Brazil	China	Brazil	China	Brazil
Agricultural	-0.19	1.13	-0.18	1.00	-0.17	0.90	-0.14	0.77
Food commodities	-0.10	0.50	-0.09	0.43	-0.07	0.31	-0.06	0.31
Mineral extraction	0.04	1.72	0.06	1.60	0.05	1.41	0.04	1.25
Chemical, rubber and plastic	0.09	-0.25	0.09	-0.34	0.08	-0.37	0.11	-0.62
Basic pharmaceutical products	-0.03	1.03	-0.03	1.15	-0.02	0.99	-0.01	0.80
Rubber and plastic products	0.10	-0.49	0.10	-0.47	0.08	-0.42	0.12	-0.71
Electronical equipment	0.14	-8.07	0.14	-7.98	0.13	-7.19	0.05	-4.01
Machinery and equipment	0.34	-0.48	0.36	-0.40	0.32	-0.38	0.38	-1.58
Oil and gas	-0.01	-0.59	-0.01	-0.58	-0.01	-0.52	-0.01	-0.46
Oil derivatives	0.24	-0.06	0.25	-0.10	0.22	-0.08	0.19	-0.03
Electronic equipment	-0.23	-2.02	-0.25	-2.10	-0.21	-1.94	-0.11	-2.83
Transportation equipment	0.57	4.30	0.59	4.42	0.52	3.75	0.30	3.53
Textiles and Clothing	0.27	-14.64	0.26	-14.72	0.22	-13.07	0.12	-10.67
Ferrous metal	0.25	0.76	0.26	0.88	0.23	0.71	0.23	0.31
Motor vehicles and parts	0.26	3.05	0.29	3.07	0.25	2.64	0.19	2.54
Pulp and paper	-0.19	2.57	-0.18	2.52	-0.15	2.10	-0.13	1.89
Metal products and nec	0.13	0.54	0.13	0.68	0.12	0.56	0.06	0.99
Wood products	-0.04	1.24	-0.04	1.24	-0.03	1.05	-0.03	0.99
Wearing products	0.17	-10.65	0.17	-10.77	0.13	-9.33	-0.01	-6.33
Leather products	-0.06	2.07	-0.03	1.33	-0.05	1.56	-0.20	3.04
Other Manufacturing	0.22	-1.80	0.24	-1.95	0.21	-1.65	0.15	-0.97
Utilities and Construction	0.32	3.05	0.36	2.95	0.32	2.66	0.30	2.51
Transport and Communication	0.04	0.59	0.04	0.58	0.04	0.52	0.04	0.48
Other Services	0.04	0.28	0.04	0.31	0.04	0.29	0.04	0.26

Source: Rundynam software simulation.

In China, both improvements and deteriorations across sectors are relatively small, with transportation equipment, machinery, utilities and construction, textiles and clothing, and motor vehicles and parts better off in all scenarios, and 16 sectors out of 24 showing gains. Since Table 3.2 illustrates the changes relative to the baseline, a negative result in the table does not necessarily mean an absolute decline in the long term.

3.2 Impact on bilateral trade

Accumulated changes in bilateral trade flows resulting from the CBFTA are shown in Table 3.3, indicating that, except oil and gas extraction and services related sectors, all other sectors would benefit from the formation of the CBFTA.

Table 3.3. Accumulated change of bilateral export volume by sector under 4 scenarios(%)

Sector	Scenario I		Scenario II		Scenario III		Scenario IV	
	ECB	EBC	ECB	EBC	ECB	EBC	ECB	EBC
Agricultural	60.1	21.6	59.5	21.5	52.6	20.4	58.7	17.4
Food commodities	50.4	61.9	50.0	62.1	44.5	51.1	50.4	48.0
Mineral extraction	55.4	6.7	55.6	6.7	49.6	6.0	47.1	5.4
Chemical,rubber and plastic	55.1	80.6	53.5	81.4	47.9	71.9	50.9	62.7
Basic pharmaceutical products	55.5	78.5	55.3	79.6	49.5	74.4	51.6	60.8
Rubber and plastic products	120.7	124.9	119.7	126.4	105.0	118.4	116.5	94.6
Electronical equipment	91.8	219.0	92.4	221.3	82.9	200.2	61.8	156.0
Machinery and equipment	102.2	179.3	102.8	181.1	91.5	166.7	98.9	131.3
Oil and gas	752.5	-0.7	750.9	-0.5	610.4	-0.4	499.5	-0.5
Oil derivatives	227.9	147.9	229.5	148.5	197.4	98.0	171.8	110.6
Electronic equipment	54.2	144.5	53.3	146.4	48.3	129.3	52.7	110.6
Transportation equipment	141.0	106.2	142.2	107.3	125.5	96.6	90.0	75.6
Textiles and Clothing	97.1	202.1	94.9	204.6	84.8	188.4	74.0	144.2
Ferrous metal	76.4	46.5	77.6	46.8	68.9	42.2	75.6	36.8
Motor vehicles and parts	180.3	121.6	179.9	122.6	153.5	52.9	114.4	91.4
Pulp and paper	95.9	36.0	95.2	36.7	83.9	30.9	90.6	29.1
Metal products and nec	162.9	55.3	163.4	56.2	143.0	50.1	98.3	43.1
Wood products	101.6	28.8	100.5	29.2	89.0	25.8	96.4	22.9
Wearing products	160.7	354.1	158.5	358.9	136.9	335.2	94.6	236.8
Leather products	168.8	128.9	165.7	131.9	143.7	120.6	90.6	96.5
Other Manufacturing	134.7	193.0	133.7	194.4	117.6	182.9	93.1	139.9
Utilities and Construction	-0.6	6.1	-0.9	6.6	-0.7	5.6	-0.4	4.8
Transport and Communication	-2.5	3.8	-2.7	4.1	-2.3	3.5	-2.0	2.9
Other Services	-2.6	4.3	-2.8	4.9	-2.4	4.0	-2.1	3.4

Note: ECB-exports from China to Brazil; EBC-exports from Brazil to China.

Source: Rundynam software simulation.

In China, some sectors benefit most in volumes: oil and gas, oil derivatives, and motor vehicles and parts. In Brazil case, wearing products, electronical equipment, textiles and clothing enjoy the biggest increments in volumes.

Probably, in many sectors the increase in bilateral trade will result in a decrease of trade flows with third countries, configuring a trade diversion effect, one that´s normally expected as a consequence of bilateral liberalization.

3.3 Welfare Change Decomposition

The decomposition results of change in countries welfare are presented in Table 3.4, using the notion of equivalent variation, i.e., the change in money income that would produce the same effect on the region's utility as the policy shock. ① The comparative static welfare change is decomposed in four sources: (i) allocative efficiency, (ii) price of investment to savings (iii) terms of trade, (iv) ownership of capital endowments. ②

China receives the largest net welfare gains from the CBFTA, which is about 4 times the amount of Brazil's welfare gains. Both countries show gains related to the allocative efficiency effect. Brazil has the largest ratio of allocative efficiency to total welfare, which reflects the fact that Brazil had higher levels of trade protection before the simulation. The removal of trade distortion shifted resources to more efficient sectors from inefficient but protected sectors.

China's gains come mainly from positive terms of trade effects, as it receives a higher price for its exports. Contrarily, Brazil sees small losses in terms of trade effect. Both countries have a negative effect on price of investment to savings, as both had an initial trade surplus ③. And both show gains in capital endowment income that are higher in Brazil than in China.

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① Cheong, D. (2010). Methods for ex ante economic evaluation of free trade agreements (No. 52). ADB working paper series on regional economic integration.

② Our simulation and decomposition method zero out the other 4 source of welfare of dynamic GTAP model.

③ If the domestic return to capital investment increases relative to the foreign return to capital investment, then a country with an initial trade surplus suffers a welfare loss.

Table 3.4 Decomposition of equivalent variation on China/Brazil under 4 scenarios (US$ million)

	Allocative efficiency effect	Price of investment to saving	Terms of trade effect	Capital Endowment Income	Total
China					
Scenario I (B1S1)	9454.6	-1000.3	13096.2	40.9	21591.5
Scenario II (B2S1)	9930.1	-1141.0	13379.6	191.2	22359.8
Scenario III (B2S2)	9090.6	-1012.1	11902.3	172.6	20153.4
Scenario IV (B2S3)	8473.4	-927.8	11014.0	254.0	18813.6
Brazil					
Scenario I (B1S1)	8070.1	-4514.1	-241.1	1957.9	5272.8
Scenario II (B2S1)	7756.9	-4602.5	-464.9	2071.8	4761.2
Scenario III (B2S2)	7613.4	-3943.3	-236.5	1738.8	5172.5
Scenario IV (B2S3)	7231.8	-3496.8	-199.7	1476.7	5012.0

Source: Rundynam software simulation.

IV. Conclusion and Suggestion

4.1 Conclusion

This study adopts the dynamic GTAP model, which fully considers the international capital mobility, capital accumulation and adaptive expectations theory of investment to systematically evaluate the economic impact of the FTA between China and Brazil from macroeconomic and sectoral perspective. The results are clearly positive. The impact of the CBFTA is positive and significant for both countries, considering economic growth, sector performance, trade expansion and welfare gain. There´s a substantial export and import expansion for both China and Brazil, including a sectoral diversification of bilateral trade flows. China's welfare gain is 4 times larger than Brazil's, a proportion that´s in line with their economic size. The results lead to the conclusion that the two sides shall intensify their efforts aiming at the expeditious conclusion of an ambitious and comprehensive FTA.

4.2 Suggestion

In order to strengthen and enhance bilateral trade and economic relations, the two governments shall begin to commence a joint feasibility study as soon as possible to explore the possibility of making a free trade agreement (FTA) between China and Brazil. The officially landed feasibility study can not only make it clearer about the positive impact of FTA on both countries, but also stimulate the stakeholders to provide more ideas and contributions to the bilateral FTA. Led by the two governments, think tanks from both countries shall participate and begin to form a joint working group and conduct the research, which could work more closely for the interactions and communications for more benefits and less uncovered risks.

The two countries shall focus on long-time cooperation in sectors where mutual and complementary interests exist since the China-Brazil FTA is in the fundamental and long-term interests of both sides and will help deepen their mutually beneficial cooperation and achieve common development. This study demonstrates that transportation equipment, utilities and construction, motor vehicles and parts, textiles and clothing, and some other sectors will benefit both countries in terms of output and bilateral trade flows with the establishment of China-Brazil FTA. It may be useful for the correlated stakeholders like the manufacturers, producers and industry associations to be involved to push the process of initiating FTA after enough understanding on the possible effects. It is also important to discuss the possible adverse effects on some sectors or districts in advance and try to establish feasible mechanism to balance the gains and losses and reduce possible voice of disagreement to the China-Brazil FTA.

Considering that tariffs are not the only important barriers to trade, there are others initiatives that could be put in place in order to promote greater and more profound trade integration between China and Brazil, such as:

- Enhance bilateral collaboration for trade facilitation – the two countries shall further enhance collaboration to enforce the WTO Trade Facilitation Agreement implementation and also cooperate more to meet bilateral trade needs. Both governments shall expand cooperation to improve their capacity to remove regulatory and procedural barriers to trade,

and significantly reduce the cost of cross border trade and provide the information to the most suitable institutions, individuals or enterprises. Both sides should deepen customs cooperation, especially for the simplification and harmonization of bilateral trade procedures among key cities, and then spread the cooperation network to the secondary and third level cities or towns.

- **Promote bilateral cooperation on cross-border e – commerce**-as e-commerce has maintained strong growth and become a new engine for global economic growth under the epidemic times, China and Brazil may take it more seriously on strengthening dialogues and deepening the cooperation to foster a better business environment for bilateral cross-border e-commerce trade. Cooperation on cross-border e-commerce between the two countries will not only allow them to improve the efficiency of logistics routes and related infrastructure construction but also expand market opportunities, and reduce cost. As the international rules on e-commerce are still in the process of formulation, successful practices between China and Brazil may shed light on this area and attract more participants to have better environment for the practices in the plural level in the future.

- **Strengthen bilateral customs cooperation under the epidemic** – In order to minimize the impact of the novel coronavirus epidemic on bilateral trade, the two governments shall take joint response to highlight the cooperation on customs clearance facilitation by keeping in mind both the need of epidemic control and economic and social development. Based on the respective needs, both Customs Administrations should produce a list of specific provisional measures based on the scientific research for agricultural products inspection and quarantine to promote cooperation of mutual exchange of information, mutual recognition of controls and mutual assistance of enforcement.

It is important to stress the limitations of this study. Since global socio-economic condition may change drastically due to the evolution of COVID-19 pandemic, our projections of baseline may not adequately characterize the impact of the pandemic. And since reduction of trade distortion is used, the simulation results may differ from the traditional tariff cut only strategy.

According to the advantages and drawbacks of the GTAP model in the simulation of regional economic integration policy effects, additional static and dynamic features could be added to the recursive dynamic method of Walmsley to simulate the policy and improve the research accuracy. Besides, GTAP model can also be combined with other models for more detailed research. For example, the GTAP model can be combined with OEF's (Oxford Economic Forecasting's) global macroeconomic model to simulate and analyze the static and dynamic effects of global commodity trade liberalization.

Annex 1 Aggregation of regions

No.	Code	Description	old regions
1	China	China(Chinese Hongkong and Taiwan of China are not included)	China.
2	Brazil	Brazil	Brazil.
3	ROW	Rest of World	Australia; New Zealand; Rest of Oceania; Hong Kong; Japan; Korea; Mongolia; Taiwan of China; Rest of East Asia; Brunei Darussalam; Cambodia; Indonesia; Lao People's Democratic Republic; Malaysia; Philippines; Singapore; Thailand; Viet Nam; Rest of Southeast Asia; Bangladesh; India; Nepal; Pakistan; Sri Lanka; Rest of South Asia; Canada; United States of America; Mexico; Rest of North America; Argentina; Bolivia; Chile; Colombia; Ecuador; Paraguay; Peru; Uruguay; Venezuela; Rest of South America; Costa Rica; Guatemala; Honduras; Nicaragua; Panama; El Salvador; Rest of Central America; Dominican Republic; Jamaica; Puerto Rico; Trinidad and Tobago; Caribbean; Austria; Belgium; Bulgaria; Croatia; Cyprus; Czech Republic; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Latvia; Lithuania; Luxembourg; Malta; Netherlands; Poland; Portugal; Romania; Slovakia; Slovenia; Spain; Sweden; United Kingdom; Switzerland; Norway; Rest of EFTA; Albania; Belarus; Russian Federation; Ukraine; Rest of Eastern Europe; Rest of Europe; Kazakhstan; Kyrgyzstan; Tajikistan; Rest of Former Soviet Union; Armenia; Azerbaijan; Georgia; Bahrain; Iran Islamic Republic of; Israel; Jordan; Kuwait; Oman; Qatar; Saudi Arabia; Turkey; United Arab Emirates; Rest of Western Asia; Egypt; Morocco; Tunisia; Rest of North Africa; Benin; Burkina Faso; Cameroon; Cote d'Ivoire; Ghana; Guinea; Nigeria; Senegal; Togo; Rest of Western Africa; Central Africa; South Central Africa; Ethiopia; Kenya; Madagascar; Malawi; Mauritius; Mozambique; Rwanda; Tanzania; Uganda; Zambia; Zimbabwe; Rest of Eastern Africa; Botswana; Namibia; South Africa; Rest of South African Customs; Rest of the World.

Source: Purdue University (2019), GTAP database version 10.

Annex 2 Aggregation of commodities

No.	New	sector	Comprising
1	Code	Description	Old sectors
2	Agri	Agricultural sectors	Paddy rice; Wheat; Cereal grains nec; Vegetables, fruit, nuts; Oil seeds; Sugar cane, sugar beet; Plant-based fibers; Crops nec; Bovine cattle, sheep and goats; Animal products nec; Raw milk; Wool, silk-worm cocoons; Forestry; Fishing.
3	Food	Food commodities	Bovine meat products; Meat products nec; Vegetable oils and fats; Dairy products; Processed rice; Sugar; Food products nec; Beverages and tobacco products.
4	MinE	Mineral extraction	Coal; Minerals nec.
5	Chem	Chemical, rubber and plastic	Chemical products.
6	Phar	Basic pharmaceutical products	Basic pharmaceutical products.
7	Rubb	Rubber and plastic products	Rubber and plastic products.
8	Ecal	Electronical equipment	Electrical equipment.
9	Mach	Machinery and equipment	Machinery and equipment nec.
10	Oilg	Oil and gas	Oil; Gas.
11	Oild	Oil derivatives	Petroleum, coal products.
12	Enic	Electronic equipment	Computer, electronic and optic.
13	Trans	Transportation equipment	Transport equipment nec.
14	Text	Textiles and Clothing	Textiles.
15	Ferr	Ferrous metal	Ferrous metals.
16	Moto	Motor vehicles and parts	Motor vehicles and parts.
17	Pulp	Pulp and paper	Paper products, publishing.
18	Meta	Metal products and nec	Metals nec; Metal products.
19	Wood	Wood products	Wood products.
20	Wear	Wearing products	Wearing apparel.
21	Leat	Leather products	Leather products.
22	Mnfc	Other Manufacturing	Mineral products nec; Manufactures nec.
23	UtiC	Utilities and Construction	Electricity; Gas manufacture, distribution; Water; Construction.
24	TraC	Transport and Communication	Trade; Accommodation, Food and service; Transport nec; Water transport; Air transport; Warehousing and support activities; Communication.
	OthS	Other Services	Financial services nec; Insurance; Real estate activities; Business services nec; Recreational and other service; Public Administration and defense; Education; Human health and social work; Dwellings.

Note: nec denotes ‘‘not elsewhere classified’’.

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中国－巴西自由贸易协定货物贸易影响评估

寇埻[①]，徐曼[②]，Fernando J. Ribeiro[③]，周密[④]

① 寇埻，中国商务部国际贸易经济合作研究院助理研究员。
② 徐曼，中国商务部国际贸易经济合作研究院助理研究员。
③ Fernando J. Ribeiro，巴西应用经济研究所（IPEA）国际经济研究协调员。
④ 周密，中国商务部国际贸易经济合作研究院研究员。

目录

四、结论和建议

引言

中国和巴西同为“金砖国家”，都是重要的新兴经济体。两国间经贸合作发展迅速，贸易互补性强，有稳固的合作基础和巨大的发展潜力。随着中国经济稳中向好，实现平稳健康发展；巴西经济复苏，市场活力增强，两国进一步加强经贸合作前景广阔。未来中巴双方通过建立自由贸易区（以下简称“自贸区”），消减货物贸易关税，有利于充分利用双方巨大的市场容量、资源体量和国际市场影响力，实现优势互补，加强分工与协作，为双方务实合作开辟更广阔的空间。

本文旨在评估中巴自由贸易协定（以下简称“自贸协定”）对两国经济的影响，评估涵盖了三种可能情境：全面自由化；类似于中国与东盟国家签署的自贸协定；类似于南方共同市场－欧盟自贸协定。全面自由化意味着从 2014 年起消除中巴双边贸易中的所有扭曲行为，另外两种情况则分别对应双方取消 93% 和 91% 的贸易扭曲。本文结构如下：第一部分概述中国和巴西的双边贸易现状；第二部分详细介绍评估建模方法，基于递归动态可计算一般均衡（CGE）模型，采用 GTAP 10 数据库，参考年为 2014 年，将 141 个区域和 65 个部门汇总为 3 个区域和 24 个部门模型。GTAP-Dyn 模型保留了标准 GTAP 模型的框架，同时进一步扩展，包含了国际资本流动、资本积累和适应性投资预期理论。第三部分为 2020-2031 年期间的模拟结果：用政策模拟与基准情境的偏离变化来展示政策对宏观经济和部门的影响。最后，第四部分提出了结论和加强双边贸易关系的建议，包括关税、贸易便利化措施和电子商务等方面的建议。

一、中国与巴西双边贸易概况

近年来，中国和巴西经贸合作发展迅速。中国已连续十年成为巴西第一大贸易伙伴和第一大出口市场，巴西是中国在拉美地区的第一大进口来源国和第二大出口市场。据中国海关统计，过去十年间中巴贸易额翻了一番，现已突破千亿美元大关。2019 年，中巴双边贸易额同比增长 3.7%，占中国与拉美地区贸易总额的 35%。截至 2020 年 8 月的数据显示，2020 年巴西对中国出口的增长带动了其出口量的整体增长。但从全球范围看，中巴贸易在体量和产品多样化等方面仍有巨大挖掘潜力。

1.1 中国与巴西货物贸易

2010 年至 2019 年的十年间，中巴双边货物贸易快速增长，中国对巴西贸易逆差持续扩大。2010 年，中国与巴西进出口额为 625.60 亿美元，中方贸易逆差为 136.39 亿美元。到 2019 年，中巴双边货物贸易大幅增长至 1153.42 亿美元，其中中国对巴西出口额 355.44 亿美元，进口额 797.98 亿美元，贸易逆差扩大到 442.54 亿美元，为 2010 年的三倍（见图 1.1）。

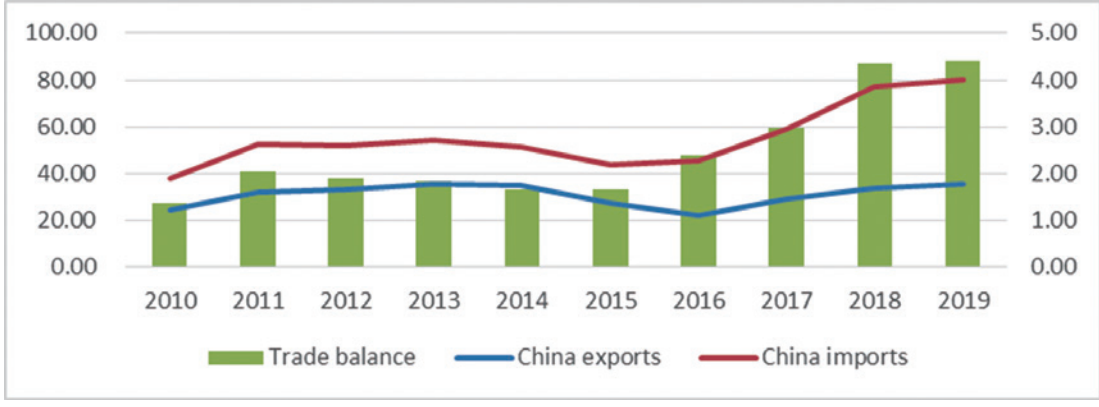

图 1.1 2010–2019 年中巴双边贸易情况（十亿美元）

资料来源：2010–2019 年中国海关统计。

巴西海关发布的数据与中国略有不同。巴方数据显示，2019 年中巴双边贸易总额 986.28 亿美元，其中巴西出口 633.57 亿美元，中国出口 352.70 亿美元，巴方贸易顺差 280.86 亿美元。双方数据反映的总体情况一致，即双边贸易增长迅速，巴西处于贸易顺差且顺差额不断扩大。

截至 2020 年 8 月，巴西对中国贸易顺差已达 255.48 亿美元。[①]

1.1.1 中国对巴西出口情况

巴西是拉美地区面积最大、人口最多的国家，经济规模和市场规模都居区域首位。巴西是中国在拉美地区最大的出口市场，也是中国的全球第 20 大出口贸易伙伴。据中国海关统计，2019 年，中国对巴西出口额 355.44 亿美元，约占对拉美出口总额的四分之一。但在全球范围内，中国对巴西出口额仅占中国出口总额的 1.42%。（见图 1.2）

图 1.2 2010–2019 年中国对巴西出口额及占比（十亿美元，%）

资料来源：2010–2018 年联合国商品贸易统计数据库，2014–2019 年中国海关统计，2011–2014 年《中国统计年鉴》。

1.1.2 中国自巴西进口情况

作为世界上人口最多的国家，中国现已成为世界第二大经济体，也是世界第二大进口国和消费国。中国目前已进入消费持续增长的新阶段，进口产品和服务潜力巨大，对高质量产品的需求日益增长。

巴西是中国在拉美地区第一大进口来源国，也是中国的全球第七大进口贸易伙伴。2019 年，中国自巴西进口额为 797.98 亿美元，占中国自拉美进口总额近一半，但仅占全球进口总额的 3.84%。（见图 1.3）

① 所有数据都基于离岸价格（FOB）。

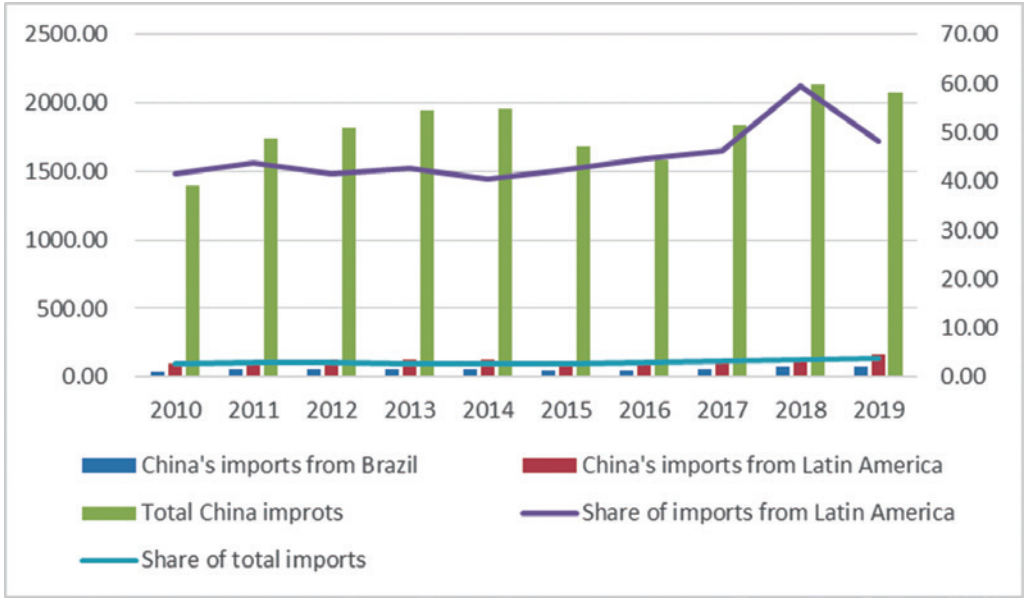

图 1.3 中国自巴西进口及占比（十亿美元，%）

资料来源：2010–2018 年联合国商品贸易统计数据库，2014–2019 年中国海关统计，2011–2014 年《中国统计年鉴》。

1.1.3 中国与巴西贸易平衡情况

中国对巴西长期保持贸易逆差，且逆差持续扩大。2019 年，中国从巴西进口额几乎达到对巴西出口额的两倍，贸易逆差 442.54 亿美元。（见图 1.4）

图 1.4 2010–2019 中巴贸易逆差及同比变化（十亿美元，%）

资料来源：2010–2018 年联合国商品贸易统计数据库，2014–2019 年中国海关统计。

1.2 中国与巴西贸易结构

中巴双边贸易互补性强，中国对巴西主要出口机电设备、光学仪器等工业制成品，巴西则已成为中国进口市场上大豆、鸡肉、牛肉等农产品的最大供应国。

1.2.1 中国对巴西的主要出口产品

2019 年，中国对巴西出口前 20 位的商品占对巴西出口总额的 85.82%。其中主要出口商品包括电机和电气设备、机械及机械器具、有机化学品、船舶以及光学、照相、医疗或外科用设备。这些商品分别占中国对巴西出口总额的 25.41%、13.56%、7.19%、4.80% 和 4.63%（见表 1.1）。

表 1.1　2019 年中国对巴西主要出口商品　（十亿美元，%）

排名	HS	主要出口商品	金额	占比 (%)
1	85	电机和电气设备	9.031	25.41
2	84	机械及机械器具	4.819	13.56
3	29	有机化学品	2.555	7.19
4	89	船舶及浮动结构体	1.707	4.80
5	90	光学、照相、医疗或外科用设备	1.644	4.63
6	87	非铁道车辆	1.443	4.06
7	39	塑料	1.14	3.21
8	54	化学纤维长丝、织物	0.795	2.24
9	95	玩具和运动用品	0.752	2.12
10	94	家具和床上用品	0.735	2.07
11	38	杂项化学产品	0.705	1.98
12	73	钢铁制品	0.703	1.98
13	42	皮革制品、鞍具、箱包	0.678	1.91
14	61	针织服装	0.664	1.87
15	72	钢铁	0.595	1.67
16	31	肥料	0.592	1.67
17	55	化学纤维短纤	0.534	1.50
18	40	橡胶	0.507	1.43
19	62	机织服装	0.485	1.36
20	76	铝	0.413	1.16
合计				85.82

资料来源：中国海关总署，2019 年 12 月对部分国家（地区）出口商品类章金额表（美元值）：http://www.customs.gov.cn/customs/302249/302274/302277/302276/2851466/index.html。

从全球范围看，尽管肥料、船舶等产品对巴西出口占中国对全球出口的比重分别达到8.26%和6.97%，但整体而言，中国对巴西出口产品占全球出口比重不高，仍有较大发展空间。以中国第一和第二大出口商品电机和电气设备、机械及机械器具为例，2019年，中国这两种产品对巴西的出口约占对巴西出口总额的1/4和1/7，但仅分别占中国出口总额的1.35%和1.16%。（见图1.5）

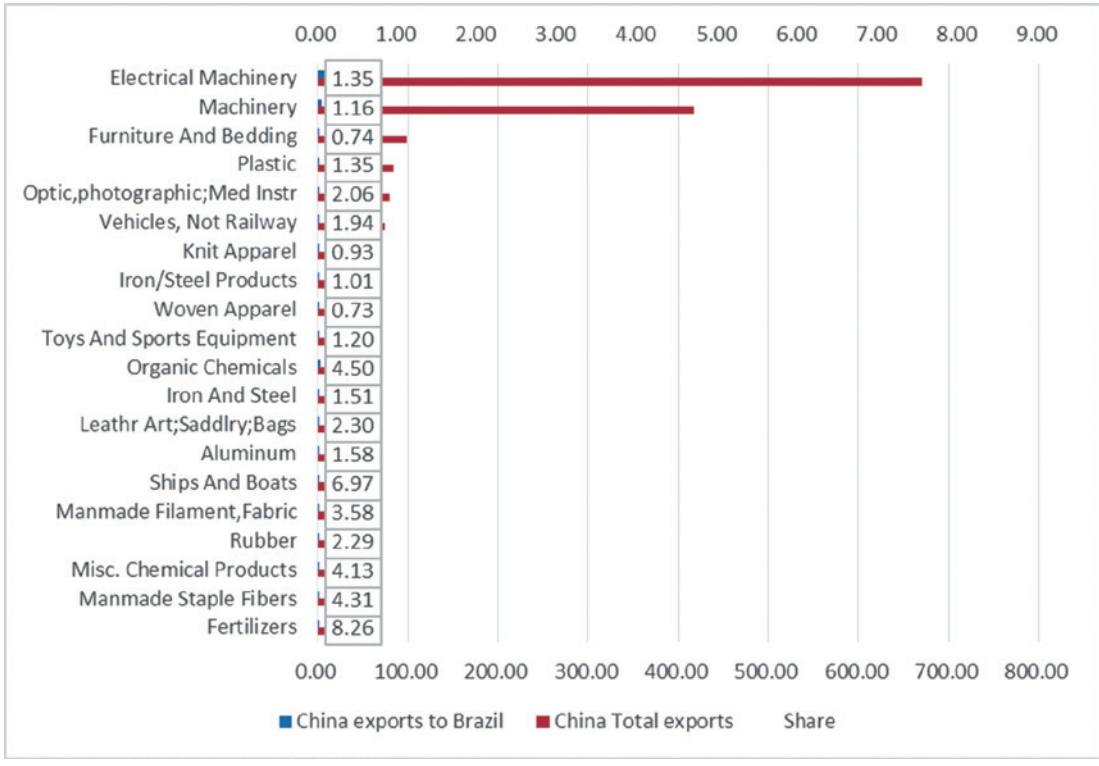

图1.5 2019年中国对巴西主要出口商品及占比（十亿美元，%）

资料来源：中国海关总署，2019年12月对部分国家（地区）出口商品类章金额表（美元值）：http://www.customs.gov.cn/customs/302249/302274/302277/302276/2851466/index.html
中国海关总署，2019年12月进出口商品类章总值表（美元值）：http://www.customs.gov.cn/customs/302249/302274/302277/302276/2851406/index.html

据巴方统计，中国是巴西第一大进口来源国。尽管双方统计数字略有不同，但双边贸易的结构和模式是一样的。2019年，巴西从中国进口352.71亿美元，同比增长2%，占巴西进口总额的21%。巴西自中国进口的前20大产品占自中国进口总额的88.09%。（见表1.2）

表 1.2 2019 年巴西从中国进口的主要商品 （十亿美元，%）

排名	HS	主要进口商品	金额	占比 (%)
1	85	电机和电气设备	10.708	30.36
2	84	机械及机械器具	4.973	14.10
3	29	有机化学品	3.003	8.51
4	89	船舶	2.116	6.00
5	87	非铁道车辆	1.111	3.15
6	39	塑料	1.028	2.92
7	90	光学、照相设备	0.871	2.47
8	54	化学纤维长丝、织物	0.761	2.16
9	38	杂项化学产品	0.728	2.06
10	72	钢铁	0.724	2.05
11	31	肥料	0.708	2.01
12	73	钢铁制品	0.678	1.92
13	40	橡胶	0.553	1.57
14	94	家具和床上用品	0.509	1.44
15	61	针织服装	0.478	1.35
16	95	玩具和运动用品	0.46	1.30
17	55	化学纤维短纤	0.451	1.28
18	62	机织服装	0.438	1.24
19	76	铝	0.424	1.20
20	60	针织、钩编织物	0.352	1.00
合计				88.09

资料来源：巴西外贸秘书处（经济部）。

从全球范围看，机电产品、机械设备、有机化学品和船舶等既是巴西从全球进口的主要商品，也是从中国进口的主要商品。2019 年，巴西自中国进口上述产品占其自华进口额比重的 30.36%、14.10%、8.51% 和 6.00%；占其全球进口额比重分别为 48.49%、23.35%、27.39% 和 46.07%。此外，中国的家具、玩具、床上用品和纺织产品在巴市场也很有竞争力，占其全球进口额比重均超过 50%。

另一方面，药品、化肥、杂项贱金属制品是巴西的主要进口产品。但是 2019 年，巴西从中国进口上述产品分别仅占其全球进口份额的 0.40%、7.74% 和 4.76%，表明这些产品在巴西市场仍有较大发展空间。（见图 1.6）

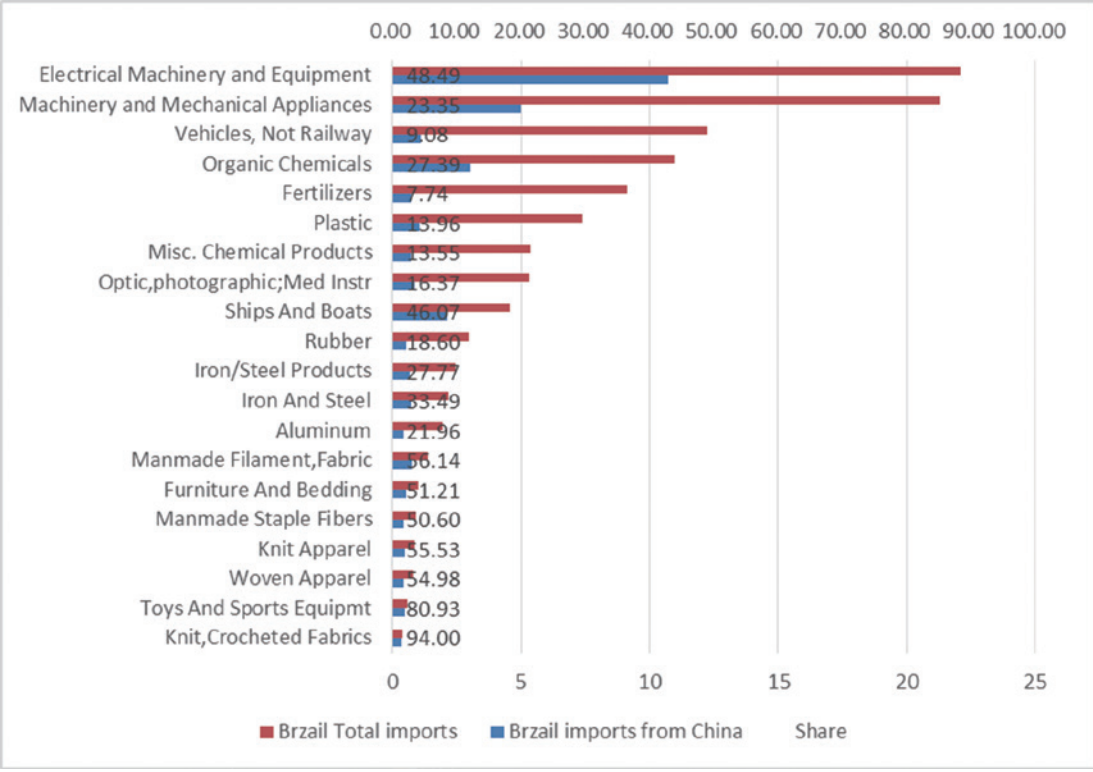

图 1.6 2019 年巴西从中国进口的主要商品及占比（十亿美元，%）

资料来源：巴西外贸秘书处（经济部）。

1.2.2 中国从巴西进口的主要产品

巴西石油、矿产、林业等资源丰富，农牧业条件得天独厚。咖啡、可可、大豆、甘蔗、玉米、牛肉、鸡肉等农牧产品产量居世界前列。中国主要从巴西进口矿产品、大豆、肉类等产品。巴西现已成为中国进口市场上大豆、鸡肉、牛肉等农产品的最大供应国。2019 年，中国自巴西进口前 20 位的商品占其自巴西进口总额的 99.28%。其中，重点商品为矿砂、矿渣及矿灰、油籽、矿物燃料、肉类和木浆，分别占自巴西进口总额的 29.53%、28.85%、23.86%、5.04% 和 4.97%。（见表 1.3）

表 1.3　2019 年中国从巴西进口的主要商品 （十亿美元，%）

排名	HS	主要进口商品	金额	占比 (%)
1	26	矿砂、矿渣及矿灰	23.563	29.53
2	12	含油子仁及果实；杂项子仁及果实	23.019	28.85
3	27	矿物燃料、矿物油等	19.039	23.86
4	02	肉	4.025	5.04
5	47	木浆等	3.964	4.97
6	72	钢铁	1.327	1.66
7	52	棉花	0.93	1.17
8	24	烟草	0.505	0.63
9	17	糖类	0.437	0.55
10	41	生皮	0.408	0.51
11	74	铜及其制品	0.314	0.39
12	84	机械及机械器具	0.293	0.37
13	15	油脂	0.292	0.37
14	44	木及木制品	0.24	0.30
15	29	有机化学品	0.212	0.27
16	39	塑料	0.211	0.26
17	25	盐；硫磺；土及石料	0.189	0.24
18	20	腌制食品	0.131	0.16
19	71	珠宝、贵金属	0.06	0.08
20	48	纸及纸板	0.059	0.07
合计				99.28

资料来源：中国海关总署，2019 年 12 月自部分国家（地区）进口商品类章金额表（美元值）： http://www.customs.gov.cn/customs/302249/302274/302277/302276/2851472/index.html.

从全球范围看，中国从巴西进口的主要商品在其全球进口中占比较高。中国是巴西农产品第一大进口国，其中尤以进口油籽类产品为主。2019 年，中国进口巴西油籽产品占中国该产品全球进口总额的 57.44%。此外，2019 年，中国从巴西进口的糖和烟草制品占其全球进口量的 1/4 以上，进口的巴西木浆和肉制品占其全球进口量的 1/5 以上。矿砂、矿渣及矿灰、皮革、棉花等产品均占中国全球进口量的 1/10 以上，表明上述产品在中国市场具有较强竞争力。（见图 1.7）

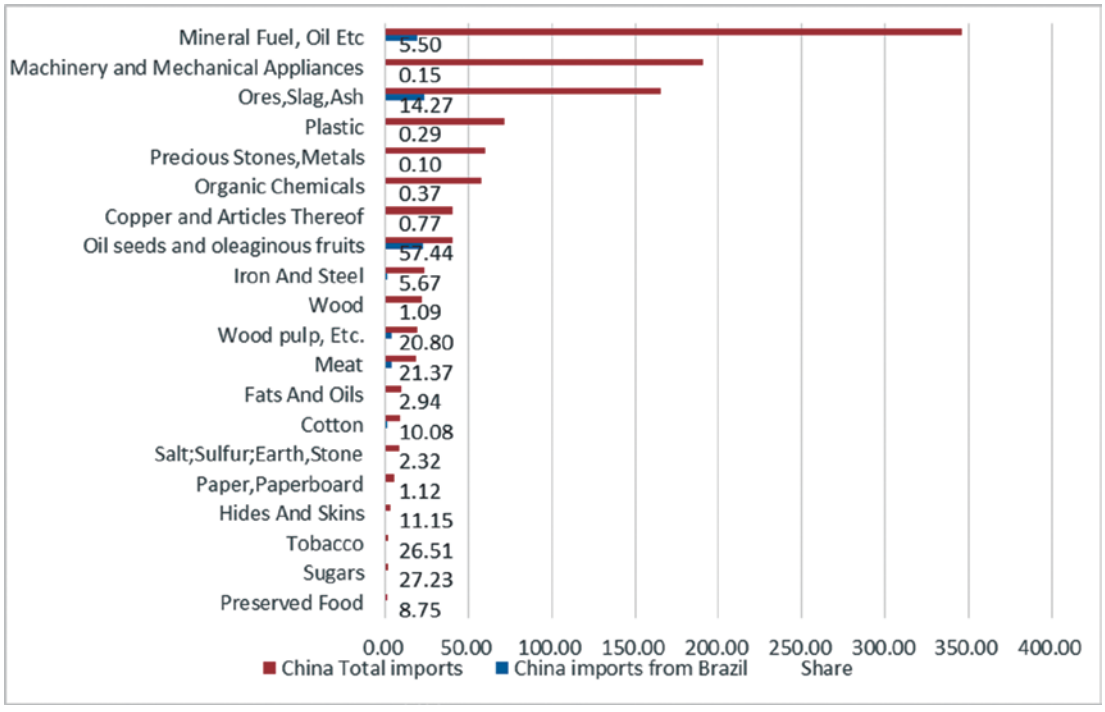

图 1.7 2019 年中国从巴西进口的主要商品及占比（十亿美元，%）

资料来源：中国海关总署 2019 年 12 月自部分国家（地区）进口商品类章金额表（美元值）：http://www.customs.gov.cn/customs/302249/302274/302277/302276/2851472/index.html
中国海关总署 2019 年 12 月进出口商品类章总值表（美元值）：http://www.customs.gov.cn/customs/302249/302274/302277/302276/2851406/index.html

据巴方统计，中国是巴西最大的出口市场。2019 年，巴西对华出口 633.58 亿美元，占巴西出口总额的 28.11%。截至 2020 年 8 月的数据显示，巴西产品在中国的市场份额正在快速增长。巴西对华出口排名前 20 位的产品占对华出口总额的 99.23%。（见表 1.4）

表 1.4 2019 年巴西对中国主要出口商品 （十亿美元，%）

排名	HS	主要出口商品	金额	比重 (%)
1	12	含油子仁及果实；杂项子仁及果实实	20.453	32.28
2	27	矿物燃料、矿物油等	15.519	24.49
3	26	矿砂、矿渣及矿灰	14.398	22.73
4	02	肉	4.545	7.17
5	47	木浆等	3.250	5.13
6	72	钢铁	1.227	1.94
7	52	棉花	0.821	1.30
8	17	糖类	0.391	0.62
9	24	烟草	0.386	0.61
10	41	生皮	0.290	0.46
11	74	铜及其制品	0.275	0.43
12	15	油脂	0.256	0.40
13	84	机械及机械器具	0.214	0.34
14	39	塑料	0.187	0.30
15	44	木材	0.175	0.28
16	25	盐；硫磺；土及石料	0.141	0.22
17	29	有机化学品	0.141	0.22
18	20	腌制食品	0.077	0.12
19	85	电机和电气设备	0.063	0.10
20	48	纸及纸板	0.056	0.09
合计				99.23

资料来源：巴西外贸秘书处（经济部）。

从全球范围看，油籽、矿物燃料、矿砂、矿渣及矿灰、肉类和木浆不仅是巴西对世界的主要出口产品，也是对中国的主要出口产品。2019 年，巴西上述产品对华出口分别占其对华总出口额的 32.28%、24.49%、22.73%、7.17%、5.13%；在巴西全球出口中，上述产品占比分别为 77.42%、51.20%、55.73%、29.70%、43.47%。

另一方面，巴西工业实力位居拉美国家前列，钢铁、汽车等工业基础较为雄厚。然而，机械、车辆等巴西主要出口产品对华出口占比不高，在中国市场有较大开辟空间。2019 年，巴西前述产品对华出口仅占其全球出口比重的 1.7% 和 0.9%，仍有很大发展潜力。（见图 1.8）

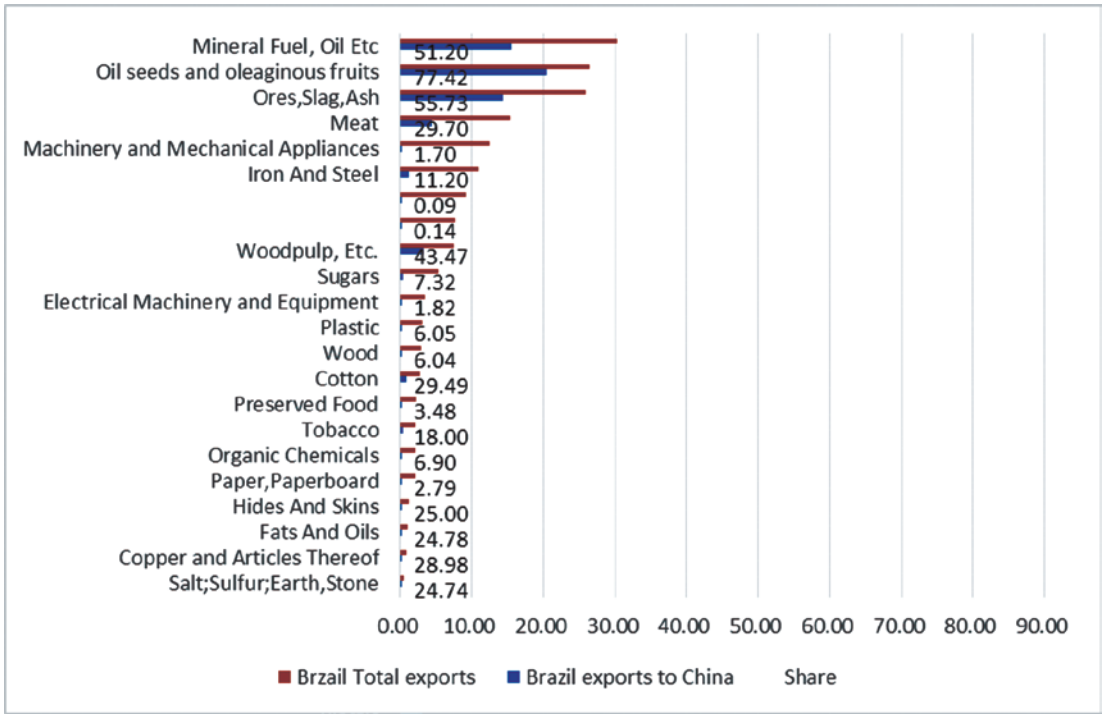

图 1.8 2019 年巴西对中国主要出口商品及占比（十亿美元，%）

资料来源：巴西外贸秘书处（经济部）。

二、建模分析

为了研究中巴自贸协定的动态效应，我们使用了 Ianchovichina 和 McDougall 开发的递归动态可计算的一般均衡（CGE）模型（GTAP-Dyn 或 Gdyn）[①]。GTAP-Dyn 模型保留了标准 GTAP 模型的框架[②]，同时包含了国际资本流动、资本积累和适应性投资预期理论。结合 Gdyn 模型，我们利用 GTAP 10 数据库，参考年份为 2014 年，将 141 个区域和 65 个部门汇总为 3 个区域（中国、巴西和世界其他国家和地区）和 24 个部门（见附录 1）。

2.1 模型描述

2.1.1 GTAP 模式的总体优势

GTAP 模型由美国普渡大学开发，是根据新古典经济理论设计的多地区多部门的可计算一般均衡模型。一般均衡理论把经济系统看作一个整体，研究整个经济各要素之间的相互作用和相互关系。

GTAP 模型是目前全球贸易分析模型中最值得推荐的模型，原因有三： 第一，包含并整理了不同国家的投入产出、关税数据等大量数据，帮助研究人员节省时间；第二，与一般的计量分析方法相比，GTAP 是一种预分析方法，可以综合考虑各种经济政策变量，为经济系统中各部门设定政策变量，考察各种政策同时实施的效果，这是其他研究方法所不具备的。第三，GTAP 模型对政策定量分析具有良好效果，能够为政策选择和决策提供具体准确的建议。

2.1.2 GTAP 模型在其他国家的应用

国外学者广泛运用 GTAP 模型对双边贸易自由化效应进行一般均衡研究。研究对象多为发达国家，研究目的是定量分析自贸区对成员国整体经济和个别部门的影响。国外学者对欧盟、日本、韩国等地区建立自贸区的政策效应进行了大量研究，研究成果丰硕。

Stephan Von Cramon-Taubadel、Sebastian Hess 和 Bernhard Brummer（2010）对欧盟 - 乌克兰自贸区进行了初步分析。实证分析表明，自贸区建立后，乌克兰资源配置效率提高，小麦、其他粮食作物和油料作物产量增加；乌克兰对俄出口增加，价格下跌，贸易条件恶化；乌

① Ianchovichina, E., & McDougall, R. (2012). Theoretical structure of Dynamic GTAP. Dynamic modeling and applications for global economic analysis, 13–70。

② Hertel, T. W. (1997). Global trade analysis: modeling and applications. Cambridge university press.

克兰的农产品进口也有所增加。

Joseph F. Francois（2005）等人使用 GTAP 模型评估了欧盟与发展中国家之间贸易自由化的经济效应。研究结果表明，自贸区建立后，发展中国家现有出口水平仅略有变化，欧盟发达国家现有出口水平大幅提高，而且欧盟从自贸区获得了更多福利效应。

Inkyo Cheong（2002）和 Tomoyoshi Nakajima（2002）研究了日韩自贸区对两国整体经济的影响以及对各产业贸易平衡的影响。前一种模拟证明，自贸区建立后，日韩两国的国民福利将显著上升，韩国的产业结构也不会遭到破坏。后一种研究采取了部门角度，通过分析证明，自贸区成立后，日本贸易平衡改善最大的是机械设备部门，其次是金属制品、其他制成品和电子设备部门，其他部门则有所恶化。韩国贸易平衡改善最大的是加工食品部门，其次是纺织品和服装，机械设备部门负扭曲程度最大。

Boot Sumran Tawan（2005）分析了泰国与日本、澳大利亚、新西兰、中国以及东盟、欧盟、北美等国家或地区建立自贸区的经济影响。实证分析表明，所有与泰国建立自贸区的国家都会受益。此外，建立自贸区还可以提高生产效率，推动经济增长。

上述研究均采用比较静态分析方法，即在不考虑经济如何发展的情况下，比较不同政策可能对经济产生的不同效应。分析结果只是相对于模拟基期的静态变化。

Thomas W. Hertel、Terrie Walmsley 和 Ken Itakura（2001）使用动态 GTAP 模型（GDyn 模型）来分析日本 - 新加坡自贸区的短期和长期影响，发现自贸区对投资、资本积累和经济增长的影响比较显著，这一点在新加坡尤为明显。

Brian Mureverwi1（2016）使用动态 GTAP 模型模拟了非洲大陆自贸区（CFTA）全面关税自由化的福利效应，发现建立自贸区后，许多非洲经济体的福利将有不同程度的改善。GTAP 模拟结果显示，非洲大陆自贸区将创造更多的就业机会，提高投资和竞争力。但是，因为非洲内部贸易的全面关税自由化，许多非洲国家将遭受收入损失。

Martin H. Thelle 和 Eva R. Sunesen（2011 年）使用 GTAP 模型评估欧盟 - 南方共同市场自贸区对欧盟贸易和投资的影响。研究结果表明，自贸区的建立将对欧盟经济整体产生积极影响，但是，由于产业间存在较大差异，欧盟具有全球竞争力的产业将获利最多，该自贸区还可大大提高欧盟高新技术产业的发展潜力。

2.1.3 GTAP 模型在中国的应用

中国学者对中国与贸易伙伴国签订的双边自贸协定的政策效应进行了广泛的实证研究。相关研究大多采用递归动态方法，即考虑贸易政策和经济变量是不断变化的动态过程。多数研究

将 GTAP 数据库中人口、GDP、非熟练劳动力、熟练劳动力、自然禀赋等变量的变化引入目标年份，以此为新的基准进行政策模拟，使模拟程序更接近现实。

魏巍和魏超（2009）认为，中韩自贸区是实现未来中日韩自贸区的突破口。利用动态 GTAP 模型进行实证模拟，结果表明，中韩自贸区将对两国 GDP、经济福利、贸易条件和进出口总量产生正面积极的影响。

李丽等人（2008）对中国 - 新西兰自贸区的建立对双方经济的影响进行了定量分析。实证研究表明，自贸区建立后，中新两国产品将实现优势互补，中新贸易规模将有所扩大；中国出口将大幅增长，新西兰进口将大幅增长。两国之间的贸易平衡及贸易条件呈反向变动。李丽等人还就中印自贸区的建立对中国和世界经济的影响做了研究，模拟了四种可能的情况。通过比较 GDP、福利水平、进出口额、贸易差额和贸易条件，他们认为中国应努力建立中印自贸区或中印澳自贸区。

杨军、黄季焜和仇焕广（2005）利用 GTAP 模型分析了中澳自贸区的政策效应。他们认为，中澳自贸区的建立可以促进中澳双边贸易发展，改善两国经济福利，推动两国产业部门调整结构。澳大利亚的工业和农业都将受益，农业部门所得利益大于工业部门，中国所得利益全部来自劳动力密集型的工业部门，而农业部门会受到一定的冲击。

2.2 中国 – 巴西自贸协定降低关税的情境设定

为考察中巴自贸协定的动态效应，我们采用 Gdyn 模型，结合 GTAP 10 数据库，将数据库中的 141 个地区和 65 个部门汇总为 3 个地区和 24 个部门（见附录 8）。

表 2.1 显示了根据 GTAP 10 数据库估计的双边进口关税。中国收取关税最高的自巴西进口产品类别是服装（15.9%）、食品（10.5%）和其他制造业（10.6%）。巴西的关税水平高于中国。巴西收取关税最高的自中国进口产品类别是服装（34%）、皮革（28.1%）、纺织品和服装（24.6%）。中国针对自巴西进口产品的关税税率大都低于 10%，而巴西 24 个部门中有 13 个部门的关税税率高于 10%。模拟采用渐进减税，即每两年以相等的比例逐步减少贸易扭曲，共分五轮（2021-2031 年）。

两个基线（正常增长情况和低增长情况[①]）的构建使用了以下变量：实际国内生产总值、人口和熟练 / 非熟练劳动力。对每一基线考察三种情况：全面自由化（S1）、中国 - 东盟自贸

① Maliszewska 等人（2020 年）预测，全球疫情将冲击所有国家：全球大流行的基线假设是，全球 GDP 比基线下降 2%，发展中国家下降 2.5%，工业国家下降 1.8%。而且全球疫情将呈波浪式发展，持续 12—36 个月。

区水平（S2）和南方共同市场 - 欧盟自贸区水平（S3），其中全面自由化意味着从 2014 年起消除中巴双边贸易中的所有扭曲行为，而其他两种情况则分别对应取消双方 93% 和 91% 的商品关税。由于全球疫情可能会持续较长时间，我们只保留了六种情况中的四种进行讨论。（见表 2.2）值得指出的是，在两个基准下得出的结果大多无非常显著的差异，原因在于这些结果为较基准的偏离数值。但如果考察一些变量的绝对水平数值，则会发现诸多不同。

表 2.1 中巴货物贸易当前关税水平（%）

部门	中国[a]	巴西[b]
农业	2.97	11.1
粮食产品	10.5	9.84
矿物开采	0.004	3.59
化工、橡胶和塑料	5.36	6.71
基本医药产品	5.01	4.91
橡胶和塑料制品	8.59	15
电气设备	7.24	15.7
机械设备	7.06	10.9
石油和天然气	0	0
石油衍生物	4.02	0.269
电子设备	2.18	9.09
运输设备	3.15	15.4
纺织品和服装	8.92	24.6
黑色金属	1.25	12.2
机动车辆及零部件	6.72	19
纸浆和纸张	0.226	11.4
金属制品和其他未分类商品	1.02	15.1
木制品	0.497	12.4
穿戴物	15.9	34
皮革制品	5.15	28.1
其他制造业	10.6	19.7
公用事业和建筑	0	0
运输和通讯	0	0
其他服务	0	0

[a] 中国对自巴西进口商品征收的关税。

[b] 巴西对自中国进口商品征收的关税。

资料来源：Purdue University (2019), GTAP database version 10。

表 2.2　GTAP 中的中巴自贸协定模拟设计

	基线	
情境设定	正常增长（B1）	低增长（B2）
I [a]	B1S1	
II [a]		B2S1
III [b]		B2S2
IV [c]		B2S3

[a] 全面自由化。

[b] 中国－东盟自贸区水平：取消 93% 的商品税补。

[c] 南共市－欧盟自贸协定水平：取消 91% 的商品税补。

2.3 数据

构建基准使用的历史数据和预测数据主要来自经济学人智库（EIU）[①]和法国国际预测研究中心数据库（CEPII）[②]。

表 2.3 GDP 增长率预测

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
I	中国	6.0	6.3	6.3	6.3	6.3	6.1	6.1	5.9	5.9	5.7	5.7
	巴西	2.7	2.7	2.7	2.6	2.6	2.5	2.5	2.4	2.4	2.4	2.4
II	中国	3.5	3.8	6.3	6.3	6.3	6.1	6.1	5.9	5.9	5.7	5.7
	巴西	0.2	0.2	2.7	2.6	2.6	2.5	2.5	2.4	2.4	2.4	2.4

资料来源：CEPII 和作者计算。

注意：I&II 为对正常增长 (B1) 和低增长 (B2) 的预测。

2.4 建模过程和结果

本部分采用动态 GTAP 模型评估中巴自贸协定未来十年的潜在经济效应，从宏观经济效应、部门效应、双边贸易效应和福利变化四个方面报告中巴自贸协定的 GTAP 模拟结果。数值结果均为对基准情形的偏离，以考虑关税削减带来的具体影响。

研究发现，中巴自贸协定对经济增长、部门表现、贸易扩张和福利收益有积极且显著的影响，对出口和进口有巨大促进作用，中国和巴西将从自贸协定中获益。虽然中国的福利收益是巴西的四倍以上，但这与两国的经济规模比例基本一致。

① https://eiu.bvdep.com/frame.html

② http://www.cepii.fr/cepii/en/bdd_modele/bdd.asp

三、结果分析

3.1 对宏观经济和不同部门的影响

3.1.1 宏观经济影响

表 3.1 概述了中巴自贸协定的宏观经济影响。首先，研究结果表明，中巴自贸协定将对中国和巴西的经济增长产生正向影响，巴西的实际 GDP 增长率较高，约为 0.5%，而中国的实际 GDP 增长率不到 0.1%。较大经济体的相对收益较低，这也跟预期一致。此外，两国全面自由化（情境一和情境二）的 GDP 增长率略高于部分自由化（情境三和情境四）的增长率。

表 3.1 四种情境下中巴自贸协定的宏观经济效应

宏观经济变量	中国				巴西			
	情境 I	情境 II	情境 III	情境 IV	情境 I	情境 II	情境 III	情境 IV
实际 GDP (%)	0.09	0.09	0.09	0.08	0.57	0.55	0.51	0.48
出口量 (%)	0.29	0.27	0.23	0.21	7.03	6.93	5.96	5.15
进口量 (%)	1	1.02	0.9	0.82	10.68	10.34	9.09	8.15
贸易条件 (%)	0.27	0.27	0.25	0.23	0.3	0.31	0.33	0.32
贸易平衡（百万美元）	-10277.6	-11914.3	-10751.5	-9874.4	-21865.7	-19869.5	-17987.5	-16993.3
福利 - 等价变化								
（百万美元）	23639.1	22359.8	23528.5	18813.6	5153.9	4761.2	5309.9	5012.0
(% of GDP)	0.14	0.14	0.12	0.11	0.1	0.09	0.11	0.12

资料来源：Rundynam 软件模拟。

其次，中巴自贸协定对巴西贸易的影响大于对中国的影响。巴西在不同情境下的出口增长幅度为 5.15%-7.03%，进口增长幅度则更大，达到 8.15%-10.68%。四种情境对中国贸易的影响相对较小（出口增长幅度在 0.21% 至 0.29% 之间，进口在 0.82% 至 1% 之间）。中国和巴西的进口增速均高于出口增速，贸易条件均有所改善。但中国和巴西的整体贸易收支都受到负面影响。

福利净收益一般用等价变化来衡量[①]。表 3.1 显示，中国和巴西都有等价变化的正收益，表明中巴自贸协定将为两国带来经济福利改善（约占两国 GDP 的 0.1%）。情境一和情境二

① GDyn 模型中的福利分解涉及 Walmsley 等人（2012）描述的比较静态模拟。

下等价变化间的差异，表明全球疫情造成产出下降，福利有所损失。值得注意的是，在三种低增长情境中，第三种情境获得的福利最多，而不是第二种。在所有四种情境中，中国的福利净收益约为巴西的 3.75~4.7 倍。

3.1.2 部门影响

表 3.2 显示了中巴自贸协定给两国不同部门带来的产出效应，即相对于 2021 年初始产出水平的数量变化百分比。就巴西而言，运输设备的产出有最大改善，其次是公用事业和建筑、机动车辆和零部件、纸浆和纸张以及皮革产品，但电子设备、穿戴物、纺织品和服装的产出则出现重大下降。根据模拟结果，巴西 24 个部门中有 10 个部门的情况恶化，商品相关部门的产出明显增长（汽车零部件除外），劳动密集型部门以及技术更为先进的制造业的产出则明显下降。

在中国，各部门的改善和恶化都相对较小，在所有情境下，得到改善的部门包括运输设备、机械、公用事业和建筑、纺织品和服装以及机动车辆和零部件，24 个部门中有 8 个部门出现恶化。鉴于表 3.2 表示均为相对于基准的变化数值，表中负值并不意味着最终实际数值的减少。

表 3.2　四种情境下各部门产出变动估计（%）

部门	情境一		情境二		情境三		情境四	
	中国	巴西	中国	巴西	中国	巴西	中国	巴西
农业	-0.19	1.13	-0.18	1.00	-0.17	0.90	-0.14	0.77
粮食产品	-0.10	0.50	-0.09	0.43	-0.07	0.31	-0.06	0.31
矿物开采	0.04	1.72	0.06	1.60	0.05	1.41	0.04	1.25
化工，橡胶和塑料	0.09	-0.25	0.09	-0.34	0.08	-0.37	0.11	-0.62
基本医药产品	-0.03	1.03	-0.03	1.15	-0.02	0.99	-0.01	0.80
橡胶和塑料制品	0.10	-0.49	0.10	-0.47	0.08	-0.42	0.12	-0.71
机械设备	0.34	-0.48	0.36	-0.40	0.32	-0.38	0.38	-1.58
石油和天然气	-0.01	-0.59	-0.01	-0.58	-0.01	-0.52	-0.01	-0.46
石油衍生物	0.24	-0.06	0.25	-0.10	0.22	-0.08	0.19	-0.03
电子设备	-0.23	-2.02	-0.25	-2.10	-0.21	-1.94	-0.11	-2.83
运输设备	0.57	4.30	0.59	4.42	0.52	3.75	0.30	3.53
纺织品和服装	0.27	-14.64	0.26	-14.72	0.22	-13.07	0.12	-10.67
黑色金属	0.25	0.76	0.26	0.88	0.23	0.71	0.23	0.31
机动车辆及零部件	0.26	3.05	0.29	3.07	0.25	2.64	0.19	2.54
纸浆和纸张	-0.19	2.57	-0.18	2.52	-0.15	2.10	-0.13	1.89
金属制品和和其他未分类商品	0.13	0.54	0.13	0.68	0.12	0.56	0.06	0.99
木制品	-0.04	1.24	-0.04	1.24	-0.03	1.05	-0.03	0.99
穿戴物	0.17	-10.65	0.17	-10.77	0.13	-9.33	-0.01	-6.33
皮革制品	-0.06	2.07	-0.03	1.33	-0.05	1.56	-0.20	3.04
其他制造业	0.22	-1.80	0.24	-1.95	0.21	-1.65	0.15	-0.97
公用事业和建筑	0.32	3.05	0.36	2.95	0.32	2.66	0.30	2.51
运输和通讯	0.04	0.59	0.04	0.58	0.04	0.52	0.04	0.48
其他服务	0.04	0.28	0.04	0.31	0.04	0.29	0.04	0.26

资料来源：Rundynam 软件模拟。

3.2 对双边贸易的影响

中巴自贸协定引起的双边贸易流量累计变化见表 3.3。表 3.3 显示，除油气开采和服务相关部门外，所有其他部门都将从中巴自贸协定中获益。中国从贸易量上受益最大的部门包括石油和天然气、石油衍生品、汽车及零部件。巴西则在穿戴物、电子设备、纺织品和服装等部门的销量增长最快。

通常认为双边贸易自由化将导致贸易转移效应，即各部门双边贸易的增长很可能导致与第三方国家贸易流量的下降。

表 3.3　四种情境下的部门双边出口量累计变化（%）

部门	情境一		情境二		情境三		情境四	
	ECB	EBC	ECB	EBC	ECB	EBC	ECB	EBC
农业	60.1	21.6	59.5	21.5	52.6	20.4	58.7	17.4
粮食产品	50.4	61.9	50.0	62.1	44.5	51.1	50.4	48.0
矿物提取	55.4	6.7	55.6	6.7	49.6	6.0	47.1	5.4
化工、橡胶和塑料	55.1	80.6	53.5	81.4	47.9	71.9	50.9	62.7
基本医药产品	55.5	78.5	55.3	79.6	49.5	74.4	51.6	60.8
橡胶和塑料制品	120.7	124.9	119.7	126.4	105.0	118.4	116.5	94.6
电气设备	91.8	219.0	92.4	221.3	82.9	200.2	61.8	156.0
机械设备	102.2	179.3	102.8	181.1	91.5	166.7	98.9	131.3
石油和天然气	752.5	-0.7	750.9	-0.5	610.4	-0.4	499.5	-0.5
石油衍生物	227.9	147.9	229.5	148.5	197.4	98.0	171.8	110.6
电子设备	54.2	144.5	53.3	146.4	48.3	129.3	52.7	110.6
运输设备	141.0	106.2	142.2	107.3	125.5	96.6	90.0	75.6
纺织品和服装	97.1	202.1	94.9	204.6	84.8	188.4	74.0	144.2
黑色金属	76.4	46.5	77.6	46.8	68.9	42.2	75.6	36.8
机动车辆及零部件	180.3	121.6	179.9	122.6	153.5	52.9	114.4	91.4
纸浆和纸张	95.9	36.0	95.2	36.7	83.9	30.9	90.6	29.1
金属制品和其他未分类商品	162.9	55.3	163.4	56.2	143.0	50.1	98.3	43.1
木制品	101.6	28.8	100.5	29.2	89.0	25.8	96.4	22.9
穿戴物	160.7	354.1	158.5	358.9	136.9	335.2	94.6	236.8
皮革制品	168.8	128.9	165.7	131.9	143.7	120.6	90.6	96.5
其他制造业	134.7	193.0	133.7	194.4	117.6	182.9	93.1	139.9
公用事业和建筑	-0.6	6.1	-0.9	6.6	-0.7	5.6	-0.4	4.8
运输和通讯	-2.5	3.8	-2.7	4.1	-2.3	3.5	-2.0	2.9
其他服务	-2.6	4.3	-2.8	4.9	-2.4	4.0	-2.1	3.4

注：ECB 指中国对巴西的出口；EBC 指巴西对中国的出口。

资料来源：Rundynam 软件模拟。

3.3 福利分解

国家福利分解结果详见表 3.4，这里采用了等价变化的概念，即货币收入的变化对区域效用产生的影响与政策冲击相同。[①]比较静态方法下的福利分解包括四个部分：（1）分配效率；（2）投资相对于储蓄的价格；（3）贸易条件；（4）资本禀赋所有权。[②]

第一，中国从中巴自贸协定中获得的净福利收益最大，约为巴西福利收益的四倍。中国的收益主要来自积极的贸易条件效应，因为中国出口的产品获得了更高的价格。第二，巴西的配置效率效应与总福利之比最大，反映了巴西在政策模拟前具有较高的贸易保护水平。消除贸易扭曲使资源从效率低但受保护的部门转向效率更高的部门。第三，对投资相对于储蓄的价格产生了负影响，因为两国最初都有贸易顺差。[③]

表 3.4 四种情境下中国 / 巴西的福利分解（百万美元）

	配置效率效应	投资对储蓄的价格	贸易条件效应	资本禀赋所有权	合计
中国					
情境一 (B1S1)	9,454.6	-1,000.3	13,096.2	40.9	21,591.5
情境二 (B2S1)	9,930.1	-1,141.0	13,379.6	191.2	22,359.8
情境三 (B2S2)	9,090.6	-1,012.1	11,902.3	172.6	20,153.4
情境四 (B2S3)	8,473.4	-927.8	11,014.0	254.0	18,813.6
巴西					
情境一 (B1S1)	8,070.1	-4,514.1	-241.1	1,957.9	5,272.8
情境二 (B2S1)	7,756.9	-4,602.5	-464.9	2,071.8	4,761.2
情境三 (B2S2)	7,613.4	-3,943.3	-236.5	1,738.8	5,172.5
情境四 (B2S3)	7,231.8	-3,496.8	-199.7	1,476.7	5,012.0

资料来源：Rundynam 软件模拟。

① Cheong, D. (2010). Methods for ex ante economic evaluation of free trade agreements (No. 52). ADB working paper series on regional economic integration.。

② 我们的模拟和分解方法消除了动态 GTAP 模型的其他 4 个福利来源。

③ 如果国内资本投资回报相对于国外资本投资回报增加，那么初始贸易顺差的国家就遭受了福利损失。

四、结论和建议

4.1 结论

本文采用动态 GTAP 模型框架进行研究，充分考虑国际资本流动、资本积累和投资适应性预期理论，从宏观经济和部门角度系统评估了中巴自贸协定的经济影响。我们发现，中巴自贸协定对中国和巴西的经济增长、部门表现、贸易扩张和福利收益都有积极和显著的影响，对两国的出口和进口促进作用尤其明显，双边贸易流呈现部门分化特征。中国的福利收益较巴西大四倍，这一比例与两国的经济规模相符。我们认为，双方应加大努力，争取尽快达成富有雄心的全面自贸协定。

4.2 建议

为加强和增进双边经贸关系，两国政府将尽快着手开展联合可行性研究，探讨达成中巴自贸协定的可能性。正式的可行性研究不仅可以明确自贸协定对两国的影响，还可以激发利益相关方为双边自贸协定提供更多建议和贡献。在两国政府的主导下，两国智库共同参与，组建联合工作组并开展研究，以便开展更密切的互动交流，扩大收益、化解风险。

中巴自贸协定符合双方的根本和长远利益，有助于深化双方互利合作，实现共同发展，因此，两国应加强互惠互利领域的长期合作。研究表明，如果中巴自贸协定达成，交通运输设备、公用事业和建筑、机动车辆及零部件、纺织品和服装等部门将实现产出和双边贸易量的增加，两国都将从中受益。一旦充分认识到自贸协定带来的积极影响，制造商、生产商、部门协会等相关利益方将积极参与，有助于推动自贸协定的启动进程。同时，双方需要提前讨论可能对部分部门或地区产生的不利影响，建立可行的盈亏平衡机制，减少针对中巴自贸协定的异议。

除消减贸易关税之外，还可以实施其他举措，以推动促进和深化中巴之间的贸易合作，例如：

加强贸易便利化双边合作

中国和巴西将进一步加强合作，落实双方关于世界贸易组织（WTO）《贸易便利化协定》的承诺，满足双边贸易需求。两国政府应扩大合作，提高消除贸易管制和程序障碍的能力，大幅降低跨境贸易成本，并向相关机构、个人或企业及时提供信息。双方应深化海关合作，尤其是简化和统一重点城市双边贸易手续，进而将合作网络延伸到二、三级城市或乡镇。

促进跨境电子商务双边合作

电子商务保持强劲增长，已成为疫情时期全球经济增长的新引擎，中巴双方可以进一步加强对话，深化合作，为双边跨境电子商务贸易营造更好的营商环境。两国开展跨境电商合作，不仅可以提高物流线路和相关基础设施建设的效率，还可以扩大市场机会，降低成本。目前电子商务的国际规则还在形成过程中，中国和巴西的成功实践将为规则制定提供启示，并吸引更多的参与者加入，为未来多元层面的实践提供更好的环境。

加强疫情下的双边海关合作

为最大限度减少疫情对双边贸易的影响，两国政府将结合疫情防控和经济社会发展的需要，采取共同应对措施，突出通关便利化合作。双方海关应根据各自需要，在农产品检验检疫科研基础上，制定具体的临时措施清单，促进信息互通、监管互认、执法合作互助。

本研究具有一定的局限性。由于全球社会经济状况可能因新冠肺炎疫情的演进而发生剧烈变化，本文的基线预测可能无法充分刻画这一大流行病的影响。由于采用了减少贸易扭曲的策略，模拟结果可能不同于传统的只削减关税策略。

根据 GTAP 模型在区域经济一体化政策效应模拟中的优缺点，可以在 Walmsley 递归动态方法的基础上增加额外的静态和动态特征来模拟政策，提高研究精度。此外，GTAP 模型还可以与其他模型相结合进行更详细的研究。例如，GTAP 模型可以与 OEF（牛津经济预测）的全球宏观经济模型相结合，模拟分析全球货物贸易自由化的静态和动态效应。

附录

附录 1　地区汇总

序号	代码	说明	原区域
1	中国	中国（不含香港和台湾）	中国
2	巴西	巴西	巴西
3	世界其他地区	世界其他地区	澳大利亚；新西兰；大洋洲的其余地区；中国香港；日本；韩国；蒙古；中国台湾；东亚其他地区；文莱达鲁萨兰国；柬埔寨；印度尼西亚；老挝人民民主共和国；马来西亚；菲律宾；新加坡；泰国；越南；中国东南亚其他地区；孟加拉国；印度；尼泊尔；巴基斯坦；斯里兰卡；南亚其他地区；加拿大；美利坚合众国；墨西哥；北美其他地区；阿根廷；玻利维亚；智利；哥伦比亚；厄瓜多尔；巴拉圭；秘鲁；乌拉圭；委内瑞拉；南美洲其他地区；哥斯达黎加；危地马拉；洪都拉斯；尼加拉瓜；巴拿马；萨尔瓦多；中美洲其他地区；多米尼加共和国；牙买加；波多黎各；特立尼达和多巴哥；加勒比；奥地利；比利时；保加利亚；克罗地亚；塞浦路斯；捷克共和国；丹麦；爱沙尼亚；芬兰；法国；德国；希腊；匈牙利；爱尔兰；意大利；拉脱维亚；立陶宛；卢森堡；马耳他；荷兰；波兰；葡萄牙；罗马尼亚；斯洛伐克；斯洛文尼亚；西班牙；瑞典；联合王国；瑞士；挪威；欧洲自由贸易联盟的其余部分；阿尔巴尼亚；白俄罗斯；俄罗斯联邦；乌克兰；东欧其他地区；欧洲其他地区；哈萨克斯坦；吉尔吉斯斯坦；塔吉克斯坦；前苏联的其他地区；亚美尼亚；阿塞拜疆；格鲁吉亚；巴林；伊朗伊斯兰共和国；以色列；约旦；科威特；阿曼；卡塔尔；沙特阿拉伯；土耳其；阿拉伯联合酋长国；西亚其他地区；埃及；摩洛哥；突尼斯；北非其余地区；贝宁；布基纳法索；喀麦隆；科特迪瓦；加纳；几内亚；尼日利亚；塞内加尔；多哥；西非其他地区；中非；中南非洲；埃塞俄比亚；肯尼亚；马达加斯加；马拉维；毛里求斯；莫桑比克；卢旺达；坦桑尼亚；乌干达；赞比亚；津巴布韦；非洲东部的其他地区；博茨瓦纳；纳米比亚；南非；南非其他海关；世界其他地区。

资料来源：Purdue University (2019), GTAP database version 10.

附录 2　商品汇总

序号	新建	部门	包括
1	代码	项目内容	原部门
2	农业	农业部门	水稻；小麦；其他谷物；蔬菜、水果、坚果；油料种子；甘蔗、甜菜；植物基纤维；其他农作物；牛、绵羊和山羊；其他动物产品；生牛奶；羊毛、蚕茧；林业；钓鱼
3	食物	粮食产品	牛肉制品；其他肉制品；植物油和脂肪；乳制品；加工过的大米；糖；其它食品；饮料和烟草制品
4	矿产能源	矿物提取	煤；其他矿产品
5	化学	化工、橡胶和塑料	化学产品
6	医药	基本医药产品	基本医药产品
7	香蕉	橡胶和塑料制品	橡胶和塑料制品
8	电气	电气设备	电气设备
9	机械	机器设备	其他机械设备
10	油气	石油和天然气	石油；煤气
11	石油产品	石油衍生物	石油、煤炭产品
12	电子	电子设备	计算机、电子和光学
13	运输	运输设备	运输设备
14	纺织	纺织品和服装	纺织品
15	黑色金属	黑色金属	黑色金属
16	机动车	机动车辆及零部件	机动车辆及零部件
17	纸浆	纸浆和纸张	纸制品、出版用品
18	金属	金属制品	金属；金属制品
19	木材	木制品	木制品
20	穿戴	穿戴物	服饰
21	皮革	皮革制品	皮革制品
22	制造业	其他制造业	其他矿产品；其他制造业
23	公用事业等	公用事业和建筑	电力；燃气生产、分配；水；建筑。
24	运输通讯	运输和通讯	贸易；住宿、餐饮和服务；其他运输；水运；空运；仓储和支持活动；通讯
	其他	其他服务	其他金融服务；保险；房地产活动；其他商业服务；娱乐和其他服务；公共管理与国防；教育；人类健康和社会工作；住宅。