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Abstract. We evaluate whether the presence of China in world trade is ultimately beneficial or whether it is a threat to Brazil. Using a gravitational model and a panel data method, we find that the Chinese exports to countries other than Brazil are not hurting the Brazilian exports, although the exports of Brazilian manufactured goods have been displaced by commodities as a result of its commerce with China.

1. Introduction

From 1990 to 2007 the growth of China's GDP averaged 10.57 percent, and its GDP per head grew 8.18 percent. This was in part caused by the increasing importance of foreign trade for the Chinese economy. Here, we will focus on the effects of this trade expansion on the Brazilian external sector. China is now one major Brazilian trade partner. It ranks third for the Brazilian export destinations, and second for imports. Figure 1 shows that the Brazilian exports to China have grown by about 97.45 percent since 1990. Most of the increase was caused by the Chinese appetite for Brazilian commodities. From 2000 onwards the Brazilian exports have risen strongly. Because this was also followed by growing imports, trade between the two countries has thrived. For Brazil, trade surpluses were the rule over the period, apart from 1996 to 2000 when the Brazilian currency was appreciated.

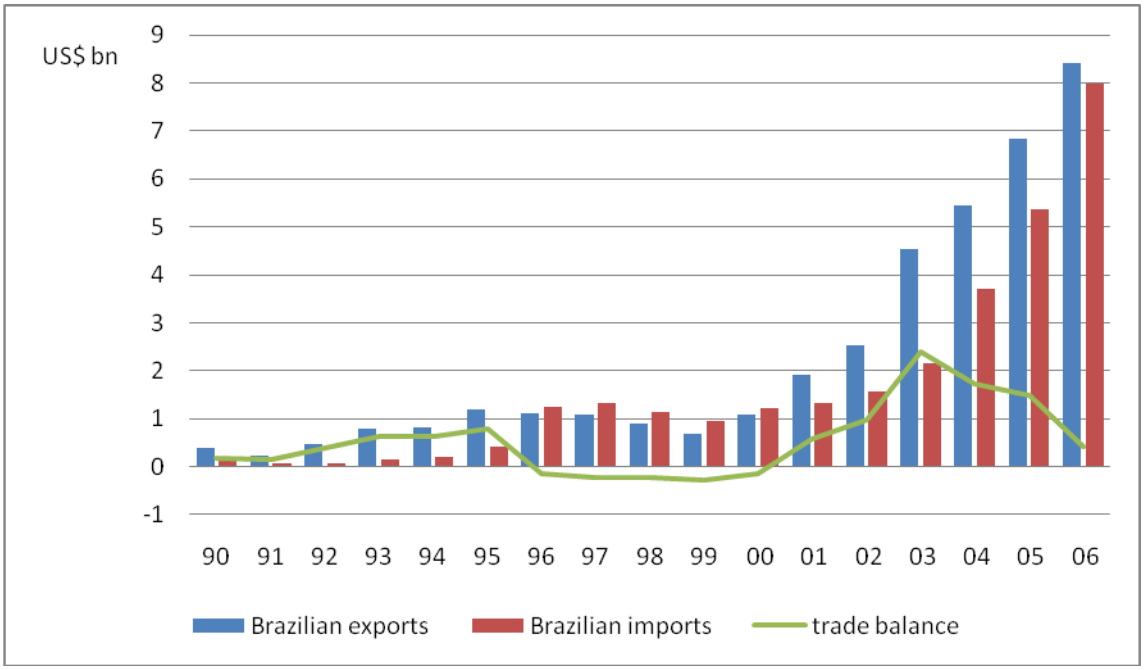

Figure 1. Brazilian trade with China (values in billion dollars). *Source: UN Comtrade*.

At first sight, trading with China has been beneficial to Brazil. However, we should further ask (1) whether the Chinese exports to countries other than Brazil may be possibly hurting the Brazilian exports to those countries, and (2) whether it is bad because the exports of Brazilian manufactured goods have been displaced by commodities as a result of the commerce with China. Answering questions 1 and 2 helps one to assess whether the presence of China in world trade is ultimately beneficial or whether it is a threat to Brazil.

To answer question 1, we consider a gravitational model to evaluate whether the Chinese presence is causing displacement of the Brazilian exports in world trade. We take the first 20 major Brazilian trade partners (apart from China) and perform a panel data analysis. We find that China plays no role in reducing the Brazilian exports. Rather, the Chinese presence in the world market shows a positive correlation with the Brazilian exports.

To answer question 2 we take the revealed comparative advantage index of Vollrath (1991) only to confirm that the Brazilian exports are complementary to those of China. In other words, both countries have become more specialized as a result of trade. Brazil is becoming more specialized in commodities whereas China is becoming more specialized in manufactures. Because the prices of the manufactured goods have fallen in recent years while those of the commodities have risen, becoming specialized in commodities is not at first bad for Brazil.

The rest of this article is organized as follows. Sections 2 and 3 present the gravitational model applied and the data. Section 4 shows the results, section 5 presents the analysis of Vollrath index for the data, and section 6 concludes the study.

2. Model and methods

Following the gravitational model in Lederman *et al.* (2007), we assume that China can influence the Brazilian trade through four major variables: (1) China's exports to Brazil, $X_{C,B,t}^{\xi}$; (2) China's imports from Brazil, $M_{C,B,t}^{\eta}$; (3) China's exports to country *i* (other than Brazil) at time t, $X_{C,i,t}^{\pi}$; and (4) China's imports from country *i*, $M_{C,i,t}^{\Psi}$. We further consider the dollar price of the currencies, that is, the Brazilian nominal exchange rate, $E_{B,t}^{\varphi}$, along with the other countries' exchange rates, $E_{i,t}^{\vartheta}$. Greek letters represent parameters. Thus, the Brazilian bilateral trade with its major 20 trading partners is given by

$$X_{i,B,t} = \alpha Y_{i,t}^{\alpha} Y_{B,t}^{\beta} E_{i,t}^{\vartheta} E_{B,t}^{\varphi} D_{i,B}^{\delta} X_{C,i,t}^{\pi} M_{C,i,t}^{\Psi} X_{C,B,t}^{\xi} M_{C,B,t}^{\eta}, \quad (1)$$

where $X_{i,B,t}$ represents the exports from country *i* to Brazil; $Y_{i,t}^{\alpha}$ and $Y_{B,t}^{\beta}$ respectively are real GDP from country *i* and Brazil; and $D_{i,B}^{\delta}$ is the distance between Brasilia and the other countries' capital cities.

We decided to apply the panel data methodology because the macroeconomic variables vary both in time and across countries. We estimated the model above with fixed and random effects, and then the outputs were compared. The fixed effect model fitted better in terms of consistency and efficiency. Thus, we resumed analysis employing the fixed effect model. In particular, we employed the least squares dummy variable (LSDV) technique using the Stata 11® software. To prevent the appearance of multicolinearity we considered the LSDV1 (without a dummy) program.

3. Data

The data on macro variables were taken from the United Nations Commodity Trade Statistics Database (UN Comtrade and UN Data) over the period 1990 to 2007. The distances between the countries were taken from the website Infoplease. The countries

in the sample were Argentina, Belgium, Britain, Canada, Chile, Colombia, France, Germany, Iran, Italy, Japan, Mexico, the Netherlands, Paraguay, Russia, South Korea, Spain, United States, Uruguay, and Venezuela. These are the 20 major trading partners of Brazil, apart from China.

4. Analysis

Table 1 shows that the Brazilian exchange rate presents a negative impact on the Brazilian trade. A one percent depreciation in the Brazilian exchange rate improves the Brazilian trade by 0.08 percent. The distance variable also presents a negative impact. The equivalent to one percent increase in the distance from Brasilia depresses Brazilian trade by about 0.07 percent.

In contrast, the selected countries' GDP growth and exchange rates have a positive impact on Brazilian trade. A one percent GDP growth leads to a 0.33 percent rise in the Brazilian exports. Also, a one percent depreciation of the countries' exchange rates relative to the dollar raises the Brazilian exports by 0.05 percent.

Table 1. Estimation results

Variable	*Coefficient*	*Std error*
Constant	9.492018	0.001
Brazilian GDP	0.0634052	0.600
GDP of the 20 countries	0.3386186	0.001
Distance	–0.07279303	0.057
Brazilian exchange rate	–0.078399	0.002
Exchange rates of the 20 countries	0.0549113	0.000
China's exports to other countries	0.3255098	0.000
China's exports to Brazil	0.0585442	0.524
China's imports from other countries	–0.0355551	0.161
China's imports from Brazil	0.0722567	0.246
Country	*Regression equation*	
United States, Germany, Holland, Italy, Belgium, Mexico, Korea, Iran, and Uruguay*	$\ln(M_{i,B}) = (9.492018) + [\,0.3386186 \times \ln(Y_B)] - [0.7279303 \times \ln(D_{i,B})] + [0.0549113 \times \ln(E_B)] - [0.078399 \times \ln(E_i)] + [0.3255098 \times \ln(C,B)] + \epsilon_{i,B}$	
	Equation + $\beta 1$**	*Std error*
Argentina	$\ln(M_{i,B}) = (9.492018 + 0.1736109) + \beta 1$	0.000
Japan	$\ln(M_{i,B}) = (9.492018 - 0.7567465) + \beta 1$	0.091
England	$\ln(M_{i,B}) = (9.492018 - 0.5831562) + \beta 1$	0.026
Chile	$\ln(M_{i,B}) = (9.492018 - 0.2291498) + \beta 1$	0.062
France	$\ln(M_{i,B}) = (9.492018 - 0.6785407) + \beta 1$	0.007
Spain	$\ln(M_{i,B}) = (9.492018 - 0.6322166) + \beta 1$	0.020
Venezuela	$\ln(M_{i,B}) = (9.492018 - 0.4692834) + \beta 1$	0.005
Russia	$\ln(M_{i,B}) = (9.492018 - 0.9219987) + \beta 1$	0.036
Canada	$\ln(M_{i,B}) = (9.492018 - 1.147379) + \beta 1$	0.000
Colombia	$\ln(M_{i,B}) = (9.492018 - 0.6802551) + \beta 1$	0.001
Paraguay	Dropped to prevent multicolinearity	

Notes

* Non-significant at the 10 percent level

** $\beta 1 =$ $[\,0.3386186 \times \ln(Y_B)] - [0.7279303 \times \ln(D)] + [0.0549113 \times \ln(E_B)] - [0.078399 \times \ln(E_i)] + [0.3255098 \times \ln(X_{C,B})] + \epsilon_{iB}$

Interestingly, a one percent growth in Chinese exports to the selected countries impacts positively Brazilian trade by 0.32 percent. Thus, China's growing presence in international markets does not negatively affect the Brazilian trade. This suggests that Chinese and Brazilian exports are complementary.

To evaluate this point, we focused on the export contents of Brazil and China using the revealed comparative advantage index of Vollrath (1991), that is,

$$RCA_{s,t}^{c} = ln\left(\frac{\frac{X_{s,t}^{c}}{X_{-s,t}^{c}}}{\frac{X_{s,t}^{-c}}{X_{-s,t}^{-c}}}\right) - ln\left(\frac{\frac{M_{s,t}^{c}}{M_{-s,t}^{c}}}{\frac{M_{s,t}^{-c}}{M_{-s,t}^{-c}}}\right) \quad (2)$$

where $X_{s,t}^{c}$ represents country *c*'s exports in sector *s* at a time period *t*; $X_{-s,t}^{c}$ stands for country *c*'s exports less the exports of sector *s* at *t*; $X_{s,t}^{-c}$ represents the other countries' exports (apart from country *c*) of sector *s* at *t*; $X_{-s,t}^{-c}$ represents the other countries' exports (apart from country *c*) of the other sectors (apart from *s*) at time *t*; and *M* represents the imports.

Index (2) is appropriate because it makes clear distinctions between a specific commodity and all the other commodities, on the one hand, and between a specific country and the rest of the world on the other, thus eliminating country and commodity double counting in world trade (Vollrath 1991).

Table 2 shows the revealed comparative advantage index for Brazil and China for the years 1992 and 2007 considering the sector classification provided by the UN Comtrade. We considered only the two-digit classification given by the Standard International Trade Classification (SITC) rev.3 criterion. Values in bold show index rises greater than 0.5 points from 1992 to 2007, and underlined values show reductions during this period.

In 1992 Brazil had a comparative advantage in food and live animals, beverages and tobacco, crude materials, animal and vegetable oils, manufactured articles, and commodities. In the same year China had a comparative advantage in food and live animals, beverages and tobacco, mineral fuels and lubricants, and manufactured articles. As can be seen, China and Brazil had similar comparative advantage in three sectors.

In contrast, the two countries in 2007 had only one sector with similar comparative advantage: food and live animals; and the importance of this sector for

China declined. The commodities sector became more important for Brazil, while the manufactured articles sector grew in importance for China.

5. Conclusion

This paper addresses the issue of whether the presence of China in world trade is ultimately beneficial or whether it is a threat to Brazil. To assess this, we used a gravitational model along with a panel data method for data over the period 1992 to 2007. We have found that the Chinese exports to countries other than Brazil are not hurting the Brazilian exports. On the contrary, they have been beneficial. This suggests that the exports of the two countries have become complementary. Then, we focused on the export-import contents of both countries and reckoned the revealed comparative advantage index. We find that while manufactures increased and commodities declined in China, commodities increased in Brazil thus displacing its manufactures. Both countries have become more specialized, though perhaps both benefited from this. This is so because, thanks mainly to China, the prices of the manufactured goods have fallen recently, while those of the commodities have risen.

References

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Table 2. Revealed comparative advantage index for Brazil and China, 1992 and 2007

Country		*Brazil*		*China*	
Year		1992	2007	1992	2007
SITC rev.3	*Sector*				
0	Food and live animals	**0.937**	**1.799**	0.957	0.743
0.1	Meat and meat preparations	**1.782**	**4.319**	2.248	–0.097
0.2	Dairy products and birds' eggs	**–2.036**	**0.137**	–0.240	–1.191
0.4	Cereals and cereal preparations	**–5.035**	**–0.489**	–0.422	1.109
1	Beverages and tobacco	1.994	1.654	0.894	–0.296
2	Crude materials, inedible, except fuels	**1.066**	**1.994**	–0.538	–3.027
2.2	Oil seeds and oleaginous fruits	**1.601**	**5.018**	2.773	–3.465
2.3	Crude rubber (including synthetic and reclaimed)	**–2.227**	**–1.366**	–3.346	–3.745
2.4	Cork and wood	**2.029**	**3.845**	–0.947	–2.018
2.6	Textile fibers (other than wool tops and other combed wool) and their wastes (not manufactured into yarn or fabric)	**–1.063**	**0.647**	–0.850	–1.764
3	Mineral fuels, lubricants and related materials	**–2.705**	**–0.622**	0.556	–1.772
3.2	Coal, coke and briquettes	**–9.308**	**–7.604**	3.186	0.943
3.3	Petroleum, petroleum products and related materials	**–2.394**	**–0.366**	0.490	–2.201
3.4	Gas, natural and manufactured	**–6.123**	**–4.572**	–2.574	–1.808
4	Animal and vegetable oils, fats and waxes	**0.538**	**1.038**	–1.527	–3.756
5	Chemicals and related products, n.e.s	–1.101	–1.228	–1.125	–0.975
6	Manufactured goods classified chiefly by material	1.368	0.375	**–0.314**	**0.584**
6.1	Leather, leather manufactures, n.e.s., and dressed furskins	**0.446**	**2.381**	**–1.917**	**–1.212**
6.2	Rubber manufactures. n.e.s.	0.756	–0.072	0.539	0.795
6.3	Cork and wood manufactures (excluding furniture)	2.747	2.330	**–0.548**	**2.348**
6.5	Textile yarn, fabrics, made-up articles, n.e.s., and related products	0.859	–0.938	**0.037**	**0.995**
6.7	Iron and steel	2.409	1.144	**–1.355**	**0.508**
7	Machinery and transport equipment	–0.675	–0.761	**–1.380**	**0.087**
7.1	Power-generating machinery and equipment	–0.110	–0.422	**–1.317**	**–0.410**
7.4	General industrial machinery and equipment, n.e.s., and machine parts, n.e.s.	–0.628	–0.961	**–1.103**	**0.101**
7.6	Telecommunications and sound-recording and reproducing apparatus and equipment	–0.966	–1.077	**0.016**	**1.468**
7.7	Electrical machinery, apparatus and appliances, n.e.s., and electrical parts thereof (including non-electrical counterparts, n.e.s., of electrical household-type equipment)	–1.158	–1.521	–0.527	–0.917
7.8	Road vehicles (including air-cushion vehicles)	0.519	0.077	**–1.315**	**0.249**
8	Miscellaneous manufactured articles	0.448	–0.649	2.298	1.347
8.2	Furniture and parts thereof; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings	1.985	0.976	**2.378**	**3.296**
8.4	Articles of apparel and clothing accessories	1.755	–1.078	4.007	4.340
8.5	Footwear	3.917	2.055	**2.599**	**3.811**
9	Commodities and transactions not classified elsewhere in the SITC	**3.319**	**4.657**	–0.290	–0.517

Source: UN Comtrade (n.e.s.means " not elsewhere specified")