LATES
LABORATÓRIO DE ANÁLISES TERRITORIAIS E SETORIAIS
Territorial and Sectorial Analysis Laboratory

TEXTO PARA DISCUSSÃO

Nº 01-2021

Does China's business matter to South America?

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Juiz de Fora
2021

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TEXTO PARA DISCUSSÃO Nº 02-2017

DOES CHINA'S BUSINESS MATTER FOR SOUTH AMERICA?

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Laboratório de Análises Territoriais e Setoriais

PEROBELLI, Fernando Salgueiro; VALE, Vinicius de Almeida, SALGUEIRO, Guilherme Perobelli. **Does China's business matter to South America?** Texto para discussão nº 01-2021. Laboratório de Análises Territoriais e Setoriais (LATES), Programa de Pós-Graduação em Economia, Universidade Federal de Juiz de Fora, Juiz de Fora, 2021.

SUMÁRIO

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ABSTRACT

The imports from China by South American countries have been increased significantly in the last decade. From the consumers' perspective, it represents a benefit since there have been more low-cost goods available. However, from the producers' perspective, the import penetration increases the competition, and it has been led to a substitution effect in favor of Chinese goods. In this context, this paper aims to explore the channels of interactions between China and South American countries. We explore the changes in China's traded goods prices through a global computable general equilibrium (GTAP) which considers some South American countries (Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, and Venezuela), China, and Rest of the World. The paper contributes to the debate by implementing a systemic analysis considering the impacts of the Chinese expansion on the productive structure and export specialization, dealing with the complementarity between the exports of primary products - especially concentrated in iron ore, copper, and soybeans - and diversified import of industrial goods. We observe that there is an unbalanced relationship between China and South America and that China can compete with South American countries in a third country situation, mainly in European Union and the United States.

Keywords: South America; China; Trade relations; Applied General Equilibrium Analysis.
JEL Code: F14; F17; C68; D58.

1 Introduction

The imports from China by South American countries have been increased significantly in the last decade. Observing the GTAP bilateral time series trade data, the share of imports from China by South America was 1.92% in 1995 and 17.1% in 2014. This share in 2014 was equivalent to 21.84% in Chile, 20.58% in Paraguay, 19.03% in Peru, 18.38% in Uruguay, 16,87% in Colombia, and 16.37% in Brazil. On one hand, from the consumers' perspective, it represents a benefit since there have been more low-cost goods available. On the other hand, from the producers' perspective, the import penetration increases the competition, and it has been led to a substitution effect in favor of Chinese goods.

Although the direct effects are significant, the main concern in South America is related to the indirect effects. The Chinese goods compete with some export goods from South America, particularly those to developed countries. There is also a concern about the diversion of investment from South America to China. Further, the effects in the world commodities prices are also common, which has a positive effect on those countries which are the major exporters of these commodities.

Thus, the direct effect of the expansion of China's business is the increasing opportunities for exports to China. This has effects upon the prices and export volumes. The second effect is related to the substitution of Chinese exports for its trading partners' products, both in their own and third-country markets. The increase in the export volumes is linked to the similarity of export commodities between China and its developing country partners, the more similar they are, the stronger is the substitution effect. The impact on terms of trade between primary commodities and labor-intensive manufactured goods related to the role of China in international trade is another important issue to be considered (Jenkins *et al.*, 2008). On one side, the increase in Chinese demand for agricultural and mineral products has been impacted the prices for primary commodities. On the other side, the massive growth of Chinese production of labor-intensive goods has led to a decrease in the prices of such goods. Thus, the growth of China has impacted the South American countries even in the absence of bilateral links of competition in third markets. Further, in relative terms, the Chinese economy is more important for South America than the opposite.

The Chinese expansion generated two distinct effects on countries, a "demand effect" or macroeconomic effect that is exerted through its impact on exports, trade balance, and investments and a "structure effect" or sectoral through its unequal impact on sectors or activities according to the degree of complementarity and rivalry. Depending on the characteristics of the countries, the endowment of natural resources, their size, the technological stage, and domestic economic policies, the combination of both effects generates different results on economic growth. Thus, the growth of China has been presented positive and negative effects to some countries, sectors, and groups. The literature has shown the producers and exporters of raw material, particularly Argentina, Brazil, Chile, and Venezuela, and some sectors, such as agriculture, agroindustry, and industrial inputs, as those winners in terms of trade with China. However, this puts also a challenge for policy makers due to the increased competitive strength of China.

Although competition exists, there is also a complementarity between the South American countries and Chinese economies in terms of their productive structure (Jenkins *et al.* 2008). Further, as suggested by Jenkins *et al.* (2008), this tendency tends to increase over time. Thus, the South American countries can take advantage of the expansion of China's market and from the increase of global production networks.

The literature deals with the role played by China in the international market and the consequences for a different group of countries. Ianchovichina and Martin (2003) and Yang (2006) analyze the implications of the entrance of China at WTO for other developing countries in a long-run context of opening and growth. Dimaranam *et al.* (2007) based on a scenario of the rapid growth of exports, the changes in the relative importance of goods and services, and changes in the composition of exports from China and India, developed global-economy wide modeling to measure all the potential impacts upon China and India and other developing countries. Lall *et al.* (2005), Blázquez-Lidoy *et al.* (2006), and Jenkins (2012) analyze the impacts of China on Latin American trade and foreign direct investment flows. Jenkins *et al.* (2008) identify the main channels through which the growth of China could impact Latin America. Afonso *et al.* (2018) also analyze China and Latin American countries to capture if the trade agreements among these regions are complementary or if they strengthen the dependence.

In this context, this paper aims to explore the channels of interactions between China and South American countries. We explore the changes in China's traded goods prices through a global computable general equilibrium (GTAP) which considers some South American countries (Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, and Venezuela), China, and Rest of the World. This price shock is justifiable due to the size of China and its influence on world prices. China has the second-largest GDP in the world and a high share in international trade, which gives the country an important price-forming status in the international market.

The paper contributes to the debate by implementing a systemic analysis considering the impacts of the Chinese expansion on the productive structure and export specialization, dealing with the complementarity between the exports of primary products - especially concentrated in iron ore, copper, and soybeans - and diversified import of industrial goods.

The applied general equilibrium analysis allows us to measure the impact in terms of welfare due to different policy scenarios. Further, due to the numerical structure behind the CGE models, which includes the inter-sectoral interdependence within each economy, the analyses allow us to project the impacts on national output, employment, income, and other macroeconomics indicators.

In what follows, Section 2 presents an overview of the trade pattern between South American countries and China. Section 3 describes the methodology and database. Section 4 presents the main results. Finally, Section 5 concludes.

2 Trade Analysis

To have an overview of the trade pattern between South American countries and China, this section presents an exploratory analysis of the recent trade data among them. Furthermore, some trade indexes are calculated to identify possible trade opportunities among these countries.

Table 1 and Table 2 present the bilateral trade shares among China, South American countries, and the rest of the World. On one hand, the export share shows how China is an important destination for exports from South America. In 2014, 5.79% of Chilean exports, 23.92 of Uruguayan exports, 21.18% of Brazilian exports, 18.40% of Peruvian exports, 16.17% of Venezuelan exports, and 12.80% of Colombian exports were to China. On the other hand, the export share shows that South America is relatively less important to China than the opposite. In the same year, 2014, only 4.24% of Chinese exports were to South America, with the highest share observed to Brazil, 1.67%.

Table 1 – Export shares, 2014 (%)

Regions		Destination											
		CHN	**ARG**	**BOL**	**BRA**	**CHL**	**COL**	**ECU**	**PRY**	**PER**	**URY**	**VEN**	**ROW**
Origin	**CHN**	0.00	0.41	0.06	1.67	0.65	0.46	0.17	0.10	0.34	0.10	0.26	95.76
	ARG	6.94	0.00	1.16	20.80	4.11	1.37	0.60	1.82	1.71	2.19	2.93	56.36
	BOL	2.65	21.01	0.00	31.78	1.28	4.59	0.94	0.56	5.12	0.07	1.07	30.94
	BRA	21.18	6.17	0.70	0.00	2.45	1.08	0.37	1.42	0.83	0.85	2.02	62.93
	CHL	25.79	1.13	1.31	5.59	0.00	1.21	0.69	0.22	1.94	0.21	0.66	61.27
	COL	12.80	0.38	0.24	2.86	1.65	0.00	3.08	0.03	1.99	0.04	3.20	73.74
	ECU	2.01	0.99	0.10	0.53	8.67	3.52	0.00	0.02	5.97	0.08	2.14	75.97
	PRY	0.79	1.98	1.36	17.16	9.73	0.62	0.64	0.00	1.99	1.91	0.48	63.34
	PER	18.40	0.28	1.65	4.27	3.93	3.03	2.34	0.03	0.00	0.09	1.28	64.70
	URY	23.92	4.41	0.47	20.92	1.41	0.42	0.34	1.31	1.49	0.00	4.47	40.86
	VEN	16.17	0.01	0.01	1.62	0.11	0.63	0.05	0.00	0.04	0.62	0.00	80.74
	ROW	11.14	0.23	0.02	1.10	0.26	0.30	0.11	0.03	0.17	0.04	0.16	86.45

Source: GTAP database.

This relative importance of China to South America is also observed by the import side. Table 2 shows that China, in 2014, imported only 6.10% from South America countries while all the South America countries imported more than 10% from China – Chile, 21.84%; Paraguay, 20.58%; Peru, 19.03%; Uruguay, 18.38%; Colombia, 16.87%; Brazil, 16.37%; Ecuador, 15.73%; Bolivia, 15.19%; Argentina, 14.77%; and Venezuela, 14.89%. This relative

importance is more evident when we compare these results with those from Mercosur countries. In 2014, Brazil, for example, has imported 6.45% from Argentina, 0.57% from Paraguay, and 0.87% from Uruguay. Only the share of Argentine imports from Brazil (23.51%) and Paraguayan imports from Brazil (29.60%) were greater than those observed between these countries and China.

Table 2 – Import shares, 2014 (%)

Regions		Destination											
		CHN	**ARG**	**BOL**	**BRA**	**CHL**	**COL**	**ECU**	**PRY**	**PER**	**URY**	**VEN**	**ROW**
Origin	**CHN**	0.00	14.77	15.19	16.37	21.84	16.87	15.73	20.58	19.03	18.38	14.89	14.18
	ARG	0.28	0.00	9.21	6.45	4.34	1.58	1.75	11.27	2.99	12.38	5.23	0.26
	BOL	0.02	4.23	0.00	1.76	0.24	0.94	0.48	0.61	1.60	0.07	0.34	0.03
	BRA	2.93	23.51	18.78	0.00	8.71	4.20	3.61	29.60	4.91	16.19	12.19	0.99
	CHL	1.13	1.36	11.07	1.84	0.00	1.49	2.12	1.45	3.61	1.28	1.25	0.31
	COL	0.46	0.37	1.63	0.77	1.51	0.00	7.74	0.16	3.03	0.18	4.96	0.30
	ECU	0.03	0.43	0.32	0.06	3.55	1.57	0.00	0.05	4.05	0.17	1.48	0.14
	PRY	0.00	0.24	1.15	0.57	1.10	0.08	0.20	0.00	0.37	1.16	0.09	0.03
	PER	0.44	0.18	7.55	0.76	2.39	2.01	3.91	0.10	0.00	0.28	1.32	0.17
	URY	0.13	0.67	0.50	0.87	0.20	0.06	0.13	1.09	0.35	0.00	1.07	0.03
	VEN	0.69	0.02	0.07	0.52	0.12	0.75	0.15	0.01	0.07	3.66	0.00	0.39
	ROW	93.90	54.22	34.54	70.03	56.01	70.46	64.19	35.08	60.01	46.24	57.18	83.17

Source: GTAP database.

Table 3 – Export shares to China by commodities, 2014 (%)

Com.	ARG	BOL	BRA	CHL	COL	ECU	PRY	PER	URY	VEN	ROW
grains	0.43	0.03	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.30
crops	64.92	0.06	35.06	5.66	0.09	25.22	9.04	3.23	62.88	0.00	2.08
animalprd	1.26	1.51	0.02	0.10	0.10	0.00	0.02	0.67	11.14	0.00	0.55
frsfsh	1.16	0.00	0.03	0.20	0.14	0.45	0.05	0.39	0.47	0.00	0.70
minergy	3.24	56.20	48.81	32.36	93.79	27.02	0.00	67.31	0.43	75.58	22.01
meatprd	3.24	0.00	1.08	0.54	0.00	0.00	0.00	0.00	17.38	0.00	0.33
otrfood	10.38	0.00	1.14	1.65	0.05	31.82	0.00	12.60	1.89	0.00	1.42
dairy	2.39	0.00	0.00	0.20	0.00	0.00	0.00	0.00	3.56	0.00	0.40
sugar	0.00	0.00	1.78	0.04	0.00	0.00	0.03	0.00	0.00	0.00	0.05
bt	2.57	0.00	0.69	0.90	0.00	0.01	0.00	0.00	0.01	0.00	0.37
textiles	0.05	0.00	0.02	0.00	0.02	0.00	0.00	0.07	0.02	0.00	1.47
waplea	5.93	1.45	2.18	0.11	0.55	0.43	37.16	0.10	1.17	0.07	0.88
woodpaper	0.63	5.41	3.90	7.65	0.06	6.02	5.09	0.63	0.60	0.00	1.85
chemicals	3.38	1.46	0.97	1.34	0.36	1.44	1.10	0.80	0.07	23.46	14.38
ferrous	0.10	0.05	1.18	0.03	2.44	0.01	1.28	0.08	0.00	0.23	2.12
metal	0.01	33.82	1.79	49.13	2.31	6.63	45.08	14.08	0.23	0.66	5.67
mqequip	0.23	0.00	0.78	0.06	0.08	0.35	1.01	0.02	0.06	0.00	35.97
motor	0.07	0.00	0.52	0.00	0.00	0.02	0.00	0.00	0.00	0.00	7.49
mnfc	0.01	0.01	0.08	0.00	0.02	0.59	0.12	0.00	0.09	0.00	1.96
services	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: GTAP database.

Another import feature about China and South American countries is related to the trade pattern among them in terms of commodities. Table 3 and Table 4 show the export shares to China and import shares from China by commodities, respectively. The South American countries mainly export to China Other crops (crops), Mining and energy (minergy), and Metal products (metal). In 2014, about 64.92% of Argentina's exports to China were Other crops (crops); 35.06% and 48.81% of Brazil's exports to China were Other crops (crops) and Mining and energy (minergy), respectively; 93.79% of Colombia's exports to China were Mining and energy (minergy); 62.88% of Uruguay's to China were Other crops (crops).

China, on the other hand, mainly export Machinery and equipment (mqequip); Chemicals, rubber, and plastic (chemicals); Motor vehicles and parts (motor); Textiles (textiles); and Wearing apparels (waplea) to South America. In 2014, Brazilian and Argentine imports from China were concentrated in Machinery and equipment (mqeqip), 45.84% and 46.66%, and in Chemicals, rubber, and plastic (chemicals), 16.02% and 20.11%. The same pattern is observed in most of the South American countries, as shown in Table 4.

Table 4 – Import shares from China by commodities, 2014 (%)

Com.	ARG	BOL	BRA	CHL	COL	ECU	PRY	PER	URY	VEN	ROW
grains	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
crops	0.03	0.03	0.34	0.08	0.28	0.29	0.10	0.04	0.04	0.81	0.63
animalprd	0.04	0.02	0.07	0.02	0.02	0.02	0.00	0.04	0.05	0.01	0.26
frsfsh	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.09
minergy	0.66	0.05	0.09	0.02	0.11	0.16	0.01	0.02	0.01	0.07	0.31
meatprd	0.00	0.00	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19
otrfood	0.41	0.62	1.23	1.17	0.64	0.39	0.20	0.68	0.69	0.16	1.65
dairy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
sugar	0.01	0.02	0.01	0.05	0.06	0.04	0.01	0.13	0.01	0.01	0.03
bt	0.00	0.02	0.00	0.01	0.14	0.00	0.03	0.01	0.00	0.00	0.12
textiles	4.25	5.66	6.50	5.64	6.54	3.99	3.98	6.44	2.96	2.66	4.55
waplea	4.48	6.26	7.04	23.28	6.12	4.98	4.96	8.18	12.38	5.52	12.78
woodpaper	1.06	1.68	1.05	1.33	1.53	1.73	0.69	1.59	0.83	1.04	1.96
chemicals	20.11	14.56	16.02	10.86	12.60	12.66	17.67	12.77	16.68	7.77	10.11
ferrous	2.20	12.03	6.71	8.47	9.17	15.62	3.06	12.70	2.41	9.95	5.54
metal	5.16	6.79	5.02	5.89	5.10	6.67	2.57	5.55	3.37	7.98	5.97
mqequip	46.66	31.19	45.84	33.10	44.99	38.52	55.16	38.59	44.75	44.56	45.46
motor	11.36	16.83	6.38	5.36	7.08	10.54	8.10	8.85	11.57	15.86	4.12
mnfc	3.58	4.24	3.53	4.70	5.60	4.39	3.47	4.41	4.25	3.59	6.21
services	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: GTAP database.

Given the trade pattern between China and South America countries, it is relevant to evaluate the comparative advantage of each region and the complementarity between them. Based on Balassa's (1965) Revealed Comparative Advantage index (RCA), a trade complementarity index[4] has been calculated. Basically, the index identifies those products that an exporter country has comparative advantage revealed for the country exporter and the importer has comparative disadvantage revealed.

Table 5 shows the trade complementarity index among South American countries and China. The index greater than the average country is highlighted in grey. On one hand, it is possible to observe a trade complementarity among South American countries. In general, the trade complementary indexes are higher than the average for the South America index. On the other hand, the results do not show a complementarity trade among China and South American countries. Considering the South American countries as importers, only Uruguay presents an index above the average. China, otherwise, presents an index above the average with Argentina, Brazil, Colombia, Peru, and Uruguay.

Table 5 – Trade complementary index, 2014

Regions		Importer										
		CHN	**ARG**	**BOL**	**BRA**	**CHL**	**COL**	**ECU**	**PRY**	**PER**	**URY**	**VEN**
Exporter	**CHN**	-	27.03	10.91	33.63	19.04	25.85	13.59	16.62	21.84	27.90	11,33
	ARG	26.75	-	29.87	54.84	33.57	35.33	27.35	43.69	35.92	46.36	17,19
	BOL	10.86	30.10	-	31.76	34.04	20.12	18.36	20.06	41.67	14.39	12,91
	BRA	33.17	55.35	31.14	-	42.85	38.56	27.25	36.01	43.13	45.31	21,01
	CHL	18.66	32.86	34.03	42.46	-	25.93	31.51	13.40	75.81	24.75	12,27
	COL	25.71	35.98	20.27	39.79	26.44	-	63.77	14.86	35.45	26.77	54,38
	ECU	13.24	25.44	17.52	26.42	30.59	62.42	-	11.25	31.78	18.78	54,94
	PRY	16.32	43.50	19.51	34.28	13.40	14.57	11.04	-	15.01	49.37	6,48
	PER	21.71	35.89	41.81	43.27	75.30	35.37	34.37	15.37	-	26.25	16,78
	URY	27.67	46.78	14.45	44.03	25.46	26.71	19.21	50.22	26.83	-	10,42
	VEN	11.37	17.46	12.87	21.66	12.39	54.91	57.82	6.70	16.67	10.59	-
	ROW	52.88	54.92	23.99	56.80	29.02	47.10	28.73	22.10	37.76	40.63	23,83
Average		**21,53**	**33.77**	**21.36**	**35.75**	**28.51**	**32.24**	**27.75**	**20.86**	**31.82**	**27.59**	**20.13**

Source: Own calculations.

[4] The trade complementarity index is calculated as follows:

$$IC_{ij} = \left[1 - \left(\sum\nolimits_k \left|\frac{M_j^k}{M_j} - \frac{X_i^k}{X_i}\right| \div 2\right)\right] \times 100$$

where M_j^k is the import of product k by country j; M_j is the total import of country j; X_i^k is the exports of product k by country i; and X_i is the total exports of country i. The index is expressed in percentage terms, where higher values indicate greater complementarity between the exports of country i and the imports of country j.

In order to capture the complementarity by products, Table 6 presents the number of products by main activities with IC[5]> 1 for each pair of countries. We observe that Uruguay, Argentina, and Brazil present the highest number of cases with IC>1, 171, 151, 138, respectively.
For Agriculture, Argentina presents the highest number of products with IC>1, 55, followed by Uruguay, 51 cases, and Brazil, 47 cases. For Industry, the first place is also occupied by Argentina with 59 cases, followed by Brazil, with 58 cases, and Uruguay, 55 cases. For services, Uruguay presents the highest number of cases, 62, followed by Peru with 39 cases.

Considering each bilateral trade, it is possible to observe the highest number of cases with IC>1 in the trade between China and Uruguay (12 cases) and between China and Brazil (11 cases). For Argentina, the trade with Uruguay and Brazil are those with the higher number of cases, 25 and 23, respectively. Venezuela, Uruguay, and Chile present a higher number of cases in the trade with Bolivia. In the case of Brazil, we can highlight the number for Bolivia and Uruguay, 23 and 17, respectively. Venezuela and Bolivia are the countries with the highest number of cases in trade with Chile. For Colombia, Ecuador, Paraguay, and Peru trade with Venezuela present the highest number of cases for IC>1, 17 for Colombia and Ecuador, 21 for Paraguay, and 23 for Peru. Trade between Uruguay and Bolivia is the one with more cases. For Venezuela trade with Chile and Colombia are the most important in terms of the number of cases of IC>1.

[5] The IC is calculated as follows:

$$IC_{ij}^{k} = RCA_{i}^{k} \times RCD_{j}^{k}$$

where RCA_i^k is the Revealed Comparative Advantage Index and RCD_j^k is the Revealed Comparative Disadvantage Index. An index greater than 1 indicates complementarity in the trade of this good between country *i* and country *j*. Higher index values indicate greater complementarity.

Table 6 - Distribution of the total products with IC> 1 between categories

Exporter	Sector	Importer											Total
		CHN	ARG	BOL	BRA	CHL	COL	ECU	PRY	PER	URY	VEN	
	Agriculture	-	5	2	4	3	2	3	2	4	4	-	29
	Mining	-	-	-	-	1	-	-	-	1	-	-	2
China	Industry	-	4	3	8	4	4	2	6	5	6	1	43
	Trade	-	-	-	-	-	-	-	-	-	-	-	0
	Services	-	-	-	-	-	-	-	1	-	3	-	4
	Agriculture	5	-	4	9	6	4	5	6	7	8	1	55
	Mining	-	-	1	1	1	1	1	-	1	-	1	7
Argentina	Industry	3	-	4	11	9	6	2	9	5	9	1	59
	Trade	-	-	-	-	-	-	-	-	-	-	-	0
	Services	-	-	2	2	2	4	2	2	7	8	1	30
	Agriculture	-	2	-	4	4	2	2	2	2	4	4	26
	Mining	-	-	-	1	1	1	2	2	-	2	-	9
Bolivia	Industry	-	3	-	4	6	3	3	4	4	2	6	35
	Trade	-	-	-	-	-	-	-	-	-	-	-	0
	Services	-	-	-	2	1	1	2	2	1	4	8	21
	Agriculture	-	4	9	-	4	4	4	5	6	5	6	47
	Mining	-	1	1	-	1	1	1	2	-	1	-	8
Brazil	Industry	-	8	11	-	6	9	7	4	7	6	1	59
	Trade	-	-	-	-	-	-	-	-	-	-	-	0
	Services	-	-	2	-	1	2	2	1	3	5	9	25
	Agriculture	-	3	5	2	-	4	2	3	3	5	7	34
	Mining	-	1	1	1	-	1	1	1	-	1	1	8
Chile	Industry	-	4	9	3	-	9	4	4	8	4	9	54
	Trade	-	-	-	-	-	-	-	-	-	-	-	0
	Services	-	-	2	1	-	1	3	2	1	5	6	21
	Agriculture	-	2	4	2	3	-	2	3	4	2	4	26
	Mining	-	-	1	2	1	-	1	1	-	-	-	6
Colombia	Industry	-	4	6	3	7	-	3	2	3	5	5	38
	Trade	-	-	-	-	-	-	-	-	-	-	-	0
	Services	-	-	3	2	2	-	3	2	2	6	8	28
	Agriculture	-	3	5	2	5	3	-	3	5	4	5	35
	Mining	-	-	1	2	2	1	-	1	-	1	-	8
Ecuador	Industry	-	2	2	4	4	4	-	2	5	4	6	33
	Trade	-	-	-	-	-	-	-	-	-	-	-	0
	Services	-	-	2	2	1	2	-	2	2	3	6	20
	Agriculture	-	2	6	2	6	4	4	-	5	6	6	41
	Mining	-	-	-	-	-	-	-	-	-	-	-	0
Paraguay	Industry	-	6	8	5	7	8	3	-	5	4	7	53
	Trade	-	-	-	-	-	-	-	-	-	-	1	1
	Services	-	1	2	2	3	1	2	-	2	4	7	24
	Agriculture	-	4	7	4	5	5	2	4	-	5	8	44
	Mining	-	1	1	2	1	1	-	1	-	-	1	8
Peru	Industry	-	5	5	2	7	4	5	4	-	4	7	43
	Trade	-	-	-	-	-	-	-	-	-	-	-	0
	Services	-	-	7	4	4	5	6	3	-	3	7	39
	Agriculture	-	4	8	4	6	7	4	5	6	-	7	51
	Mining	-	-	-	-	-	1	-	-	-	-	1	2
Uruguay	Industry	-	6	9	6	1-	9	5	6	7	-	7	55
	Trade	-	-	-	-	-	-	-	-	1	-	-	1
	Services	-	3	8	8	9	6	8	6	7	-	7	62
	Agriculture	-	-	1	-	1	1	1	1	1	-	-	6
	Mining	-	-	1	2	2	1	2	1	-	2	-	11
Venezuela	Industry	-	1	1	2	1	2	1	1	-	2	-	11
	Trade	-	-	-	-	-	-	-	-	-	-	-	0
	Services	-	-	1	1	2	2	1	1	1	1	-	10

Source: Own calculations.

3 Methodology and database

In order to explore the channels of interactions among China and South American countries, this study uses an applied general equilibrium analysis. The following subsections describe the methodology, the empirical strategy, and the database.

3.1 Methodology and empirical strategy

Since the early 1990s, the Computable General Equilibrium (CGE) models have been employed to investigate the effects of trade policy (e.g. trade liberalization, regional agreements, and impact of reforms implemented by the WTO) on industries, production factors, and welfare (Burfisher, 2011). In this context, the Global Trade Analysis Project (GTAP) was established in 1992 (Hertel, 1997). Besides a global network of researchers, the GTAP includes a global database and models to conduct applied general equilibrium analysis of global economic issues. In this paper, we use a global CGE model derived from the GTAP Data Base. The standard modeling framework, the GTAP model structure, and the database are well described in Hertel (1997), Walmsley et al. (2012), and Burfisher (2011).[6] The GTAP model assumes constant returns to scale and perfect competition in the production and consumption activities.

In general, the model can be represented by three core modules: i) database with input-output/social accounting matrices and tax matrices, which provides the numeric structure of the model; ii) nested structure that represents the cost minimization, profit maximization behavior, and equilibrium conditions, which provides the functional and theoretical structure; and iii) macroeconomic closure determining the endogenous and exogenous variables.

The functioning of the global economy structure modeled in the GTAP environment can be explained by performing an analysis through an arbitrary region and therefore its interactions with the other regions. These interactions occur through the imposition of conditions of equilibrium between the global players.

Overall, in this modeling framework, in which the equations are derived from optimization problems (by producers and consumers) and market equilibrium conditions, Walras law prevails. Households are provided with preferences and each seeks to maximize its utility

[6] Technical papers are also available at https://www.gtap.agecon.purdue.edu.

subject to a budget constraint. Producers are faced with a production function with constant returns to scale, and each seeks to minimize its cost function through the combination of inputs. The market is competitive; therefore, producers have zero economic profits. Finally, global investments are equal to global savings.

It is also important to point out that *i* imported goods have an international price (*pwmi*) over which, upon entry into each country/region, a customs tariff (ad valorem) *j* is associated with it (*ti*), if any. Therefore, the price on the domestic market of imported goods (*pmi*) is calculated as follows: $pm = pwm + t$. Therefore, a variation of the customs tariff tests an initial change in domestic prices of imported goods, which affects the demand of the domestic economic agents of each economy that react to changes in relative prices. Because there is in the model an explicit structure of interrelations between internal and external economic agents, it can be said that the effects of early changes in demand decisions affect the whole economic system.
In order to capture the impact of China's business upon South American countries, we propose a decrease in China's traded goods prices. Our strategy is based on the idea that China currently has significant participation in the international market, the second-largest GDP in the world, and a solid exportation model, which gives the country an important price-forming status in the global scenario. Based on this, we implement a shock at market prices (*pm*) of all Chinese commodities.

To implement this exercise, we change the traditional GTAP closure. The market prices in China have been fixed as follows. It allows us to capture the impact of a decrease in Chinese goods prices upon the South American countries and the Rest of the World.

The new closure includes de following modifications:

```
swap walraslack = pfactwld;
swap incomeslack("China") = y("China");
swap profitslack(PROD_COMM,"China") = qo(PROD_COMM,"China");
swap endwslack(ENDW_COMM,"China") = pm(ENDW_COMM,"China");
swap tradslack(TRAD_COMM,"China") = pm(TRAD_COMM,"China");
swap cgdslack("China") = pm(CGDS_COMM,"China");
```

Since a decrease in Chinese good prices means a decrease in import prices of Chinese products by South American countries and the Rest of the world, it allows us to see how China's business matter to South America.

3.2 Database

The Global Trade Analysis Project Data Base, version 10 (GTAP-10) has been used in this study. The detail about this version is available in Aguiar et al. (2019). The GTAP-10 considers four reference years (2004, 2007, 2011, and 2014) and it covers 65 sectors, 141 regions, and five factors of production (land, skilled labor, unskilled labor, capital, and natural resources). However, to assess the systemic effects of the trade relationship among South American countries and China, we have used 2014 as the base year (reference year) and we have aggregated the model to consider the following spatial dimension: China (CHN), Argentina (ARG), Bolivia (BOL), Brazil (BRA), Chile (CHL), Colombia (COL), Ecuador (ECU), Paraguay (PRY), Peru (PRY), Uruguay (URY), Venezuela (VEN), and the Rest of the World (ROW).

In general, the database consists of goods and services flows in USD, including domestic purchases and imports by firms, government, and households (at basic prices and market prices), capital stock, exports of margins and non-margins, depreciation of capital, net savings by region, antidumping duties, purchase and sales of primary factors, subsidies, and population (Walmsley et al., 2012).

Considering our empirical strategy, it is important to highlight some structural data, such as regional endowments, regional stock of capital, and savings shares. The regional endowments are important to explain the trade pattern and region/country shares in the global trade market. Table 7 shows the shares of each endowment category (land, skilled labor, unskilled labor, capital, and natural resources) in each region/country considered in our model. Argentina, Paraguay, Brazil, and Peru are the countries with more unskilled labor share in the base year. In terms of the skilled labor force, we can highlight the shares of Peru, Venezuela, and Paraguay. China, Brazil, and Chile also show values above the average. The most intensive countries in terms of capital are Colombia, Ecuador, Uruguay, Chile, and China. In terms of natural resources, we can highlight the shares of Bolivia, Ecuador, Colombia, and Venezuela.

Table 7 – Regional Endowments - % - 2014

Regions	Land	Unskilled Labor	Skilled Labor	Capital	Natural Resources	Total
China	1.75	11.54	36.33	48.77	1.61	100
Argentina	1.68	22.12	27.45	47.20	1.56	100
Bolivia	3.25	11.57	33.40	43.79	8.00	100
Brazil	0.91	15.10	34.80	47.88	1.31	100
Chile	0.88	8.45	37.20	52.05	1.42	100
Colombia	1.24	9.16	25.73	60.62	3.25	100
Ecuador	1.91	11.58	23.72	56.88	5.90	100
Paraguay	5.75	16.94	37.35	39.76	0.19	100
Peru	3.43	13.79	45.11	35.69	1.99	100
Uruguay	2.46	9.82	32.17	55.41	0.15	100
Venezuela	1.00	12.39	41.44	42.08	3.09	100
Rest of the World	0.91	10.93	38.81	47.69	1.66	100
Average	2.10	12.78	34.46	48.15	2.51	-

Source: GTAP database.

Table 8 – Stock of Capital and Savings (Regional Share - %) – 2014

Regions	Stock of Capital (VKB)	Savings (SAVE)
China	15.91	36.76
Argentina	0.51	0.50
Bolivia	0.02	0.07
Brazil	2.59	1.85
Chile	0.30	0.32
Colombia	0.43	0.49
Ecuador	0.14	0.17
Paraguay	0.03	-0.01
Peru	0.21	0.30
Uruguay	0.08	0.01
Venezuela	0.55	0.76
Rest of the World	79.22	58.78
Total	100.00	100.00

Source: GTAP database.

Table 8 presents the regional share of capital stock and savings. We observe that China and Brazil are the countries with the largest share. China has 15.91% and 36.76% of the stock of capital and savings in the base year, respectively. Brazil, on the other hand, has 2.59% and 1.85%. The rest of the World has a significant share since it includes all other regions in the World, excluding China and the South American countries listed in the table.

4 Results

This section reports the main results related to a decrease in China's traded goods prices. We presented first the macro-economic effects, following by the sectorial and trade effects.

Table 9 shows the macro-economic effects, including those in terms of real GDP, export and import volume, terms of trade, trade balance, equivalent variation, and real consumption. It is possible to observe that all regions had increased their real GDP - China, as expected, experiences a greater increase, 6.30%. These findings indicate that the increase of China's business has positive effects for all the regions in terms of real GDP.

Furthermore, the trade macro results show the following pattern: a) China experiences an increase in exports while all the other regions experience decrease; b) the opposite is observed in terms of imports.

The trade balance indicates, on one hand, that Argentina, Bolivia, Chile, Ecuador, Venezuela, and the Rest of the World may worsen. On the other hand, China, Brazil, Colombia, Paraguay, Peru, and Uruguay may improve their trade balance.

Through the equivalent variation (EV) and real consumption expenditure, we can observe welfare gains.[7] Table 9 shows a positive effect on the EV for all countries. China and the Rest of the World are the two regions that present the highest positive impacts, followed by Brazil, Argentina, and Uruguay. The impact is also positive in real consumption expenditure for all regions considered in this study.

Thus, considering the macro results and demand effects, we can affirm that China's business matter to South American countries. Through our simulation, we observed positive impacts in terms of welfare and real consumption for all countries and a heterogeneous impact upon the trade balance.

[7]According to Brown et al. (2005) and Siriwardana (2006; 2007), the EV measures the amount of income that would have to be given or taken away from an economy before trade liberalization to leave the economy as well off as it would be after the policy has been changed.

Table 9 - Macro-economic effects due to a decrease in China's traded goods prices

Regions	Real GDP (%)	Export Volume (%)	Import Volume (%)	Terms of Trade (%)	Trade Balance (US$ million)	Equivalent Variation (US$ million)	Real Consumption (%)
China	6.3008	2.7767	-0.6070	-0.4842	20757.49	597357.94	6.3432
Argentina	0.0100	-0.4499	0.3391	0.1806	-742.42	441.72	0.0881
Bolivia	0.0098	-0.0439	0.0615	-0.0482	-294.28	33.31	0.1044
Brazil	0.0148	-0.6239	0.5024	0.2047	2606.58	1901.91	0.0868
Chile	0.0075	-0.1969	0.1341	0.0660	-259.54	227.55	0.0986
Colombia	0.0073	-0.3742	0.3292	0.0397	143.83	294.55	0.0858
Ecuador	0.0154	-0.4320	0.2332	0.1153	-345.38	124.50	0.1386
Paraguay	0.0222	-0.3283	0.1048	0.1373	281.06	21.17	0.0750
Peru	0.0016	-0.1677	0.2185	0.0648	210.58	180.26	0.0950
Uruguay	0.0664	-0.9112	0.4865	0.3241	128.43	95.96	0.1961
Venezuela	0.0116	-0.3066	0.4891	-0.0303	-653.68	406.53	0.0874
Rest of the World	0.0085	-0.3074	0.1142	0.0621	-21832.65	45458.45	0.0816

Source: Own calculations.

Table 10 reports the welfare decomposition. It shows that the resource allocation effect contributes to EV more than in terms of trade and investment-savings terms of trade. The resource allocation effect contributes positively to all regions. The terms of trade contribute negatively to China, Bolivia, and Venezuela. Investment-savings in terms of trade contribute negatively to China. Brazil is the country with the highest change in welfare, followed by Argentina and Venezuela. The positive results for these three countries are strongly related to the investment-savings terms of trade.

The terms of trade and the demand derived from the Chinese expansion remain favorable to regional economic growth, taking advantage of them, however, depends on industrial policies whose absence in recent years or the low priority given to them has certainly collaborated to reduce the prospects for productive diversification. in the region.

To see the contribution to each sectorial shock in the trade balance, Table 11 shows the effects decomposition by the 20 sectors. On one hand, we observe that China, as expected, has the highest positive result, followed by Brazil and Paraguay. On the other hand, the Rest of the World has the highest deficit at trade balance followed by Argentina and Venezuela.

Table 10 - Decomposition of estimated equivalent variation on China decrease of the prices of tradeable good (US$ million)

Regions	Resource Allocation Effect	Terms of Trade	Investment-Savings terms of trade	Total
China	52279.58	-11916.80	-53555.59	-13192.81
Argentina	54.94	147.36	239.42	441.72
Bolivia	3.25	-5.49	35.55	33.31
Brazil	358.53	542.68	1000.71	1901.91
Chile	19.51	55.47	152.57	227.55
Colombia	27.49	23.25	243.81	294.55
Ecuador	15.51	34.05	74.94	124.50
Paraguay	6.85	13.31	1.01	21.17
Peru	3.20	28.90	148.16	180.26
Uruguay	38.00	43.90	14.07	95.96
Venezuela	59.11	-14.36	361.78	406.53
Rest of the World	5401.85	11271.73	28784.99	45458.57
Total	58267.81	224.00	-22498.59	35993.22

Source: Own calculations.

Through the decomposition subtotals, we can affirm that the decrease in imports prices from China on Other food products (otrfoof), Wearing apparels (waplea) and Beverage and tobacco (bt) are the sectors that most influence the positive total variation at trade balance. For Brazil, we can highlight the results for Metal products (metal), Other crops (crops), and Ferrous metals (ferrous). The result of the decomposition analysis is partially linked to the results that we got from IC index, in which we observe that the global picture is the nonexistence of complementary trade between China and the South American countries and partially linked to the sectorial effect meaning that we expected an unequal impact on sectors according to the degree of complementarity and rivalry (See Table 5).

Table 11 - Changes at the trade balance in US$ million and the decomposition

Com.	CHN	ARG	BOL	BRA	CHL	COL	ECU	PRY	PER	URY	VEN	ROW
grains	1167.57	-6.55	-0.28	-28.88	-3.69	-6.52	-2.04	-0.19	-3.15	-1.13	-6.52	-1108.62
crops	1124.10	8.77	-2.95	600.25	-15.05	1.46	3.66	9.56	-23.28	46.05	-11.58	-1740.99
animalprd	2020.06	4.32	-1.71	233.76	-6.83	-6.87	1.75	7.26	-23.32	19.98	-13.63	-2234.76
frsfsh	1046.14	-5.23	-0.47	-24.28	-4.33	-4.43	-0.63	0.32	-2.88	2.00	-5.33	-1000.87
minergy	75.48	-50.45	-17.16	305.18	5.62	384.14	92.49	28.65	40.75	11.68	290.61	-1166.98
meatprd	2170.94	-9.95	-1.47	87.50	-8.24	-16.33	-4.78	6.52	-7.29	53.35	-19.90	-2250.36
otrfood	9035.77	-14.97	-4.56	-133.84	-24.60	-58.82	13.23	6.34	-19.76	10.46	-72.12	-8737.13
dairy	487.31	-0.83	-0.45	-11.95	-1.63	-4.23	-1.25	0.45	-1.99	9.89	-5.32	-470.02
sugar	70.04	-1.35	-0.20	79.39	-0.55	-0.33	-0.33	0.16	-0.43	0.47	-1.87	-145.00
bt	3158.97	-18.64	-0.54	-113.86	-6.56	-20.14	-6.96	-1.74	-7.61	-6.62	-19.28	-2957.01
textiles	332.82	-19.07	-7.84	211.20	-44.61	4.09	-1.68	10.80	-2.24	12.96	-41.48	-454.96
waplea	3351.77	13.43	-15.87	108.57	-54.96	-4.03	-10.74	33.79	61.29	161.15	-168.15	-3476.25
woodpaper	52.00	9.25	-4.29	349.73	55.12	7.42	10.94	9.24	-2.08	33.44	-12.98	-507.78
chemicals	978.14	-184.90	-44.83	-224.67	-104.97	150.32	-2.14	23.98	12.89	-31.23	141.36	-713.93
ferrous	75.62	22.73	-9.62	445.00	-51.83	17.84	-74.07	4.90	19.95	-5.80	-3.96	-440.77
metal	135.66	1.58	-11.35	652.98	568.01	63.36	-9.27	23.82	164.96	22.71	-75.59	-1536.88
mqequip	393.76	-32.92	-25.33	-47.35	-71.87	-81.78	-58.17	2.13	-45.36	-130.31	-121.85	219.04
motor	1172.15	-477.07	-120.99	-405.69	-426.94	-357.63	-329.81	64.10	22.82	-183.39	-440.74	1483.23
mnfc	200.46	-5.32	-10.10	163.15	-33.92	21.95	23.54	16.11	7.18	20.57	-40.08	-363.54
services	-6290.94	24.74	-14.25	360.39	-27.70	54.35	10.86	34.87	20.13	82.22	-25.26	5770.60
Total	20757.49	-742.42	-294.28	2606.58	-259.54	143.83	-345.38	281.06	210.58	128.43	-653.68	-21832.65

Source: Own calculations.

5 Final Considerations

The rapid economic growth, the degree of openness, and the dimension of China's economy had led to a controversial discussion in the literature. Questions were raised looking for the best understanding of who could win and who could lose. Specifically, the literature has based on different methodological approaches raised hypotheses about the impact upon export prices, jobs, international prices of commodities, income, and other economic dimensions.

Thus, this paper has aimed to answer the following question: Does China's business matter to South America? By the exercise proposed, it is possible to affirm that China's business matter to South American countries. We observe that there is an unbalanced relationship between China and South America and that China can compete with South American countries in a third country situation, mainly in European Union and the United States.

Besides the first question, a complementary question can be raised: Does China's business is good or not for South American countries? There are positive and negative effects. Positive impacts were observed in terms of GDP, real consumption, and welfare in all countries. However, they are not balanced. Further, we can also highlight the importance of imports. For all South American countries, there is a positive variation in imports.

Finally, one more question can be raised: For which sectors are China's business more important? To answer it, we analyzed the contribution to each sectorial shock in the trade balance making a decomposition by the 20 sectors. On one hand, we observed that China, as expected, had the highest positive result, followed by Brazil and Paraguay. On the other hand, the Rest of the World had the highest deficit at trade balance followed by Argentina and Venezuela.

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