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**Economic Analysis**

## **The impact of the emergence of China on Brazilian international trade**



# Abstract

**BBVA Research<sup>1</sup>**

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We take advantage of a novel dataset that incorporates both the technological content of each product as well as its quality to unveil some new features of Brazil-China's trade flows and to challenge the view that the emergence of China would imply the deindustrialization of Brazilian exports.

The trade between the two countries builds on exports of commodity goods from Brazil to China and of manufactured products from China to Brazil. Looking at the technological dimension of the dataset we show that Brazil (increasingly) exports to China products with lower technological content and (increasingly) imports products with higher technological content. The quality dimension of the dataset reveals that both countries export to each other basically low-quality goods (i.e. products whose unit-value are in the lower range of world's distribution of unit-values for the product). We then show that the overlapping between Brazilian and Chinese total exports is limited and that the degree of competition between the two countries is relatively small. We also show that the number of products in which the two countries have comparative advantage declined in the last years and that in the last years both countries increased their advantage in the products in which they already had advantage in 1994 and lost advantage in the sectors in which they had small advantage in producing in 1994.

Available data analyzed in this paper evidences that in the last years Brazilian exports of commodity products increased significantly due to the emergence of China and other Asian countries. We show, however, that Brazilian exports of high technological content and high quality increased more than the average and more than low technological and low quality exports in the last years. Overall, the emergence of China has been supporting a displacement of Brazilian exports not only towards natural-based products but also to goods with higher quality and higher technological content.

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1: The authors thanks the outstanding research assistance provided by Carla Zambrano Barbery.

# 1. Introduction

The share of China in world output jumped from 5.3% in 1994 to 10.8% in 2007. In the same period, the share of Chinese exports in world exports expanded even more, from 5.8% in 1994 to 12.7% thirteen years later. The weight of China in global imports also expanded in this period, from 6.5% in 1994 to 8.5% in 2007<sup>2</sup>. These figures illustrate the well-known unveiling of the Chinese economy in the last years.

The emergence of China as giant global player in trade markets has been generating opportunities and challenges for economies all over the world. It has been also the source of excitement and concerns for policy makers around the globe. In parallel, Chinese growth has been stimulating a large literature on the impact China could have on other regions:<sup>3</sup>

Just few years ago Brazil and China barely displayed bilateral trade transactions and any other type of economic relationship was also rare. The internal market orientation of both economies prevented them to search for opportunities far away. The opening process promoted in both countries and their recent economic developments have, however, changed their economies. This change has been followed by a boom in the bilateral trade between these two countries and has stimulated a more general economic integration. China is today one of the main Brazilian trade partners, as more than 10% of Brazilian imports come from China and more than 7% of its exports are destined to China.

Just as it has been observed in other countries, both policy makers and economists have been analysing the effects China could have on Brazil. On one hand, Brazil's comparative advantage in the production of primary products associated to the increasing Chinese appetite for commodities are seen by most as a good example of opportunity for Brazil (see Blazquez-Lidoy, Rodriguez and Santiso (2004) and IADB (2007), for example). On the other, the constant expansion of Chinese exports has been treated mostly as an example of how the emergence of China will threaten Brazilian industry as well as the country's exports of manufactured goods (see Lall and Weiss (2004), Mesquita Moreira (2007); and IADB (2007), for example).

In this work we study the impact that the Chinese trade expansion had on the Brazilian international trade. For pursuing this objective, besides using standard trade data we analyse a novel dataset, BACI, developed by Gaulier and Zignago (2010) that incorporates both the technological content of each product as well as its quality. Therefore, in addition to studying trade performance, analysing comparative advantage and analyzing trade complementarity in terms of classical trade classification (i.e. trade data disaggregated by region and by sector), in this paper we analyze trade flows, comparative advantages and trade complementarity issues taking into account the quality and the technological component of a product. Incorporating these dimensions allow us to take in account the increasingly important intra-industry international trade and explicitly recognize that competition can take place within the same product in a process of vertical differentiation and quality upgrading. In addition, the analysis of this new dataset is in accordance with new trade theories which have been increasingly focusing on trade in varieties, unit values, differentiation and technology.

The technological dimension of the trade flows follows Lall (2000b). Five groups are created according to the technological content of each product: high-technology (HT), medium technology (MT), lower technology (LT), resource-based products (RB) and primary products (PP). The first four groups – HT, MT, LT and RB – fall within the classical manufactures category while PP corresponds to the non-manufactures group.

On the other hand, to incorporate the quality dimension, each bilateral flow is classified into three quality segments (L: low, M: medium, or H: high) by comparing its unit value with the world distribution of unit values of the product, following the Fontagné, Gaulier and Zignago (2008) methodology. The quality dimension is orthogonal to the traditional product classification, i.e. any product can be classified as L, M or H independently of its characteristics or technological content. A non-technological product as soybeans exported by Brazil can be, for example, classified as high, medium or low quality depending on how its quality compares to the average quality of the soybeans traded in world markets.<sup>4</sup>

2: For the GDP, see World Economic Outlook from the IMF (October, 2009). For the international trade data refer to the BACI dataset described and used in this paper.

3: See, for example, Feenstra, Hai, Woo and Yao (1998); Fung and Lau (2002); Blazquez-Lidoy, Rodriguez and Santiso (2004); Lora (2005); Kaplinsky (2006); Rumbaugh and Blancher (2006); IADB (2007); Mesquita Moreira (2007).

4: As commented by Hausmann and Klinger (2007), the potential for incorporating knowledge and value added differs across products as each product has its own "technological and productive frontier".

Using, therefore, standard and new dataset on international trade we unveil some basic features of the bilateral trade flows between Brazil and China. As expected – and showed in previous literature – the growing dynamism of Brazil – China trade relationships builds on the exports from Brazil to China of commodity goods and, on the other hand, on the exports of manufactured products from China to Brazil, suggesting that the two countries have complementary trade structures. Looking at the technological dimension of the dataset we show that this complementarity is once more evident as Brazil (increasingly) exports products with lower technological content to China and as it (increasingly) imports goods with higher technological content. In addition, we take advantage of the quality dimension of the data to show that both countries export to each other basically low-quality goods. This suggests that the degree of competition between these countries could be higher than suggested by both sector and technological data; although this is not necessarily true as the low-quality trade could be taking place in different sectors.

We then examine more formally whether – and to which extent – Brazil and China compete in international markets. We first compute an index to capture the degree of similarity between the exports of both countries and then show that the overlapping between Brazilian and Chinese total exports is limited, both in absolute terms and also in comparison to other regions.

The calculation of both comparative advantage and complementarity / competition indicators confirms that the degree of competition between the two countries is relatively small.

Among other results we show that the number of products in which the two countries have comparative advantage declined in the last years. We also show that in the last years both countries increased their advantage in the products in which they already had advantage in 1994 and lost advantage in the sectors in which they had small advantage in producing in 1994.

This last evidence, as well as the fact - also showed in this paper - that these countries compete in some manufactured sectors, raises the issue of whether the emergence of China can generate a displacement of Brazilian exports towards natural-based goods and to a deindustrialization. Available data analyzed in this paper shows that in the last years Brazilian exports of commodity products increased significantly due to the emergence of China and other Asian countries. We show, however, that Brazilian exports of high technological content and high quality increased more than the average and more than low technological and low quality exports in the last years. Overall, the emergence of China has been supporting a displacement of Brazilian exports not only towards natural-based products but also to goods with higher quality and higher technological content. This weakens the view that the emergence of China would imply a deindustrialization of Brazilian external sales.

This paper contributes to the existent literature on the issue by unveiling some new features of the evolution of the Brazilian trade flows since 1994 until 2007, by showing, through the use of a set of different indicators and of different dimensions of trade data, that Brazil and China display trade complementarities in both absolute and relative terms, and finally, by challenging the view that the emergence of China would imply the deindustrialization of Brazilian exports.

In the next section we investigate the performance of aggregated bilateral flows between Brazil and China in the 1994-2007 period. In the section 3 we then analyze the structure of this bilateral flow by product, technological content and quality. In the section 4 we report the results related to the similarity index to check the degree of overlapping between Chinese and Brazilian overall exports. In the section 5 we perform a series of exercises to check what are the comparative advantages of each country and how complementary their trade structures are. Before we conclude the paper in the section 7, we investigate in section 6 how the market share of the Brazilian exports evolved since 1994. The goal of this investigation is to see whether the recent evolution of Brazilian exports confirms the view that the emergence of China would imply the deindustrialization of Brazilian exports.

## 2. An overview of aggregated bilateral trade flows

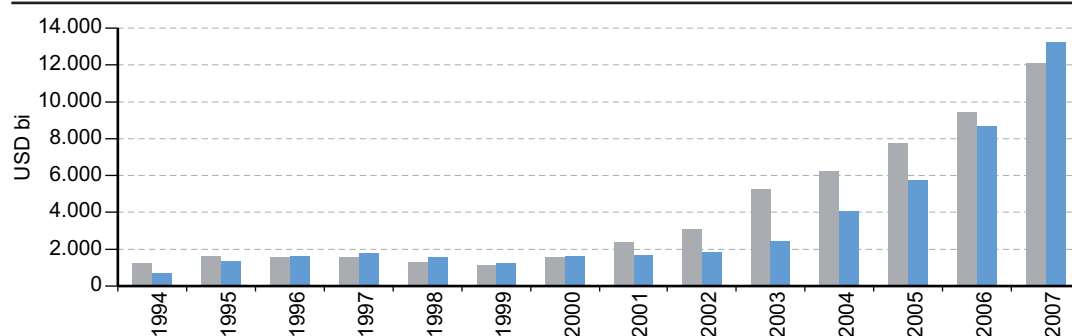
Trade flows between Brazil and China increased by more than 20% per year, in average, in the 1994 – 2007 period. The total trade flow (i.e. the sum of exports and imports) between these two countries was equal to USD 1.8 billions in 1994. Thirteen years later this flow reached USD 25 billions.<sup>5</sup>

The economic emergence of both countries, especially of China, played an important role to explain the booming of the bilateral trade. In the 1994 to 2007 period, the average Chinese GDP growth was around 10% in yearly terms. In the same period, Brazil was able to implement successful stabilization programs and to grow slightly more than 3% per year (and 4.7% more recently, in the 2004-2007 period). In addition, both countries experienced an economic opening process in which tariffs were cut and non-tariff measures became less common. Regarding Chinese opening process, its integration into the World Trade Organization in 2001 was a milestone.

Export promotion policies, especially in China, were also effective to stimulate bilateral flows. In particular, official visits of Chinese authorities to Brazil and vice-versa were an increasingly common strategy to implement trade promotion.<sup>6</sup>

Chart 1

### International Trade - Brazil and China



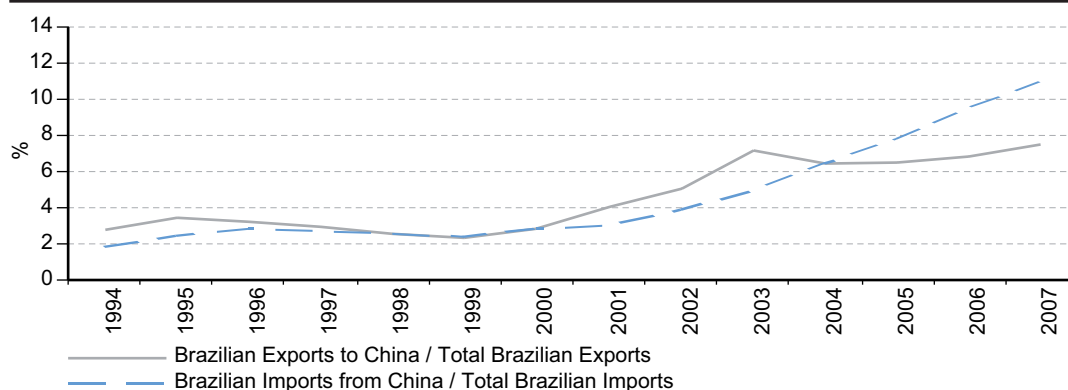
Source: COMTRADE and BBVA Research

The growth of trade flows between Brazil and China was not only impressive in absolute terms. Brazilian exports to China as a share of Brazil's total exports surged from 2.7% in 1994 to 7.5% in 2007. China was the origin of only 1.8% of Brazilian imports in 1994, but in 2007 this figure had expanded to 11.0%. These numbers make clear the current importance of China for Brazil. On the other hand, however, Brazil's importance for Chinese foreign trade is still low, despite the recent evolution. In 1994 Brazil accounted for 0.43% of total Chinese imports and an insignificant 0.24% of total Chinese exports. As of 2007, these numbers had increased to 0.84% and 0.91% respectively.

5: Trade data referred in this section comes from COMTRADE.

6: See IADB (2007) for more on the determinants of the recent Chinese trade performance. See CEPAL (2010) for a list of official visits of Chinese authorities to Latin America and vice-versa. Finally, refer to Villani (2008) to more on the impact of official visits on trade flows.

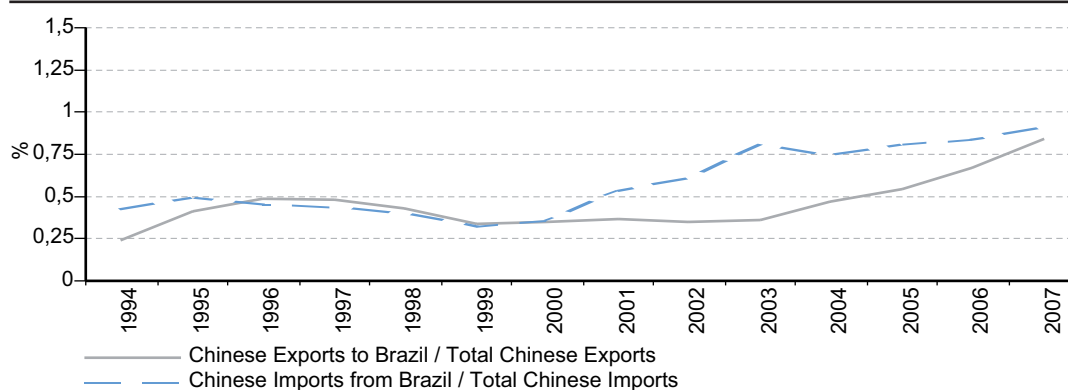
Chart 2

**Participation in Total Exports and Imports**

Source: COMTRADE

The fact that China is more important for Brazil's trade than vice-versa is easily understood after looking at the total traded by each country. On one hand, after growing around 14% yearly since 1994, Chinese international trade was equal to USD 2,893 billions in 2007. On the other hand, Brazil's international trade increased around 10% per year since 1994 but the total traded by Brazil in 2007, USD 281 billions, was more than ten times less than the total traded by China.<sup>7</sup>

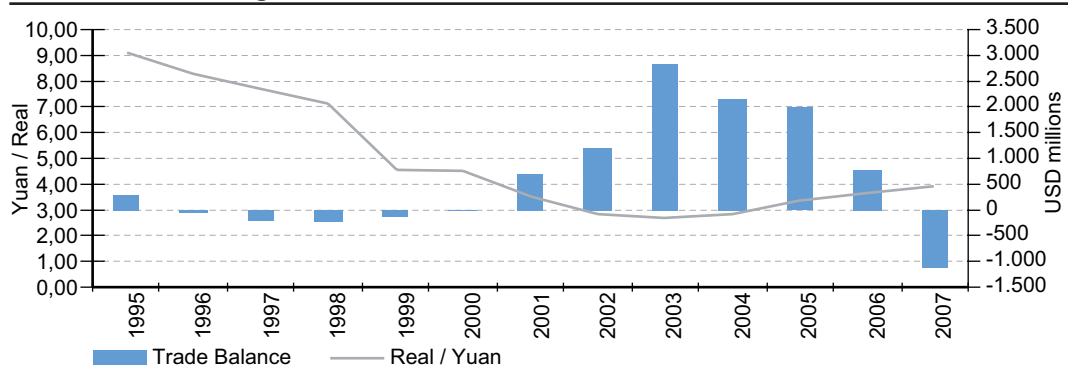
Chart 3

**Participation in Total Exports and Imports**

Source: COMTRADE

Regarding bilateral trade balance, Brazil had been displaying a superavit with China till very recently. In 2007, however, the appreciation of the Brazilian currency and the strength of Brazilian internal demand on one hand, and the remarkable dynamism of Chinese exports on the other, contributed importantly to the emergence of a deficit amounting to USD 1,132 billions.

Chart 4

**Yuan / Real Exchange Rate and Trade Balance**

Source: Bloomberg

7: From 1994 to 2007, both Brazil's and China's international trade grew more than the world's international trade, which expanded around 7% per year during this period.



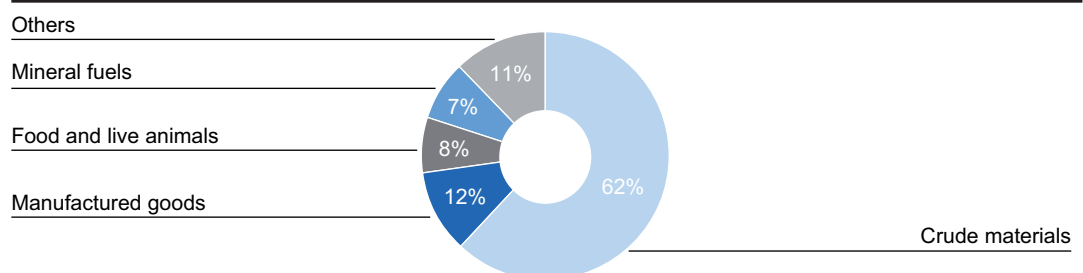
### 3. The structure of the bilateral trade flows: a look at more disaggregated data

Brazil exports to China basically commodities and imports manufactures. This is the main fact that emerges from the analysis of data regarding Brazil and China trade relationships.

62% of Brazilian exports to China in 2007 are in the group “Crude materials” which includes products as soybeans and iron ore, for example. Although Brazilian exports to China are highly concentrated in commodities, Brazil also exports manufactured goods to China.<sup>8</sup>

Chart 5

#### Brazilian Exports to China in 2007 (1 digit)



Source: COMTRADE

“Manufactured goods” is in fact the second in the list of products exported to China. The exports of this group of products, however, are among those which expanded less in the 1994 – 2007 period (10% per year). The most dynamic group in the period was “Mineral fuels” with a 36% growth per year in average (driven at some extent by rising oil prices in the period). “Crude materials” and “Beverage and tobacco” were also among the most dynamic groups in the period under analysis (yearly growth rates of 35% and 33% respectively). In general, commodities and commodities-related products were, therefore, the most dynamic sectors in the period.

Table 1

#### Main Brazilian Exports to China in 2007

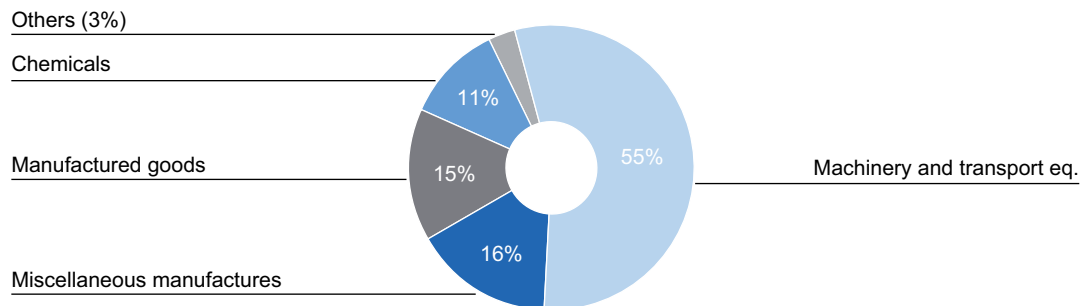
	Yearly % (2007-1994)
Mineral fuels	36
Crude materials	35
Beverages and tobacco	33
Food and live animals	18
Machinery and transport eq.	17
Chemicals	15
Miscellaneous manufactures	13
Manufactured goods	10
Animal and vegetables oils and fats	-2

Source: COMTRADE and BBVA Research

Chinese main exports to Brazil are “Machinery and transportation equipments”, “Miscellaneous manufactures” and “Manufactured goods”. These three groups together represented 86% of Brazilian imports from China in 2007. China’s exports to Brazil clearly rely in manufactured sectors.

8: We are taking a one-digit classification from COMTRADE. There exist ten groups of products as displayed in the table presented in the Annex 1.

Chart 6

**Chinese Exports to Brazil in 2007 (1 digit)**

Source: COMTRADE

The most dynamic Chinese exports to Brazil in the 1994 – 2007 period were “Chemicals”, “Manufactured goods” and “Machinery and transport equipment”. The less dynamic groups were, on the other extreme, “Food and live animals”, “Beverages and tobacco” and “Animal and vegetables oils and fats”.<sup>9</sup>

Table 2

**Main Chinese Exports to Brazil in 2007**

	Yearly % (2007-1994)
Chemicals	32
Manufactured goods	31
Machinery and transport eq.	28
Miscellaneous manufactures	21
Crude materials	17
Mineral fuels	14
Food and live animals	7
Beverages and tobacco	0
Animal and vegetables oils and fats	-8

Source: COMTRADE and BBVA Research

As suggested by the graphs displaying information at 1-digit level, Brazilian exports to China are more concentrated than Chinese's exports. Using the 2-digit level of the Harmonized System (Annex 1), the top ten products exported by Brazil to China account for 88% of Brazilian exports to the Asian country, (and 78% using the 4-digit one). On the other hand, Chinese top ten exports to Brazil account for 75% of its total exported to Brazil, according to the 2-digit aggregation (and only 22% using the 4-digit one). The concentration of Brazilian exports, actually, is not only observed in the trade with China. It is a general feature of Brazil's international trade as it is revealed by the Hirshmann - Herfindahl concentration index (the concentration is higher as higher is the index). Brazil's concentration in 2007, using a 4-digit classification, was equal to 172 while this same index was equal to 119 for China.

Looking at trade data by Broad Economic Classification (BEC) – which classifies the products into capital, intermediate, consumption and primary categories– one can verify that the Brazilian imports of capital and intermediate goods from China expanded, in the 1994-2007 period, more than the imports of consumption goods.<sup>10</sup> More specifically, the Brazilian imports of intermediate goods grew by 517% in the period under analysis and the imports of capital goods expanded 1200% while the imports of consumption goods increased 308% in the same period.

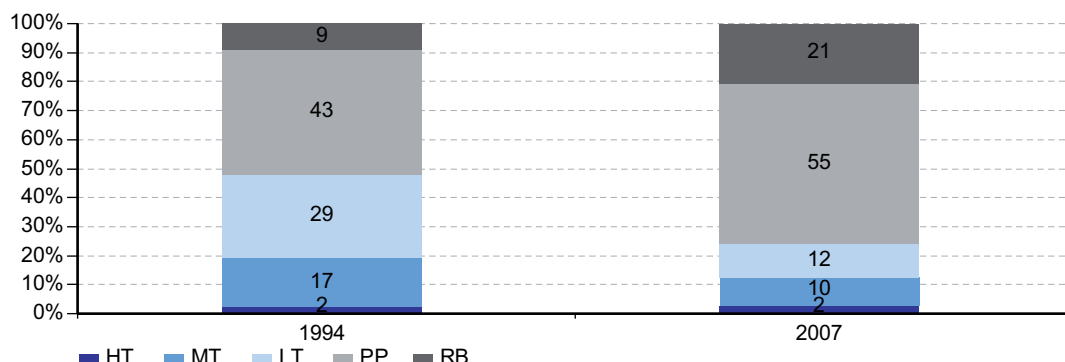
Using the technological-content classification, the main change in Brazilian exports from 1994 to 2007 was the enlargement of both RB and PP groups, compensated by a reduction in importance of the MT and LT groups as can be observed in the figure below. The HT group remained practically unchanged.

9: The one-digit classification displays a more general picture of the trade relationship between Brazil and China. Check Annex 1 for 2-digit and 4-digit data.

10: Refer to the Annex 2 to more on this issue. The increasing share of intermediate and capital goods within Brazilian imports from China could actually be a source of increasing competitiveness for Brazilian exports as the production costs of Brazilian exports could be declining.



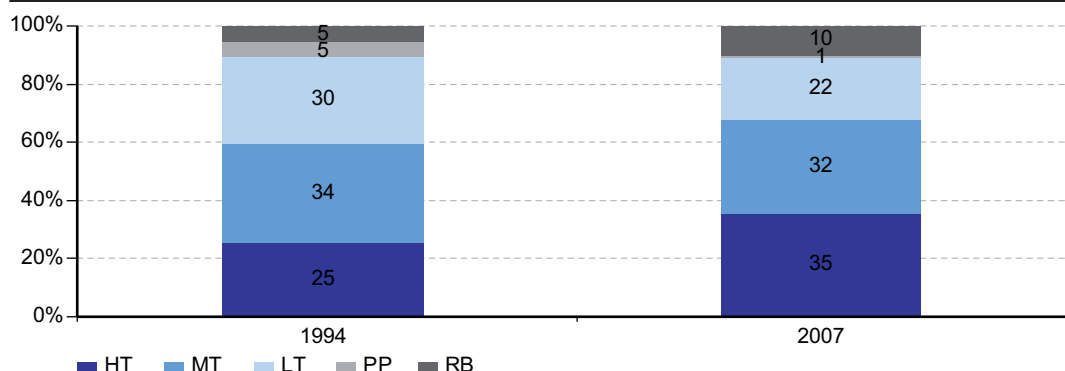
Chart 7

**Brazilian Exports to China by Technology-Content (share of total exports; in %)**

Source: BACI

Regarding Brazilian imports from China, the most important change in the 1994 - 2007 was the augment of the importance of the HT group, as it is depicted from the figure below. The RB group also became more important in 2007. On the other hand, PP and LT groups lost the most in the period.

Chart 8

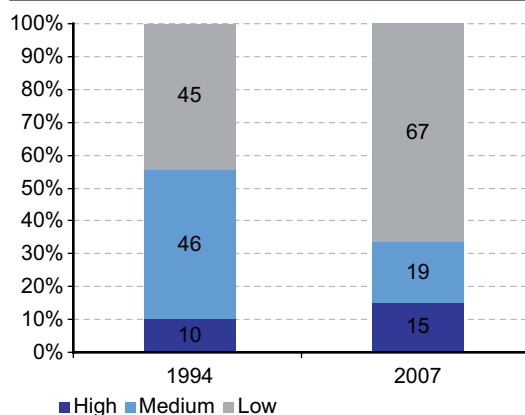
**Brazilian Imports from China by Technology-Content (share of total imports; in %)**

Source: BACI

These changes – Brazil exporting more primary and resources-based manufactures while China is specializing in the exports of products with higher technology – are in accordance with the claim (which will be formally checked below) that Brazil has comparative advantage in the production of non-manufactured products while China has advantage in the production of manufactured goods.

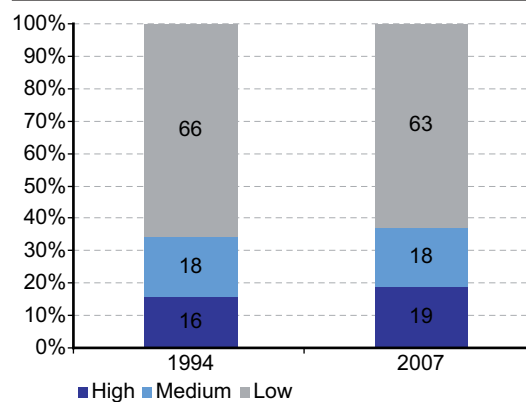
Looking at the change in the composition of trade flows with respect to the quality of the product, we observe that the share of low-quality products (i.e. products with low unit-value) in Brazilian exports increased significantly from 45% to 67% of total exports to China. The share of medium quality goods declined drastically while the share of high quality products increasing from 10% to 15% from 1994 to 2007.

Chart 9

**Brazilian Exports to China by Quality Segment (share of total exports; in %)**

Source: BACI

Chart 10

**Brazilian Imports from China by Quality Segment (share of total imports; in %)**

Source: BACI

The quality composition of Brazilian imports from China remained practically unchanged in the period analyzed. The imports of low quality goods represented in 2007 the largest share of the total imports from China.

Therefore, on one hand the structures of exports and imports are clearly complementary regarding the technological content, while on the other hand most of the trade flow between Brazil and China fall within the same quality category, namely the low quality category.

## 4. The similarity of exports' structures

For a more precise assessment of the degree of competition between Brazil and China we look at which extent the exports of both countries overlap. Clearly, the competition should be higher when the overlap is higher.

Following Mulder, Paillacar and Zignago (2009), we compute a similarity index which ranges from 0 to 1, with 0 meaning no overlapping at all and 1 meaning perfect overlapping.

The similarity index of Brazil and China's export structures at the product level remained relatively stable in the 1994 – 2007 period. More precisely, as depicted in the table below, this similarity was equal to 0.18 in 1994 and to 0.19 in 2007. Although the overlapping between Brazilian and Chinese exports are more important than between Latin America (ex-Mexico) and China, for example, the overlapping Brazil – China is much lower than the overlapping between Brazil and some of its main trade partners (Europe, USA or Mexico). It is also lower than the overlapping between China and these regions. In other words, the overlapping of Brazilian and Chinese exports is relatively small in comparison to the overlapping that these two countries display with regards to Mexico, USA and Europe. This, therefore, shows that the competition between Brazil and China is restricted to a relatively limited number of sectors.

Table 3

### Similarity of export structures at the product level

1994								
	Asia (ex-China)	Brasil	China	Europe	Mexico	Latam (ex-Mexico)	Rest of the World	USA
Asia (ex-China)	-	-	-	-	-	-	-	-
Brasil	0.14	-	-	-	-	-	-	-
China	0.26	0.18	-	-	-	-	-	-
Europe	0.12	0.21	0.19	-	-	-	-	-
Mexico	0.18	0.22	0.28	0.20	-	-	-	-
Latam (ex-Mexico)	0.08	0.12	0.10	0.07	0.09	-	-	-
Rest of World	0.06	0.07	0.08	0.06	0.06	0.05	-	-
USA	0.21	0.29	0.30	0.29	0.36	0.09	0.08	-
2007								
	Asia (ex-China)	Brasil	China	Europe	Mexico	Latam (ex-Mexico)	Rest of the World	USA
Asia (ex-China)	-	-	-	-	-	-	-	-
Brasil	0.17	-	-	-	-	-	-	-
China	0.29	0.19	-	-	-	-	-	-
Europe	0.17	0.23	0.25	-	-	-	-	-
Mexico	0.21	0.26	0.33	0.28	-	-	-	-
Latam (ex-Mexico)	0.09	0.13	0.10	0.09	0.11	-	-	-
Rest of World	0.08	0.09	0.10	0.09	0.09	0.06	-	-
USA	0.24	0.35	0.35	0.36	0.40	0.12	0.11	-

Source: BACI

## 5. Assessing comparative advantages and the degree of trade competition

The analyses in previous sections suggest that Brazil has comparative advantage in the production of commodities while China in the production of manufactures. In this section we will formally investigate the products in which Brazil and China have comparative advantage.

To pursue this objective we use a Revealed Comparative Advantage indicator that compares the net exports of each product  $k$  with total exports of the country  $i$  weighted by the share of the product  $k$  in the world trade.<sup>11</sup> More precisely:

$$\text{Revealed Comparative Advantage Indicator} = [1000 / Y_i] * [(X_{ik} - M_{ik}) - (X_i - M_i) * (X_k + M_k) / (X_{..} + M_{..})]$$

where,

$Y_i$  = country  $i$ ' GDP

$X_{ik}$  = country  $i$ 's exports of the product  $k$

$M_{ik}$  = country  $i$ 's imports of the product  $k$

$X_i$  = country  $i$ 's total exports

$M_i$  = country  $i$ 's total imports

$X_k$  = world exports of the product  $k$

$M_k$  = world imports of the product  $k$

$X_{..}$  = world's total exports

$M_{..}$  = world's total imports

The overall sum of this indicator for each product  $k$  is, by construction, equal to zero.

The table below shows that the main sectors in which Brazil display comparative advantage are commodity-related sectors. More specifically, the sectors in which Brazil has more advantage in producing are "Food products and beverages", "Metal ores" and "Agriculture, hunting and related", according to data available for 2007. These sectors were also among those in which the country had trade advantage in 1994. However, during these 13 years the country accentuated its advantage in these sectors. On the other hand, there was an increase in the disadvantage in the production within sectors that were already the less competitive in 1994.

The increase in the dispersion of comparative advantages should be expected beforehand given the opening process that Brazil went through in the period under analysis.

11: We use CHELEM trade data for these calculations.

Table 4

**Brazil: Revealed Comparative Advantage (From ISIC Classification)**

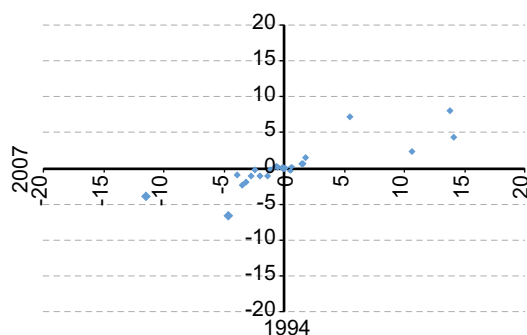
PRODUCT	ISIC	2007	1994
Food products and beverages	15	14.07	4.36
Metal ores	13	13.76	7.98
Agriculture, hunting & related	1	10.60	2.29
Basic metals products	27	5.43	7.18
Leather products	19	1.84	1.49
Paper and paper products	21	1.61	0.70
Wood & pr. exc. furnit.; straw	20	1.42	0.61
Other non-metallic mineral pr.	26	0.61	0.16
Motor vehicles and trailers	34	0.57	-0.33
Tobacco products	16	0.06	0.06
Electricity, gas and steam	40	0.01	-0.01
Other service activities	93	0.00	0.00
Uranium and thorium ores	12	0.00	0.00
Other business activities	74	0.00	0.00
Recycling	37	-0.02	-0.01
Forestry, logging & rel. act.	2	-0.02	0.02
Leisure, cultural & sport pr.	92	-0.03	0.00
Fish, prod. of fish hatcheries	5	-0.04	0.01
Other mining and quarrying pr.	14	-0.06	0.06
Publishing, printing & reprod.	22	-0.12	-0.06
Furniture; manufacturing n.e.c	36	-0.13	0.15
Wearing apparel; fur	18	-0.48	0.09
Fabr. metal pr. exc. machin.	28	-0.54	0.26
Textiles	17	-0.65	0.30
Rubber and plastics products	25	-0.88	0.11
Electr. machinery & apparatus	31	-1.15	-0.22
Coal, lignite and peat	10	-1.40	-1.13
Office and computing machinery	30	-2.04	-1.05
Other transport equipment	35	-2.45	-0.17
Medical & precision instr.	33	-2.73	-1.08
Coke, refined petr. pr., nucl.	23	-3.20	-1.92
Radio, TV and communication	32	-3.45	-2.31
Machinery and equipment n.e.c.	29	-3.94	-0.87
Crude petroleum & natural gas	11	-4.59	-6.59
Chemicals & chemical products	24	-11.49	-3.98
Total	TT	0.00	0.00

Source: CHELEM and BBVA Research

The graph below shows that the dispersion of values in the 2007 axis is higher than the dispersion of values in the 1994 axis.

Chart 11

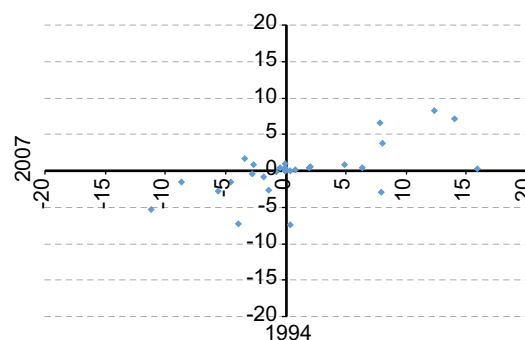
**Brazil: Dispersion of Revealed  
Comparative Advantage: 1994 vs 2007**



Source: Author's calculations using CHELEM database

Chart 12

**China: Dispersion of Revealed  
Comparative Advantage: 1994 vs 2007**



Source: Author's calculations using CHELEM database

The same type of evidence – i.e. more dispersion of comparative advantage among sectors – is depicted from the analysis of the Chinese case. The opening of the Chinese economy is likely to be the main driver of this movement.

In the case of China, however, the sectors with higher comparative advantage are manufacture-related sectors. On the other hand it is clear the lack of advantage in the production of resource-based sectors.

Although the trade complementarity between Brazil and China is clear, the two countries have comparative advantages in some common sectors, especially in leather and wood products, according to 2007 data.



Table 5

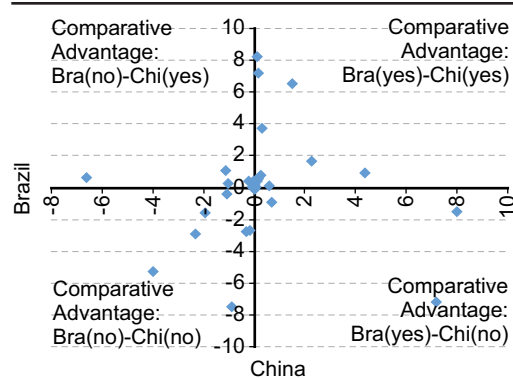
**China: Revealed Comparative Advantage (From ISIC Classification)**

PRODUCT	ISIC	2007	1994
Office and computing machinery	30	<b>15.91</b>	<b>0.26</b>
Furniture; manufacturing n.e.c	36	<b>13.98</b>	<b>7.20</b>
Wearing apparel; fur	18	<b>12.32</b>	<b>8.26</b>
Textiles	17	<b>8.04</b>	<b>3.76</b>
Radio, TV and communication	32	<b>7.97</b>	-2.93
Leather products	19	<b>7.79</b>	<b>6.54</b>
Electr. machinery & apparatus	31	<b>6.32</b>	<b>0.43</b>
Fabr. metal pr. exc. machin.	28	<b>4.89</b>	<b>0.78</b>
Other non-metallic mineral pr.	26	<b>2.10</b>	<b>0.54</b>
Rubber and plastics products	25	<b>1.91</b>	<b>0.44</b>
Wood & pr. exc. furnit.; straw	20	<b>0.83</b>	<b>0.14</b>
Machinery and equipment n.e.c.	29	<b>0.37</b>	-7.47
Publishing, printing & reprod.	22	<b>0.35</b>	<b>0.04</b>
Fish, prod. of fish hatcheries	5	<b>0.02</b>	<b>0.20</b>
Other service activities	93	<b>0.00</b>	<b>0.00</b>
Leisure, cultural & sport pr.	92	<b>0.00</b>	<b>0.07</b>
Recycling	37	<b>0.00</b>	-0.01
Other business activities	74	-0.01	-0.01
Electricity, gas and steam	40	-0.01	<b>0.41</b>
Uranium and thorium ores	12	-0.02	<b>0.00</b>
Coal, lignite and peat	10	-0.02	<b>1.03</b>
Tobacco products	16	-0.08	<b>0.02</b>
Other mining and quarrying pr.	14	-0.52	<b>0.49</b>
Forestry, logging & rel. act.	2	-0.74	-0.08
Other transport equipment	35	-1.45	-2.68
Paper and paper products	21	-1.83	-0.91
Food products and beverages	15	-2.66	<b>0.90</b>
Medical & precision instr.	33	-2.78	-0.39
Agriculture, hunting & related	1	-3.40	<b>1.65</b>
Basic metals products	27	-3.93	-7.23
Coke, refined petr. pr., nucl.	23	-4.61	-1.59
Motor vehicles and trailers	34	-5.64	-2.80
Metal ores	13	-8.71	-1.48
Chemicals & chemical products	24	-11.14	-5.26
Crude petroleum & natural gas	11	-21.68	<b>0.61</b>
Total	TT	0.00	0.00

Source: CHELEM and BBVA Research

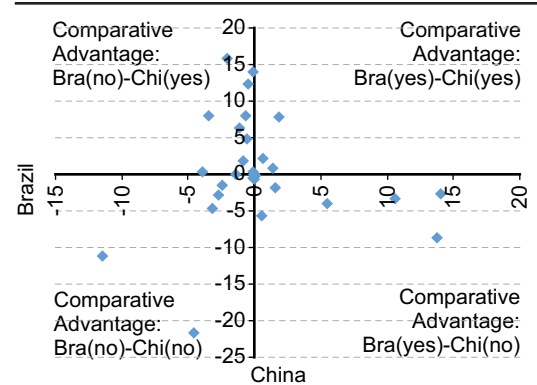
The number of sectors in which both countries have comparative advantage declined since 1994, as showed in the graphs below: in the graph for the year 2007 it is clear that the number of sectors in the “yes – yes” zone (i.e. the quadrant in which both countries display comparative advantage) is lower than in the 1994 graph. The number of sectors in the “yes – no” zones (i.e. the quadrants where only one country has comparative advantage) is much higher in 2007 than in 1994, suggesting high and increasing complementarity.

Chart 13

**Brazil and China:  
Dispersion of Revealed Comparative  
Advantage by Products (1994)**

Source: Author's calculations using CHELEM database

Chart 14

**Brazil and China:  
Dispersion of Revealed Comparative  
Advantage by Products (2007)**

Source: Author's calculations using CHELEM database

We take advantage of the technological dimension of our dataset to calculate the Revealed Comparative Advantage indicator based on technology groups (instead of sectors or products). The results displayed in the tables below show that Brazil has advantage in the production of primary products (PP) and of resource-based manufactures (RB), and to a small extent in low technology (LT) products.

The data for China confirms the complementarity with Brazil as it shows that China has advantage in the production of manufactures (LT and HT) and disadvantage in RB and PP groups. This data also shows that despite general complementarity, Brazil and China compete in LT market, where China has much higher advantage in comparison to Brazil.

Table 6

**Brazil: Revealed Comparative Advantage (by Technological Content\*)**

TECHNOLOGY	2007	1994
PP	14.25	1.20
RB	13.64	3.15
LT	5.12	10.17
MT	-12.40	-4.55
HT	-12.84	-6.25

\* Services are not presented in the table. The Index of Comparativa Advantage for Brazilian services was equal to -7.77 in 2007 and to -3.72 in 1997

Source: BACI and BBVA Research

Table 7

**China: Revealed Comparative Advantage (by Technological Content\*)**

TECHNOLOGY	2007	1994
LT	47.17	17.09
HT	16.64	-2.98
RB	-7.92	-0.79
MT	-8.42	-16.62
PP	-37.49	0.94

\* Services are not presented in the table. The Index of Comparativa Advantage for Brazilian services was equal to -9.98 in 2007 and to 2.36 in 1997

Source: BBVA; BACI.

Finally, to measure the overall degree of complementarity between Brazil and China we will use two indicators that are standard in the international trade literature.

The first indicator is the Coefficient of Specialization.<sup>12</sup> This index varies from 0 to 1. It is equal to one when there is no complementarity between the overall exports of both countries and it is equal to zero when there is a perfect complementarity between the overall exports of the countries under analysis.

In the case of the trade between Brazil and China, this index was equal to 0.27 in 2007, confirming that the degree of complementarity between the two countries is high. The same indicator was equal to 0.25 in 1997.

The second indicator that we analyze is the Complementarity Index.<sup>13</sup> This index compares the exports profile of a given country to the imports profile of another country. It tends to zero when one country does not export the same products imported by the other. It is bigger than one when there exists a complementarity between a country's exports and other country's imports.<sup>14</sup> This complementarity is, therefore, larger as higher is the trade Complementarity Index.

In 2007, the Complementarity Index between Brazil and China was equal to 1.14 showing that these countries display trade complementarity. This is the same result derived from the analysis of the Coefficient of Specialization.

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12: See Blásquez-Lidoy et al. (2004).

13: See Anderson and Nordheim (1993).

14: This index is not upper-bounded.

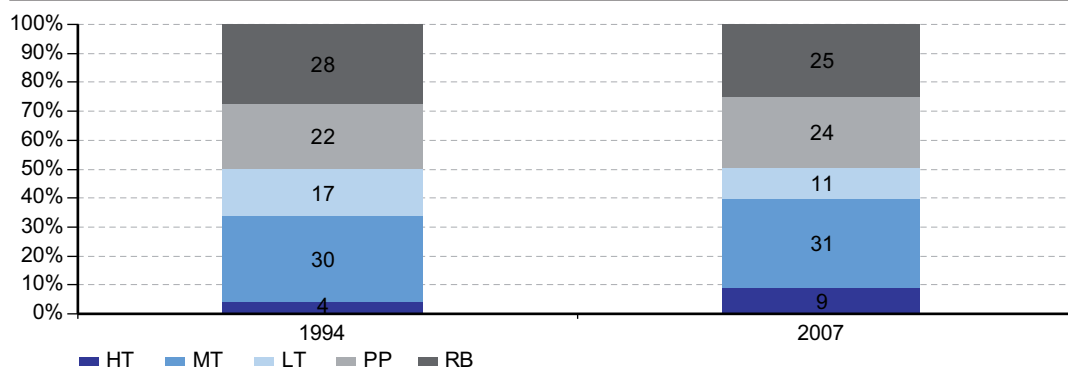
## 6. The market share of Brazilian exports

As suggested by the previous literature and also by some of the evidence presented in this work, although there is a general complementarity between their trade structures, Brazil and China compete in a set of manufactured products. Both the stimulus that China represents for Brazilian exports of commodities and the competition that the Asian country exerts in manufactured markets raise concerns regarding an excessive specialization of Brazilian exports in commodities as well as the deindustrialization of its external sales. To verify if this has happened in the last years we analyze the performance of Brazilian exports in foreign markets. On pursuing this objective we take advantage of the technological and quality dimensions of our data.

The total share of Brazilian exports in global markets increased timidly from 1.11% in 1994 to 1.21% in 2007. By regions, the share of exports destined to USA, Europe and Asia (ex-China) declined while the share of Brazilian total exports to Latin America, China and the Rest of the World expanded.<sup>15</sup>

Chart 15

### Brazilian Exports by Technology-Content (share of total exports; in %)



Source: BACI

Analysing the technological dimension of the data, the share of Brazilian PP exports in world market expanded from 3.26% to 5.24% in the 1994-2007 period mainly due to an expansion of the share of Brazilian PP exports in China (this share increased from 1.05% to 9.38%).

As a share of global markets, Brazilian HT exports also expanded significantly, although they still remain at small levels. More precisely, the share of HT exports in global markets more than doubled. They increased from 0.21% in 1994 to 0.48% in 2007. Moreover, the expansion was also observed in the most important markets for the Brazilian exports, namely Europe, Latin America and Europe.<sup>16</sup>

15: See Annex 3 for more data on this issue.

16: See Annex 3 for more information on Brazilian exports by destination.

Table 8

**Brazil: Share of Brazilian Exports in Foreign Markets by Technology Content**

Quality	Year (ex-China)	Asia	Brasil	China	Europe	Mexico (ex-Mexico)	Latam	Rest of the World	USA	Total
HT	1994	0.05%	0.00%	0.06%	0.12%	0.74%	3.19%	0.10%	0.33%	0.21%
	2007	0.03%	0.00%	0.05%	0.24%	1.13%	8.58%	0.49%	0.83%	0.48%
MT	1994	0.77%	0.00%	0.25%	0.31%	2.23%	9.05%	0.55%	1.25%	0.92%
	2007	0.62%	0.00%	0.27%	0.43%	2.90%	12.59%	0.53%	1.20%	1.00%
LT	1994	0.60%	0.00%	0.60%	0.46%	1.23%	10.51%	0.50%	1.90%	0.99%
	2007	0.31%	0.00%	0.73%	0.44%	1.15%	9.80%	0.41%	1.10%	0.77%
PP	1994	1.66%	0.00%	1.05%	4.40%	0.83%	7.16%	2.21%	4.04%	3.26%
	2007	3.46%	0.00%	9.38%	4.86%	0.59%	8.78%	6.56%	3.39%	5.24%
RB	1994	1.97%	0.00%	1.89%	1.27%	1.66%	11.48%	1.53%	2.57%	1.85%
	2007	1.08%	0.00%	1.11%	1.30%	2.01%	12.90%	2.23%	2.59%	1.84%

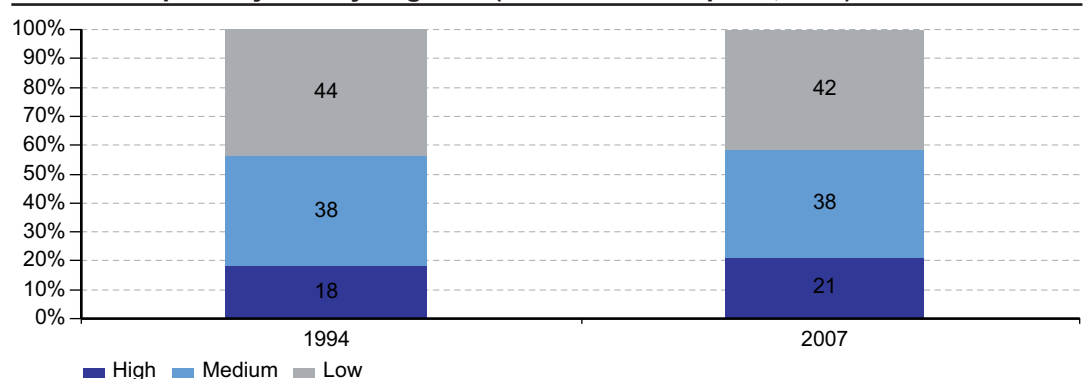
Source: BACI

Regarding other technological groups, MT and RB shares in world markets remained basically stable while the share of LT exports dropped the most, from 0.99% in 1994 to 0.77% in 2007.

The main evidences derived from the analysis of the technological dimension of Brazilian trade from 1994 to 2007 are, therefore, that PP and HT groups have been gaining space in international markets while LT exports have been losing market share. The exports of PP to China are clearly behind the overall expansion observed in the PP group (incentives provided by increasing commodity prices are also a driver of this result, but at some extent the upward commodity prices trend seems also to be a consequence of Chinese emergence). The expansion of HT and the weakening of LT external sales seem to be related to the fierce competition of Chinese LT products which could have helped to displace Brazilian exports to more technological groups (related data for China is displayed in the Annex 3). Anyway, this movement towards more technological exports contrasts to what is suggested from other papers in the literature (see Lall and Weiss, 2004, Mesquita Moreira, 2007; and IADB 2007, for example).

With respect to the quality dimension of exports, in the 1994 – 2007 period Brazilian external sales of high quality (H) products expanded from 18% to 21% while the exports of medium quality (M) goods remained stable at 38% and the share of low quality (L) goods in Brazilian exports dropped to 42%.

Chart 16

**Brazilian Exports by Quality Segment (share of total exports; in %)**

Source: BACI

The market share of H exports expanded the most among quality groups in the analysed period. In 1994 the share of Brazilian H exports in foreign markets was equal to 0.69% and in 2007 this figure rose to 0.80%. The share of M exports in foreign markets expanded less in the same period, from 1.21% to 1.28%. On the other hand, L exports lost space in global markets. In 1994 the market share of Brazilian L exports was 1.66% and in 2007 it declined to 1.6%.

Table 9

**Brazil: Share of Brazilian Exports in Foreign Markets by Quality Segment**

Quality	Year	Asia (ex-China)	Brasil	Europe	Mexico	Latam (ex-Mexico)	Rest of the World	USA	Total
High	1994	0.51%	0.00%	0.53%	1.76%	7.01%	0.47%	0.87%	0.69%
	2007	0.35%	0.00%	0.59%	2.50%	8.86%	0.72%	0.76%	0.80%
Medium	1994	1.39%	0.00%	0.85%	1.45%	7.85%	0.86%	1.41%	1.21%
	2007	0.65%	0.00%	0.95%	1.29%	13.09%	1.32%	1.53%	1.28%
Low	1994	0.95%	0.00%	1.23%	1.62%	10.62%	1.12%	2.65%	1.66%
	2007	0.99%	0.00%	0.94%	2.53%	11.73%	1.42%	1.66%	1.60%

Source: BACI

This general evidence of increasing the participation in high quality markets and losing space in low quality markets was also observed in Latin America, Europe and USA (in the last, the share H exports declined but the expansion of M exports compensated the H drop).

This result is in accordance with the evidence that emerged from the analysis of the technological dimension. Since 1994 until 2007, while China emerged as a giant player in international trade markets, Brazil was able to increase significantly its share in global markets of products with more technological content and with higher quality. On the other hand, low technological and low quality goods lost space in global markets. It is worth noting that this movement towards more technologic and more quality took place especially in the main markets for Brazilian exports, namely in Europe, Latin America and USA. This weakens the view that the emergence of China would imply a deindustrialization of Brazilian exports and also raises the importance of further research on the impact of China on Brazil.



## 7. Final Comments

Brazil and China have been through an economic integration process in the last years which is based on the opening of their economies, the strength of their domestic demand and on their complementary factor endowments. Despite some competition in the production of some manufactured products, Brazil and China display a general trade complementarity.

Brazil has benefited largely from this complementarity as its exports of commodities to China has been guaranteeing the expansion of Brazilian total exports. Increasing imports from China, on the other hand, could have helped to increase the competitiveness of Brazilian exports due to a price-effect, as imports of intermediate and capital goods from China were more dynamic in the last years than the imports of consumption goods. Finally - and differently of the expected by many - Brazil was able to increase its share in high technological and high quality markets.

This last piece of evidence shows that concerns regarding the deindustrialization of Brazilian exports were probably exaggerated (see also Lora2005, for more on this issue). Excessively negative were also the concerns about a redirecting of FDI flows from many emerging countries – including Brazil – to China. The evidence accumulated in the last years shows that China was able to attract large capital flows without diverting capital flows away from Brazil. Although in the future this evidence should not take the attention away from the challenges raised by this type of economic integration, they should help us to prevent over-alarmist reactions to other economic integration processes in the future.

The impressive evolution observed in the trade between Brazil and China is from now on likely to be replicated in other economic arenas. It is actually natural that two countries with a relatively recent economic integration display first an evolution in the volume traded and then an expansion in investment volumes. And given that trade volumes only expanded few years ago, it is natural that investment volumes have not surged yet. They are likely to do so in the next years as Brazilian investments should be attracted by Chinese market size, especially during a time in which foreign direct investment start to be more common among Brazilian companies. On the other hand, Chinese investments in Brazil are likely to expand significantly in the future as China's necessity to import commodities match Brazil's comparative advantages.

Although foreign investment numbers reveal that current levels are still very low, there is plenty of anecdotal evidence and of economic reasons to support this perspective. Among the recent signs of Chinese interest in Latin America and in Brazil were its recent incorporation to the Inter-American Development Bank (IADB), the intensification of official visits from Chinese authorities to Brazil and the impressive loans Petrobras (the giant Brazilian oil company) was able to get from Chinese banks during the worst of the international crisis.

# Annex 1

Table 10

## Harmonised System Groups

Group	Code
Food and Live Animals	0
Beverages and Tobacco	1
Crude Materials (except fuels)	2
Fuels	3
Animal and vegetable oils and fats	4
Chemicals	5
Manufactured goods	6
Machinery and transportation equipment	7
Miscellaneous manufactures	8
Goods not classified by kind	9

Source: COMTRADE

Table 11

## Brazilian Main Exports to China in 2007

Products 2 digit	Value USD millions	Yearly % (2007-1994)
08 Animal feed stuff	3,850	28
27 Crude fertilizers	2,832	-
25 Pulp and waste paper	840	93
78 Road vehicles	801	18
12 Tobacco and tobacco manufactures	731	19
42 Fixed vegetables fats and oils	425	27
51 Organic chemicals	331	5
06 Sugar and sugar preparations, honey	329	13
68 Non-ferrous metals	275	30
33 Petroleum and petroleum products	211	3

Source: COMTRADE and BBVA Research

Table 12

## Brazilian Main Exports to China in 2007

Products 4 digit	Value USD millions	Yearly % (2007-1994)
2815 Iron ores and concentrates, not agglomerated	3,125	11
2222 Soya beans	2,832	-
3330 Crude petroleum	840	-
6114 Bovine and equine leather	713	6
2816 Iron ore agglomerates	591	9
0123 Poultry, meat and offal	446	9
2515 Chem, wood pulp	387	10
4211 Soya bean oil	328	53
1212 Tobacco, wholly or partly stemmed/stripped	275	24
6726 Semi-finish iron and steel	100	36

Source: COMTRADE and BBVA Research

Table 13

**Chinese Main Exports to Brazil in 2007**

<b>Products 2 digit</b>	<b>Value USD millions</b>	<b>Yearly % (2007-1994)</b>
76 Telecommunication and sound record machines	2,352	18
77 Electrical machinery	2,082	23
75 Office machines and ADP machines	1,384	31
65 Textile yarn, fabric, etc.	722	18
74 General industrial machinery	721	18
87 Scientific equipment	642	29
89 Miscellaneous manufactured goods	618	11
51 Organic chemicals	517	17
67 Iron and steel	446	44
69 Metals manufactures	378	21

Source: COMTRADE and BBVA Research

Table 14

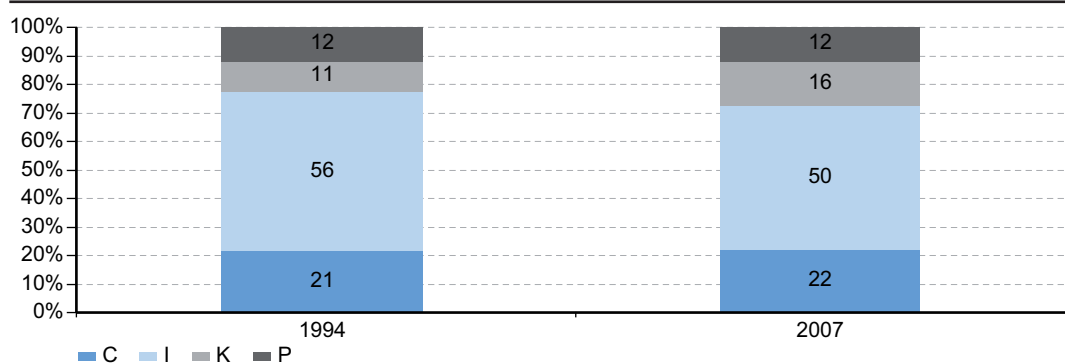
**Chinese Main Exports to Brazil in 2007**

<b>Products 4 digit</b>	<b>Value USD millions</b>	<b>Yearly % (2007-1994)</b>
7649 Telecommun.equipt.	1,240	26
8719 Liquid crystal devices and lasers	524	33
7599 Data process.mch	495	31
7764 Electronic microcircuits	374	27
7638 Sound,video recordng	326	41
7527 Storage units	235	-
7712 Electrical power mach.	217	26
5629 Fertilizers	216	-
7781 Batteries,accumulators	213	32
3250 Coke of Coal	211	6

Source: COMTRADE and BBVA Research

## Annex 2

Chart 17

**Brazilian Exports by Broad Stage Classification (share of total exports; in %)**

Source: BACI

Table 15

**Brazil: Share of Brazilian Exports in Foreign Markets by Broad Stage Classification**

Quality	Year (ex-China)	Asia	Brasil	China	Europe	Mexico (ex-Mexico)	Latam	Rest of the World	USA	Total
C	1994	0.47%	0.00%	0.22%	0.59%	0.62%	6.74%	0.58%	1.28%	0.84%
	2007	0.66%	0.00%	0.90%	0.54%	3.06%	9.83%	1.50%	0.63%	1.03%
I	1994	1.20%	0.00%	0.83%	0.85%	1.73%	12.22%	0.81%	1.72%	1.28%
	2007	0.64%	0.00%	0.49%	0.82%	1.49%	13.20%	1.03%	2.04%	1.20%
K	1994	0.13%	0.00%	0.08%	0.22%	2.00%	5.79%	0.54%	0.74%	0.62%
	2007	0.29%	0.00%	0.09%	0.40%	2.41%	10.04%	0.76%	1.17%	0.96%
P	1994	1.60%	0.00%	0.20%	4.65%	0.93%	4.78%	1.72%	5.95%	3.16%
	2007	2.40%	0.00%	6.48%	5.23%	0.75%	6.40%	2.91%	4.64%	4.27%

Source: BACI

Table 16

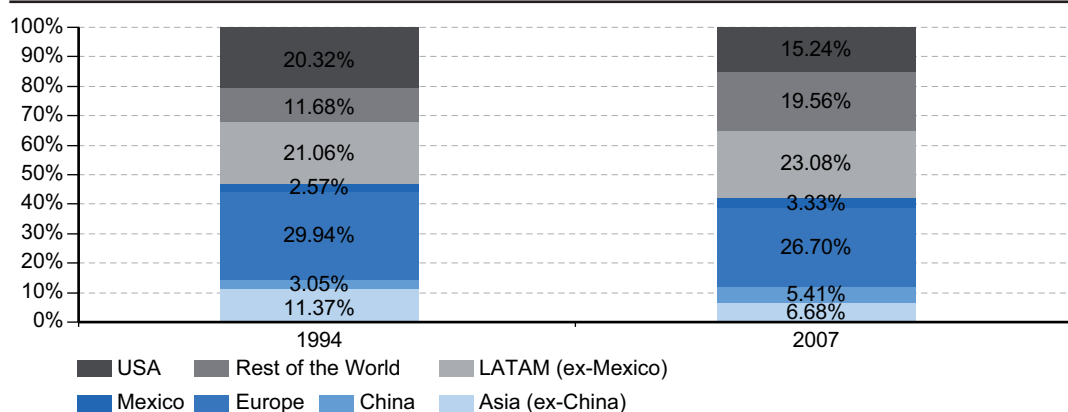
**China: Share of Chinese Exports in Foreign Markets by Broad Stage Classification**

Quality	Year	Asia	Brasil	China	Europe	Mexico (ex-Mexico)	Latam	Rest of the World	USA	Total
C	1994	18.06%	4.40%	48.17%	5.43%	3.37%	11.26%	8.74%	14.41%	11.37%
	2007	32.87%	13.57%	42.25%	9.23%	12.67%	15.98%	13.43%	21.96%	15.51%
I	1994	5.84%	2.01%	16.30%	1.17%	0.56%	2.24%	3.29%	3.10%	3.68%
	2007	19.45%	10.41%	14.56%	5.11%	8.32%	9.33%	9.66%	12.68%	10.11%
K	1994	3.72%	1.47%	13.46%	1.51%	0.61%	1.10%	1.78%	4.43%	3.18%
	2007	26.38%	17.67%	21.99%	12.02%	17.12%	10.42%	12.76%	27.22%	17.04%
P	1994	8.49%	0.28%	14.59%	1.43%	0.38%	0.34%	3.14%	1.80%	4.01%
	2007	6.16%	0.88%	4.86%	1.42%	0.68%	0.55%	2.65%	3.66%	3.04%

Source: BACI

## Annex 3

Chart 18

**Brazilian Exports - By Region (share of total exports)**

Source: BACI

Table 17

**China: Share of Chinese Exports in Foreign Markets by Technology Content**

Quality	Year	Asia	Brasil	China	Europe	Mexico	Latam (ex-Mexico)	Rest of the World	USA	Total
HT	1994	4.95%	2.88%	19.63%	2.05%	0.92%	2.26%	3.29%	5.00%	4.50%
	2007	24.19%	19.71%	21.41%	12.40%	21.86%	15.07%	15.24%	26.06%	18.33%
MT	1994	4.56%	1.83%	14.18%	1.26%	0.77%	2.25%	2.14%	2.79%	2.96%
	2007	19.02%	8.52%	12.80%	4.37%	5.93%	8.04%	7.83%	10.79%	8.25%
LT	1994	22.39%	8.80%	44.06%	7.62%	2.70%	15.78%	13.01%	22.82%	16.03%
	2007	42.70%	24.37%	40.23%	15.02%	13.76%	23.43%	23.50%	36.71%	24.54%
PP	1994	10.23%	1.02%	16.56%	1.32%	0.39%	0.96%	3.62%	2.57%	4.24%
	2007	10.78%	1.79%	6.52%	1.77%	1.44%	1.23%	3.18%	5.55%	4.01%
RB	1994	7.29%	0.63%	13.11%	0.76%	0.37%	0.72%	2.70%	1.72%	2.84%
	2007	14.95%	7.05%	7.14%	2.52%	3.50%	6.74%	6.79%	7.01%	5.96%

Source: BACI

Table 18

**China: Share of Chinese Exports in Foreign Markets by Quality Segment**

Quality	Year	Asia	Brasil	Europe	Mexico	Latam (ex-Mexico)	Rest of the World	USA	Total
High	1994	3.41%	0.84%	1.08%	0.77%	0.74%	1.60%	1.94%	1.80%
	2007	11.96%	6.81%	3.51%	7.99%	7.27%	6.52%	6.00%	5.73%
Medium	1994	10.04%	1.22%	2.53%	0.81%	2.00%	2.92%	5.33%	4.64%
	2007	22.29%	8.73%	6.63%	9.86%	9.76%	10.99%	22.23%	14.06%
Low	1994	12.68%	4.47%	4.09%	1.37%	6.93%	8.13%	16.51%	10.89%
	2007	32.14%	18.32%	13.40%	13.17%	14.36%	15.00%	22.21%	18.21%

Source: BACI

Table 19

**China: Share of Chinese Exports in Foreign Markets by Broad Stage Classification**

Quality	Year	Asia	Brasil	China	Europe	Mexico (ex-Mexico)	Latam	Rest of the World	USA	Total
C	1994	18.06%	4.40%	48.17%	5.43%	3.37%	11.26%	8.74%	14.41%	11.37%
	2007	32.87%	13.57%	42.25%	9.23%	12.67%	15.98%	13.43%	21.96%	15.51%
I	1994	5.84%	2.01%	16.30%	1.17%	0.56%	2.24%	3.29%	3.10%	3.68%
	2007	19.45%	10.41%	14.56%	5.11%	8.32%	9.33%	9.66%	12.68%	10.11%
K	1994	3.72%	1.47%	13.46%	1.51%	0.61%	1.10%	1.78%	4.43%	3.18%
	2007	26.38%	17.67%	21.99%	12.02%	17.12%	10.42%	12.76%	27.22%	17.04%
P	1994	8.49%	0.28%	14.59%	1.43%	0.38%	0.34%	3.14%	1.80%	4.01%
	2007	6.16%	0.88%	4.86%	1.42%	0.68%	0.55%	2.65%	3.66%	3.04%

Source: BACI



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