

NAFTA and the loss *of U.S. market share* by Brazil, 1992-2001

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This article quantifies Brazil's loss of U.S. market share to Mexico between 1992 and 2001 as a result of the entry into force of the North American Free Trade Agreement (NAFTA).

An expanded version of the constant market share model was used to calculate gains and losses in the competitiveness of Brazilian exports to the United States, by product and by competitor, for subperiods between 1992 and 2001. The model showed Mexico to be the country to which Brazil lost the most market share in the United States between 1992 and 1996. Exchange rate variations and preferential tariff treatment for Mexico on the U.S. market were equally important in Brazil's loss of export competitiveness to Mexico.

I

Introduction

Brazil's share in world exports of manufactured goods declined sharply between the mid-1980s and the end of the 1990s, dropping from 1.29% for the five-year period 1981-1985 to 1.08% in 1986-1990, then to 0.96% in 1991-1995, and ultimately to 0.91% in 1996-2000. A year after the major currency devaluation of 1999, Brazil's market share began to show signs of recovery, with manufactured exports from that country expected to account for 0.97% of world exports in 2001.¹

During the 1990s, Brazil's share in United States imports of manufactured goods also fell sharply, decreasing steadily from 1.41% in 1992 to 1.13% in 1996, where it hovered for the following two years. In 1999, the year of the major currency devaluation, the country's share in U.S. imports was down to 1.11%, from where it recovered slightly to 1.12% in 2000 and then to 1.27% in 2001, although this was still below the level posted in 1994.

In geographic terms, the United States was the market in which Brazil lost the most market share during the first half of the 1990s.² A closer look at the losses and gains of Brazilian manufactured exports between 1992 and 1996 reveals that the biggest losses, in value terms, were on the U.S. import market, with Mexico emerging as the main party responsible for those losses.³ Brazil also lost a considerable share of the Mexican import market, mainly to U.S. exporters. Brazilian losses to Mexico and the United States on the European Union and Asian markets, however, were negligible and in some cases even negative.⁴

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¹ See World Trade Organization (WTO), *Merchandise exporting countries*, www.wto.org.

² See Chami Batista and Azevedo (1998).

³ See Chami Batista (2001).

⁴ In fact, Brazil increased its market share at the expense of Mexico and the United States in Japan, and at the expense of the United States in the markets of South America (excluding Mercosur), while it was virtually level with Mexico in the European Union market and with the United States in the markets of the Asian tigers (China, Hong Kong, Indonesia, Malaysia, South Korea and Singapore). See Chami Batista (2001).

The foregoing analysis suggests that NAFTA may have played a significant role in the loss of U.S. market share by Brazilian exports between 1992 and 1996, especially vis-à-vis Mexico. Inasmuch as the period coincides with a strong appreciation of the Brazilian currency in real terms against both the dollar and the Mexican peso, however, it is not clear how much of Brazil's loss of U.S. market share was a consequence of NAFTA and how much was due to deterioration in Brazil's price- and cost-based competitiveness indicators.

This study seeks to assess the role of NAFTA and the exchange rate in the performance of Brazilian exports to the United States as compared with Mexico's export performance to that same country. The constant market share model will be applied to calculate U.S. market share gains or losses by product and country for subperiods between 1992 and 2001. To quantify Brazil's losses and gains vis-à-vis Mexico, a methodology is presented and subsequently applied that expands the above model by distributing the gains (losses) of a given country among its competitors (competitiveness effect).⁵ This approach also serves to identify the key commodities involved in Brazil's losses to Mexico between 1992 and 1996. A detailed analysis of trends in the margins of preference for Mexico and the export prices of selected products between 1992 and 2001 helps to establish the role of NAFTA and the exchange rate (as well as other determinants of export prices) in Brazil's market share losses to Mexico between 1992 and 1996.

The remainder of the paper is organized as follows. Section II briefly discusses the role of relative price indicators as a means of measuring the export competitiveness of a particular country or market. Section III presents the methodology used herein to obtain a country-based distribution of the variations in market share of a given country's exports in a specific market or country. Section IV analyses the performance of Brazilian exports in the U.S. market. Section V examines in greater depth the Brazilian losses to Mexico in the U.S. market, in terms of the exchange rate performance of these two countries vis-à-vis the U.S.

⁵ See Chami Batista (1999).

dollar, export prices, and tariff barriers to the main products exported by Brazil and Mexico to the U.S.

market between 1992 and 2001. Section VI summarizes the main findings.

II

Competitiveness indicators: aggregation versus precision

In simplified terms, the demand for a country's exports can be expressed as a function of world income and relative price, with the latter indicating export competitiveness and the former indicating the level of world demand for imports.

$$[1] \quad E^j = P_e^j * x^j = P_e^j * x^j(Y, P_r^j)$$

where:

E^j is the value of exports from country j ;

P^j represents the mean export price of country j ;

x^j is the volume of exports from country j ;

Y is world income;

P_r^j is the real effective exchange rate of country j .

The real effective exchange rate may be calculated by adjusting the nominal exchange rate for relative costs or prices expressed in local currency.⁶ The calculations can therefore be based on indicators of relative unit labour costs and of relative export prices. Accordingly, this rate can be interpreted as an indicator of the competitiveness of country j .

Of course, a number of other factors, such as product quality and the value of after-sales service, should technically be included in the calculation of this indicator. For practical reasons, however, competitiveness indicators are generally confined to easy-to-measure factors, i.e., those linked to price or cost differentials. Furthermore, different prices⁷ or costs⁸ and weightings thereof⁹ can be used, depending on the purpose of the indicator to be constructed.

For instance, an indicator of the competitiveness of domestic against imported goods could be the relationship between a domestic price index and a basket of price indices of the imported goods' countries of origin, weighted for the share of each such country in the importing country's total imports. Similarly, the competitiveness of an exported commodity vis-à-vis an "international" commodity can be measured by the relation between the price indices of manufactured goods¹⁰ –as a proxy for export prices– and a basket of price indices of manufactured goods of the recipient countries, weighted for the share of each such country in the total exports of the exporting country. The competitiveness of a domestic good can generally be gauged by the relationship between the manufactured goods price index and a basket of manufactured goods price indices of the countries that export to and import from the country in question, weighted for the share of each such country in the trade of the focus country.

However, even once the purpose of the indicator has been defined (e.g., to measure the competitiveness of manufactured exports from a given country), various problems remain. For instance, variations in a country's export prices or unit labour costs may reflect changes in commodity composition rather than their competitiveness. Also, some of the indices used to build these indicators (e.g., unit labour cost) are estimates

⁶ On the selection and limitations of indicators, see Durand and Giorno (1987).

⁷ E.g., consumer price indices, export price indices and manufactured goods price indices.

⁸ E.g., wages, relative cost of labour, or wholesale prices.

⁹ E.g., export or trade weightings.

¹⁰ "...it would in principle be necessary to carry out studies covering all categories of tradeable goods and services, with as detailed a breakdown as possible. In practice, such studies are normally confined to aggregate measures of manufacturing output, because there are difficulties in extending the analysis to other groups of products. In particular, many services are traded, but statistics on service prices are often unreliable. As for transactions in food products, energy and raw materials, they often take place on world markets or on highly regulated markets where price differentials are often more indicative of the importance of regulatory frameworks than of price competitiveness." (Durand, Simon and Webb, 1992, p. 6).

for the national economy as a whole, and as such they do not take account of productivity differences that may exist between the export sectors and sectors that serve the domestic market.¹¹

A further significant limitation of such price indices is that they do not reflect the impact of countries with which the focus country has little or no bilateral trade, but which compete with it in other markets. Double-weighted competitiveness indicators attempt to remedy this shortcoming by allowing for the weight of each competing country in each market as well as for the weight of each market.¹²

Consequently, given the level of aggregation of the goods being analysed and the inability to distinguish between direct competition with the domestic output

of importer countries and competition with third countries in those importer markets, it is important to acknowledge that any competitiveness indicator selected will necessarily have limitations.

Likewise, analysing the demand for exports from country j by using world income as a proxy for import demand poses two serious problems: it fails to take into account the economic buoyancy of each country that imports from country j and it assumes that the income elasticity of world imports is constant.

The constant market share (CMS)¹³ model accounts explicitly for the impact of world demand, product composition, differences in demand in each country, and competitiveness vis-à-vis exports from a particular country. The model can be expressed as follows:

$$[2] \quad \underbrace{\sum_i (X_i^t - X_i^{t-1})}_{\text{export variation}} - r \underbrace{\sum_i X_i^{t-1}}_{\substack{\text{world demand} \\ \text{for} \\ \text{exports} \\ \text{effect}}} \equiv \underbrace{\sum_i (r_i - r) X_i^{t-1}}_{\text{commodity effect}} + \underbrace{\sum_i \sum_j (r_{ij} - r_i) X_{ij}^{t-1}}_{\text{market effect}} + \underbrace{\sum_i \sum_j (X_{ij}^t - X_{ij}^{t-1} - r_{ij} X_{ij}^{t-1})}_{\text{competitiveness effect}}$$

where:

r is the growth rate of world exports between the periods t and $t-1$;

r_i is the growth rate of world exports of product i between the periods t and $t-1$;

r_{ij} is the growth rate of world exports of product i to market j between the periods t and $t-1$;

X_i is the value of the focus country's exports of product i ;

X_{ij} is the value of the focus country's exports of product i to market j .

The model breaks down into three basic effects the difference between the increase in value of a country's exports over a given period and the increase that would be required in order for that country to maintain its share of world exports (i.e., the world demand for exports effect). A positive difference means that the country has increased its share in world exports, while a negative difference indicates a reduction in that share. The first effect (measured by the first term on the right-hand side of the equation above) –identified as the *commodity effect*, i.e., the composition of exported merchandise– calculates to what extent market share gains (losses) can be attributed to the concentration of exports in goods for which world

demand is growing more rapidly (or slowly) in relative terms. The second effect (measured by the second term on the right-hand side of the equation) –identified as the *market effect*– calculates to what extent market share gains (or losses) can be ascribed to the concentration of exports in markets (countries or destinations) where demand is growing relatively more rapidly (or more slowly). The third effect (measured by the third term on the right-hand side of the equation) –identified as the *competitiveness effect*– is calculated as the residual and estimates to what extent factors other than the commodity and market effects can explain market share gains or losses.¹⁴

The world demand effect can be isolated by incorporating it into the dependent variable of equation [1], redefining it as representing the share of exports from country j to the rest of the world.¹⁵

¹³ For the application of this model to Brazilian exports, see Bonelli (1992), Chami Batista and Azevedo (1998), and Martins and Moreira (1998).

¹⁴ According to Bonelli (1992), the competitiveness effect reflects not only relative prices but also such other aspects of demand as: (i) differential rates of improvement in product quality; (ii) differences in the efficiency of export marketing and financing; and (iii) differences in the ability to meet demand rapidly. On the supply side, the single most important factor is probably the productivity differential between domestic and foreign producers, for each sector.

¹⁵ Note that world income in equation [1] should be interpreted as a proxy for world imports. Assuming that the income elasticity of

¹¹ See Kaldor, 1978, p. 106.

¹² See Chami Batista and Didier (2000).

$$[3] \quad mks_j = \frac{E_j}{M} = \frac{P_j * x_j}{P_m * m} = \left(\frac{P_j}{P_m} \right) * \frac{x_j}{m} (P_r) = mks_j(P_r)$$

where:

mks_j is the market share of exports from country j in world imports;

E_j is the value of exports from country j ;

M is the value of world imports;

P_j is the mean price of exports from country j ;

P_m is the mean price of world imports;

x_j is the volume of exports from country j ;

m is the volume of world imports;

P_r is the real effective exchange rate of country j .

As can be seen, the mean prices of exports from country j (P_j) and of world imports (P_m) have a direct and positive effect¹⁶ on market share (mks_j) as well as an indirect effect,¹⁷ deriving from the impact of the real effective exchange rate on the relationship between the volume exported by country j and the volume of world imports.

It should be noted, however, that variations in the ratio P_j/P_m differ from the variations in the competitiveness indicator, owing to the weighting system used.

In order to reflect differences in the buoyancy of each country that imports from country j (i.e., the market effect), it is necessary to analyse the demand for country j 's exports in disaggregated fashion, that is to say, in each recipient country separately:¹⁸

$$[4] \quad mks_j^c = \frac{E_j^c}{M_c} = \frac{P_j^c * x_j^c}{P_c * m_c} = \left(\frac{P_j^c}{P_c} \right) * \frac{x_j^c}{m_c} (P_{r,c}^j) = mks_j^c(P_{r,c}^j)$$

where:

mks_j^c is the market share of country j 's exports in the imports of country c ;

E_j^c is the value of exports from country j to country c ;

M_c is the value of country c 's imports;

P_j^c is the mean price of country j 's exports to country c ;

P_c is the mean price of country c 's imports;

imports is constant, we can write that $\frac{\Delta M}{M} = \eta \frac{\Delta Y}{Y}$, where: $\frac{\Delta M}{M}$ is the growth rate of world imports; η is the income elasticity of world imports; and $\frac{\Delta Y}{Y}$ is the growth rate of world income.

¹⁶ An increase in P_j relative to P_m increases the market share.

¹⁷ A relative increase in P_j increases P_r and reduces market share, inasmuch as it decreases the volume exported by country j (x_j) relative to the volume of world imports (m).

¹⁸ Exports from country j to country c continue to be viewed exclusively in terms of demand, i.e., supply is considered to be perfectly elastic.

x_j^c is the volume of country j 's exports to country c ;
 m_c is the volume of country c 's imports;
 $P_{r,c}^j$ is the price of country j 's exports compared with the export prices of the other countries competing in the market of country c .

Thus, it can be seen that the market share of country j in the imports of country c is a function of country j 's prices relative to the prices of its competitors in country c . In other words, the relative price indicator (competitiveness) now considers only the prices of the other exporter countries, since domestic producers do not participate in the import market of their own country. The Organization for Economic Co-operation and Development (OECD)¹⁹ refers to this indicator as the "strict competitiveness indicator". By considering each market in isolation, the analysis reflects the weight of each country in competition on third markets.

However, this competitiveness indicator ($P_{r,c}^j$) still overlooks the differences in composition and buoyancy of the baskets of products imported by each market receiving exports from country j . The following formula takes these differences into account:

$$[5] \quad mks_j^{c,i} = \frac{E_j^{c,i}}{M_c^i} = \frac{P_j^{c,i} * x_j^{c,i}}{P_c^i * m_c^i} = \left(\frac{P_j^{c,i}}{P_c^i} \right) * \frac{x_j^{c,i}}{m_c^i} (P_{r,c,i}^j) = mks_j^{c,i} (P_{r,c,i}^j)$$

where:

$mks_j^{c,i}$ is the market share of country j 's exports of commodity i in the imports of country c ;

$E_j^{c,i}$ is the value of country j 's exports of commodity i to country c ;

M_c^i is the value of country c 's imports of commodity i ;

$P_j^{c,i}$ is the price of country j 's exports of commodity i to country c ;

P_c^i is the mean price of country c 's imports of commodity i ;

$x_j^{c,i}$ is the volume of country j 's exports of commodity i to country c ;

m_c^i is the volume of country c 's imports of commodity i ;

$P_{r,c,i}^j$ is the relative price of country j 's exports of commodity i to country c compared with the export prices of commodity i from the other countries competing in country c .

¹⁹ See Durand, Simon and Webb, 1992, p. 10.

The market share of exports of a given commodity²⁰ from country of origin j to a given country of destination (or the variation in that share) is basically a function of the export price of the commodity from country j to the recipient country²¹ relative to the export prices of the same commodity for the other countries competing in the recipient country.

It should be noted that the difference between $\frac{P_j^{c,i}}{P_c^i}$ and P_{ni}^i is that P_c^i includes the export price from

country j to country c , ($P_j^{c,i}$) while the denominator of ($P_{r,c,i}^i$) does not; the latter consists exclusively of the export prices of country j 's competitors in country c .²²

Accordingly, most of the problems and imprecision of competitiveness indicators are essentially a matter of aggregation. Since a country's competitiveness only exists in terms of specific products and markets,²³ attempts to measure it across all products and in all destination markets by means of a single indicator will necessarily entail a high degree of imprecision.

III

Methodology for allocating market-share variations by competing country

This section elaborates upon a methodology²⁴ for identifying and quantifying what portion of losses (gains) in the value of exports from country p to a particular country or region can be attributed to the gains (losses) of a country g .

The total value of imports of a country c can be defined as:

$$[6] \quad M^t = \sum_{j=1}^k M_j^t = \sum_{i=1}^n M_i^t = \sum_{j=1}^k \sum_{i=1}^n M_{j,i}^t$$

where the import profile of country c is made up of n products originating in k countries; and

M^t is the total value of country c 's imports in period t ;

M_j^t is the value of country c 's imports from country j in period t ;

M_i^t is the value of country c 's imports of commodity i in period t ; and

$M_{j,i}^t$ is the value of country c 's imports of commodity i from country j in period t .

Country j 's market share (mks) in country c 's imports of commodity i in period t may thus be defined as the ratio of the value of country c 's imports of commodity i from country j to country c 's total imports of commodity i , i.e.:

²⁰ Differences in quality are linked essentially to the level of disaggregation of the analysis or, ultimately, to the definition of the product. If, for instance, the product is homogeneous, the market shares of the most competitive countries would be limited only by supply.

$$[7] \quad mks_{j,i}^t = \left(\frac{M_{j,i}^t}{M_i^t} \right)$$

Likewise, country j 's market share in the total imports of country c may be expressed as:

$$[8] \quad mks_j^t = \frac{\sum_{i=1}^n M_{j,i}^t}{\sum_{i=1}^n M_i^t} = \frac{M_j^t}{M^t}$$

We can say, then, that country j loses market share in commodity i when $mks_{j,i}^{t-1} > mks_{j,i}^t$ and it gains market share when $mks_{j,i}^{t-1} < mks_{j,i}^t$, between the periods t and $t-1$.

For commodity i , it is also true that:

$$[9] \quad \sum_{j=1}^k (mks_{j,i}^t) = 1$$

$$\sum_{j=1}^k (mks_{j,i}^t - mks_{j,i}^{t-1}) = 0$$

²¹ This price is set in the country of destination and includes – aside from exchange rate considerations– freight, insurance, point-of-origin subsidies, different margins of preference granted to each country, and anti-dumping or countervailing duties.

²² For further details, see Didier (2000).

²³ For a microeconomic approach to export competitiveness, see Porter (1990).

²⁴ To the best of our knowledge, this methodology was first presented in Chami Batista (1999) and applied in Azevedo (1999) and Didier (2000). See also Baumann and Franco (2001).

That is to say, the sum of the market shares of k countries that export commodity i to market c in period t is equal to unity, since it represents 100% of the total value of imports of that commodity. Consequently, the sum of the variations in the market shares of k countries that export commodity i to market c between periods t and $t-1$ will be equal to zero. In other words, the sum of the gains is equal to the sum of the losses of each country's market share.

The value of country j 's lost market share for commodity i in a given market is defined thus:

$$[10] \quad P_{j,i} = (mks_{j,i}^{t-1} - mks_{j,i}^t) * M_i^t$$

so that $mks_{j,i}^{t-1} > mks_{j,i}^t$

In other words, country j 's lost market share in commodity i is equal in value to the difference between the value of the imports originating in country j in the last year t that would be necessary to maintain that country's market share in commodity i between periods t and $t-1$ and the effective value of those imports.

Similarly, the gain in country j 's market share of commodity i in a given market in the final year would be:

$$[11] \quad G_{j,i} = (mks_{j,i}^t - mks_{j,i}^{t-1}) * M_i^t$$

so that $mks_{j,i}^{t-1} < mks_{j,i}^t$

Note that $\sum_{j=1}^k (P_{j,i} + G_{j,i}) = 0$, which means that the sum of the losses of the countries that lost market share in imports of commodity i by country c is equal to the sum of the gains of the countries that gained market share in those imports over the same period.

If p is a country that loses market share in commodity i over the period from t to $t-1$ and g is a country that gains market share in commodity i over the same period, then the lost market share of country p in commodity i that can be attributed to the gain of market share by country g in the same commodity equals:

$$[12] \quad P_{p,g,i} = P_{p,i} * \left[\frac{G_{g,i}}{\sum_{g=1}^{K_i} G_{g,i}} \right]$$

where the first term on the right-hand side corresponds to the value of the market share lost by country p and the second term reflects the share of country g (numerator) in the total gains of all countries that gained market share over the period in country c 's imports of commodity i (denominator).²⁵

Considering all (h) commodities i for which $mks_{j,i}^{t-1} > mks_{j,i}^t$ (losing country) and $mks_{i,i}^{t-1} < mks_{i,i}^t$ (gaining countries), the value of the gross total losses of country p that could be attributed to country g is defined as:

$$[13] \quad P_{p,g} = \sum_{i=1}^h \left\{ P_{p,i} * \left[\frac{G_{g,i}}{\sum_{g=1}^{K_i} G_{g,i}} \right] \right\}^{26}$$

Conversely, $P_{g,p}$ would be the value of the gross total losses of country g that could be attributed to country p , and $(P_{p,g} - P_{g,p})$ would be the value of net losses of country p attributable to country g . The value of the net losses²⁷ would thus be an *ex post* indicator of a country's competitiveness vis-à-vis its competitors in a given market.

This indicator, it should be noted, makes it possible not only to rank competitors of a given country in a given market, but also to quantify the competitive advantages and disadvantages of that country with regard to its competitors.

It can further be seen that the value of the net losses (gains) depends on the level of disaggregation of the imports (M_i) of the country c under consideration.²⁸ Ideally, the more detailed the level of disaggregation of import data, the better the estimates will be of net losses or gains per country.

²⁵ Where K_i is the number of countries that gained market share over the period in country c 's imports of commodity i .

²⁶ Note that the number of countries K_i varies according to commodity i .

²⁷ Note that this value can be positive (actual losses) or negative. In the latter case, the absolute value can be considered as being the value of the net gain.

²⁸ In other words, different levels of disaggregation will produce different values for net losses or gains.

IV

Brazil's export losses and gains, by competitor country

The performance of Brazilian exports to the United States during the period 1992-2001 was analysed, using the traditional methodology of the constant market share model.²⁹ Inasmuch as the increased margins of preference granted by the United States to Mexico under NAFTA were implemented mainly between 1992 and 1996, the performance of Brazilian exports was examined for that same subperiod. An analysis of Brazil's export performance in 2000 and 2001 is also included, to assess the impact of the sharp devaluation of the Brazilian currency as from 1999.

Between 1992 and 2001, Brazil had market gains in the United States totalling US\$ 1.15 billion, equivalent to 16% of Brazil's exports to the United States in 1992,³⁰ as may be seen in table 1. This was the so-called *competitiveness effect* of Brazilian exports for the period.³¹ However, it should be noted that Brazilian aircraft exports alone were responsible for an increase of US\$ 1.31 billion in Brazil's market share in the United States between 1992 and 2001. In other words, the overall competitiveness effect of all the other items was slightly negative for the period.³²

In terms of subperiods, the market gains by product occurred mainly between 1996 and 2001, for a total of

TABLE 1

Brazil: Net gains (losses) by major competitor countries (Millions of dollars)

Country	1992-2001	1996-2001	2000-2001
Mexico	-502.2	0.3	145.5
China	-877.9	-606.1	-95.7
Japan	941.9	532.4	191.6
United Kingdom	747.2	923.1	72.1
Others	839.8	2 897.3	1 173.5
<i>Total</i>	<i>1 148.4</i>	<i>3 747.0</i>	<i>1 487.0</i>

Source: Based on data from the U.S. International Trade Commission (ITC).

US\$ 3.75 billion. Between 1992 and 1996, however, Brazil sustained losses totalling US\$ 2.6 billion due to the competitiveness effect.³³

When we examine Brazil's performance between 2000 and 2001, it can be seen that the competitiveness effect during the period of just one year was equivalent to US\$ 1.49 billion and represented nearly 40% of the effect observed between 1996 and 2001; indeed, the figure rises to 61% if Brazilian aircraft exports are excluded. Consequently, from 1992 to 2000 the competitiveness effect was still negative—in the amount of US\$ 340 million³⁴—and would have meant a negative

²⁹ As was seen in section I, the model only compares data from the base and final years. The analysis was originally conducted with eight-digit data covering the period from 1992 to 1996. See Azevedo (1999) and Chami Batista and Azevedo (2000).

³⁰ Calculations are based on total U.S. import values (FOB) from Brazil, by product, at six digits of the United States International Trade Commission classification, which covers a total of 5,117 products. The nine products coming under chapters 98 and 99 were excluded from the database so that aircraft returned by Brazil to the United States would not distort the data on Brazilian exports. The 1992 product classification was harmonized with those of 1996, 2000, and 2001, using a conversion table of the World Trade Organization.

³¹ However, Brazil's exports to the United States were sluggish and yielded a net negative effect of US\$ 2.7 billion. As a result, Brazil lost U.S. market share equivalent to US\$ 1.55 billion. Brazil's share of U.S. imports (not including chapters 98 and 99) actually shrank by 1.41% in 1992 and by 1.22% in 2001.

³² The competitiveness effect of all products other than Brazilian aircraft was negative in the amount of US\$ 162 million.

³³ Values between 1992 and 1996 were calculated as the difference between the 1992-2001 values and those for 1996-2001, in order to maintain 2001 as the base year and thus ensure comparability of the data. The competitiveness effect between 1992 and 1996 is different if calculated directly, since the gained or lost market share of Brazil in those two years is multiplied by the value of U.S. imports in 1996, unlike the value based on 2001. The commodity effect was negative in both periods, totalling US\$ 530 million between 1992 and 1996 and US\$ 2.17 billion between 1996 and 2001. Accordingly, the net effect was negative in the amount of US\$ 3.13 billion between 1992 and 1996, but was positive in the amount of US\$ 1.57 billion between 1996 and 2001.

³⁴ Here again, calculated as the difference between the 1992-2001 and 2000-2001 effects. The net effect was US\$ 1.64 billion between 2000 and 2001, with a slightly positive commodity effect, although this had been negative in the amount of US\$ 3.2 billion between 1992 and 2000.

balance of US\$ 1.5 billion had Brazilian aircraft exports been excluded.³⁵

If we apply the methodology with a view to identifying the countries in respect of which Brazil gained or lost market share and then quantify those losses and gains by competitor country (competitiveness effect), it can be observed that Brazil lost market share to Mexico in the amount of US\$ 503 million between 1992 and 2001. As noted earlier, however, in terms of competitiveness Brazil posted net gains during this period. By country, the gains totalled US\$ 3.78 billion for the period,³⁶ with 64% of that amount coming from four developed countries: Japan, the United Kingdom, Canada and France. Net losses came to US\$ 2.63 billion, of which China accounted for one-third and Mexico 20%. Brazil also lost market

shares vis-à-vis Ireland, India, the countries of the former Soviet Union, Peru, Vietnam, and the Ivory Coast, virtually none of which are in the developed country category.³⁷

Subdividing by periods, Brazil picked up market share from Mexico between 2000 and 2001 in the amount of roughly US\$ 145 million,³⁸ compared with losses of US\$ 648 million between 1992 and 2000: US\$ 503 million between 1992 and 1996, and US\$ 145 million between 1996 and 2000. In other words, the losses incurred against Mexico were concentrated in the period between 1992 and 1996. Accordingly, even though Brazil had a significant and positive competitiveness effect between 1996 and 2000, it continued to lose market share to Mexico throughout that period.

V

Analysis of Mexico's impact on Brazilian exports to the United States

The distribution of net losses of Brazilian competitiveness by competitor country between 1992 and 1996 reveals that Mexico was the principal gainer of market share, accounting for 26% of those losses,³⁹ followed by China with 12%.⁴⁰ Figure 1, however, shows that Brazil's currency appreciated significantly against the Mexican peso during the period,⁴¹ so it is not clear how much of Brazil's loss of U.S. market share to Mexico is due to NAFTA and how much is due to deterioration of Brazil's competitiveness indicators in terms of costs and prices.

In order to assess the role of NAFTA and the exchange rate as determining factors in the loss of Brazilian competitiveness vis-à-vis Mexico between 1992 and 1996, a sample was compiled of the 20 Brazilian exports that lost the most shares to Mexico

during the period. Inasmuch as these items accounted for 76% of Brazil's gross losses to Mexico, the sample is felt to be sufficiently representative.⁴²

Three sets of data were analysed for each product: (i) Mexico's weight in the lost Brazilian share for the

³⁵ Also calculated as a difference. Brazil's gains owing to the competitiveness effect between 1996 and 1998 only amounted to US\$ 545 million, but rose to US\$ 1.71 billion between 1998 and 2000.

³⁶ Includes the net gains of Brazil against countries that reported net losses to it. It is worth noting that Brazil generally gains in some products (gross gains) and loses in others (gross losses) with each competitor country.

³⁷ Losses to the countries in question accounted for 75% of Brazil's total net losses for the period.

³⁸ As may be seen in table 1, Brazil lost a marginal share to China between 2000 and 2001. It actually lost little and to very few countries during this period, with China accounting for 44.5% of the losses, Honduras 6.4%, and Chile 5.6%.

³⁹ Competitiveness effect calculated directly.

⁴⁰ Of the 226 countries analysed, Brazil lost the equivalent of US\$ 2.3 billion to 163 countries and gained US\$ 296 million from 63 countries. The percentages cited represent Mexico's and China's share in total Brazilian losses, considering only those countries to which Brazil lost market share.

⁴¹ In real terms, Brazil's currency appreciated 50% against the Mexican peso between 1992 and 1996, or 51% if we allow for a period with a one-year lag (1991-1995), which is the typical interval for exchange rate variations to generate positive trade effects.

⁴² Since the gains and losses were calculated by product, Brazil's gross losses to Mexico are the sum of the losses in products in which Brazil lost market share to Mexico, and the gross gains are the sum of the gains in products in which Brazil gained market share from Mexico during the period.

FIGURE 1



Source: Chami Batista (2001).

product; (ii) trends in U.S. import prices (CIF) for the product from Brazil and from Mexico;⁴³ and (iii) the variation in margins of preference for Mexico as compared with Brazil.⁴⁴ The analysis focused on the period 1992-2001, giving special attention to the subperiods 1992-1996 and 1996-2001.

For the products in the sample whose relative price in Brazil dropped between 1992 and 1996—despite the currency appreciation—and for which the margin of preference for Mexico increased over the same period, NAFTA must have been the determining factor in the Brazilian losses, since the price competitiveness of those products did not warrant such losses.⁴⁵

In cases where Brazil's relative price rose concurrently with the increase in the margin of preference for Mexico, the proportion of each increase was calculated by attributing to NAFTA the weight of

the variation in the margin of preference over the total increase.⁴⁶

For the products in which Brazil did not experience losses to Mexico between 1992 and 2001 as a result of the competitiveness effect with that country, that is to say, those in which Brazil more than recovered in 1996-2001 the losses incurred vis-à-vis Mexico in 1992-1996, it was considered that NAFTA had little or no impact on the losses.

Based on relative prices and the margins of preference for Brazil and Mexico, the sample can be divided into four groups: i) products that entered the United States duty-free both from Brazil and from Mexico; ii) products for which it was not possible to obtain reliable relative prices; iii) products whose relative prices rose during the period 1992-1996; and iv) products whose relative prices fell during the period 1992-1996.

The products in group iv) account for 46% of the losses in the sample. In other words, NAFTA was responsible in principle for nearly half of Brazil's lost market share in 1992-1996. As a percentage of Brazilian exports, this figure is five times greater than the static estimates of trade diversion from Brazil to Mexico in the U.S. market, as calculated by Abreu (1994) and Machado (1993).⁴⁷ However, a more in-depth analysis

⁴³ $(\text{Brazil price}_{t+1}/\text{Mexico price}_{t+1})/(\text{Brazil price}_t/\text{Mexico price}_t)$. See Buitelaar (1997) for an analysis of relative price indices of selected Brazilian and Mexican exports to the United States.

⁴⁴ $(1+TBr_{t+1})/(1+TBr_t)/(1+TMx_{t+1})/(1+TMx_t)$, where TBr is the import tariff for Brazil and TMx is the tariff for Mexico.

⁴⁵ Other causes are also possible. The drop in Brazil's relative price could have been triggered by poorer product mix, in which case Mexico would have increased its market share on the strength of a better mix. Problems or bottlenecks in Brazilian supply flows could also have contributed to lost market share, in addition to the fall in relative price. Ascribing the losses exclusively to NAFTA entails acknowledging the limitations of this methodology in evaluating such other possible causes. Aside from its tariff advantages, NAFTA is assumed to have generated externalities that favoured Mexican exports in terms of capacity to serve U.S. clients, e.g., delivery times, after-sales service, marketing, and favourable financing conditions.

⁴⁶ The weight of NAFTA is equal to $(VMPM_x)/(VMPM_x+VPRBr)$, where $VMPM_x$ is the variation in the margin of preference for Mexico and $VPRBr$ is the relative price variation for Brazil.

⁴⁷ These estimates were prepared *ex ante* and represent 0.7% of all Brazilian exports to the United States in 1992. Brazil's gross losses to Mexico during 1992-1996 were equivalent to 7.7% of Brazil's exports to the United States in 1996. In other words, 46% of those losses would be equivalent to 3.5% of Brazil's exports to the United States in 1996.

TABLE 2

Products in the sample that enter the United States duty-free

Product	Amount lost by Brazil to Mexico (US\$)		Variations in Brazil's relative price (%)	
	1992-1996	1992-2001	1992-1996	1992-2001
Shrimps	-10 095 181	0	10.04	-17.10
Coffee, not roasted, not decaffeinated	-35 850 894	0	19.46	3.06
Chemical wood pulp, coniferous	-5 277 473	0	19.10	-22.19
Gold, non-monetary	-67 143 482	-5 240 104	8.44	-8.25

Source: Based on data from the U.S. International Trade Commission (ITC).

of these products would be necessary in order to fine-tune this observation.

Table 2 presents the four products in the sample that were not subject to U.S. import duties; these items accounted for 23% of the sample losses in 1992-1996. The tariff-free status of the Brazilian goods would be a reason in itself not to ascribe the losses to NAFTA, and that hypothesis is further supported by the fact that for three of the four products, Brazil did not lose market share to Mexico in 1992-2001. In shrimp exports, Brazil gained market share in the United States between those years. In exports of coffee and chemical wood pulp, Brazil and Mexico both lost market share during the period.⁴⁸ Non-monetary gold was the only one of these exports in which Brazil lost market share to Mexico between 1992 and 2001, but this represented only 10% of Brazil's overall losses for this commodity during the period. Moreover, Brazil's relative prices showed an upward trend from 1992 to 1996, which could account for the loss of market share, dropping again between 1996 and 2001, which would explain the gains.⁴⁹ Accordingly, all the available data indicate that the loss of competitiveness in these four products was the result of variations in competitiveness indicators based on relative prices and costs, and was not associated with NAFTA.

The data on Brazilian and Mexican prices proved to be insufficient for calculating the relative prices of five products in the sample, all from the automobile industry. These items accounted for 25% of Brazil's losses in 1992-1996. The low volume or non-existence

of Brazilian or Mexican exports to the United States in some years, coupled with big variations in product composition,⁵⁰ impeded calculations and vitiated the reliability of relative prices as competitiveness indicators.

However, Brazilian exports of steering wheels, steering columns and steering boxes for motor vehicles (Harmonized System tariff category 870894) presented indications that NAFTA did play an important role in Brazil's losses in 1992-1996. Although the country recovered some of those losses in 1996-2001, a full 92% of Brazilian losses in 1992-2001 can be attributed to Mexico,⁵¹ despite the strong devaluation of the Brazilian currency in real terms vis-à-vis the Mexican peso.⁵² To a lesser degree, the same phenomenon was observed with exports of buses⁵³ and diesel and semi-diesel engines,⁵⁴ since 45% and one-third respectively of Brazil's losses in these products in 1992-2001 also were attributable to Mexico.⁵⁵ In gasoline engine exports,⁵⁶ Brazil's losses between 1992 and 2001 cannot be attributed to Mexico, since that country also lost share in this product in the same market. In this case, Canada was responsible for 63% of Brazilian

⁴⁸ Brazil lost share in coffee mainly to Vietnam, Guatemala, Costa Rica and Nicaragua.

⁴⁹ Brazil gained market share in three of the four products between 1996 and 2001, losing share only in chemical woodpulp, where Finland was responsible for 95% of the lost share.

⁵⁰ Even at the six-digit level a reasonable number of different products are included.

⁵¹ Between 1992 and 1996, Mexico accounted for 80% of Brazil's losses in this category.

⁵² The devaluation reached a level of 129% between 1995 and 2000 and 175% between 1996 and 2001.

⁵³ Motor vehicles for the transport of ten or more persons, including driver, with a compression-ignition internal combustion piston engine (diesel or semi-diesel) (HS 870210).

⁵⁴ HS 840820 (compression-ignition internal combustion piston engines, diesel or semi-diesel, for the propulsion of vehicles).

⁵⁵ Between 1992 and 1996, Mexico accounted for 98% and 25%, respectively, of Brazilian losses in these products.

⁵⁶ HS 840734 (spark-ignition reciprocating piston engines for propulsion of vehicles, over 1,000 cc cylinder capacity).

losses under this heading during the period indicated.⁵⁷ In automobile exports (HS 870323), on the other hand, Brazil increased its share in the U.S. import market, significantly offsetting in 1996-2001 the losses posted in 1992-1996. Here, the indicators suggest that NAFTA's role in losses between 1992 and 1996 was at best secondary. The exchange rate and price- and cost-based indicators were probably the determining causes of these gains and losses.⁵⁸

Only four products in the sample showed an increase in relative prices and margins of preference for Mexico during the period; they accounted for 6% of Brazil's losses to Mexico in the total sample losses. Looking at the variations in relative prices and margins of preference in 1992-1996, it can be seen that half of these losses (3% of the sample) were due to changes in the margins of preference. In parallel with the exchange rate trends, all these products posted a drop in relative prices in 1996-2001 and, except for footwear exports,⁵⁹ Brazil gained market share over those years. In the export of semi-finished products of alloy steel (other than stainless),⁶⁰ Brazil gained market share between 1992 and 2001: the gains in 1996-2001 were more than sufficient to offset the losses in 1992-1996. In this case, it could be posited that NAFTA did not play a significant role in Brazil's loss of market share to Mexico between 1992 and 1996.⁶¹ The same conclusion holds for footwear exports, since Mexico had a weight of next to zero in Brazilian losses between 1992 and 2001 in this heading.⁶² Nevertheless, there are two headings⁶³ for

which the increase in margins of preference for Mexico explains a large part of the increase in Brazil's relative prices⁶⁴ and for which Mexico's impact on Brazilian losses remained relatively constant in 1992-1996 and 1992-2001.⁶⁵ Accordingly, the estimate that half of the losses in these four products (3% of the sample) is due to NAFTA is consistent with Mexico's weight in trade in these garments.

Finally, there is the group of seven products whose prices dropped in 1992-1996 but whose margin of preference for Mexico vis-à-vis Brazil rose during the period. For two of these products,⁶⁶ the argument that NAFTA played a pivotal role in Brazilian losses in 1992-1996 is underpinned by the continuation of Brazilian losses to Mexico in 1996-2001, despite major decreases in the relative prices of Brazilian exports during the period (see table 3). Mexico's weight in the loss of Brazilian market share in these two products between 1992 and 2001 was respectively 94% and 79%. The same argument could be made, although less strongly, for the loss of Brazilian market share in cotton T-shirt exports,⁶⁷ despite the significant reductions in Brazil's relative prices in 1992-1996 and 1996-2001. The weight of Mexico in these losses was around 50% both in 1992-2001 and in 1992-1996, despite the slight recovery in Brazil's share in the U.S. market between 1996 and 2001.

Brazilian exports of orange juice (HS 200911) are a good example in this group. Brazil's relative prices fell in 1992-1996 and in 1996-2001, while the margin of preference for Mexico increased throughout the entire period from 1992 to 2001. In the first subperiod, the increase in the margin of preference for Mexico outstripped the decrease in Brazil's relative prices, so that the Brazilian price, which was below the Mexican price after allowing for import duties, became higher than the Mexican price after the application of duties in 1996. As a consequence, Brazil lost a substantial

⁵⁷ Mexico accounted for 54% of Brazil's losses in this product between 1992 and 1996, while Japan and Austria accounted for 26% and 17% respectively. Canada did not gain market share in these products between 1992 and 1996.

⁵⁸ Between 1996 and 2001, 39% and 11% respectively of Brazil's total market gains in the export of gasoline engines and automobiles to the United States could be attributed to losses by Mexico in these products.

⁵⁹ Other footwear with outer soles of rubber, plastics, leather or composition leather and uppers of leather (HS 640399).

⁶⁰ Semi-finished products of other alloy steel (HS 722490).

⁶¹ This conclusion coincides with our calculations which indicate that the increase in the margin of preference for Mexico was responsible for only 1% of the increase in relative price, including import duties.

⁶² In this case, the increase in the margin of preference for Mexico triggered only 6% of the increase in relative price, including import duties. China was the main country responsible for Brazil's market share loss in the United States for this product during the period.

⁶³ Cotton trousers, bib and brace overalls, breeches and shorts (HS 620462) and cotton sweaters, pullovers, sweatshirts, vests and similar articles (HS 611020).

⁶⁴ The increase in the margin of preference for Mexico was responsible for 89% in the case of cotton trousers (HS 620462) and 26% for cotton sweaters (HS 611020).

⁶⁵ Mexico was responsible for 54% of Brazil's cotton trousers losses in 1992-1996 and 48% in 1992-2001; for sweater losses, the percentages were 21% in 1992-1996 and 17% in 1992-2001.

⁶⁶ Ceramic sinks, washbasins, washbasin pedestals, baths, bidets, water closet bowls, flush tanks, urinals and similar sanitary fixtures other than porcelain and china (HS 691090); and woven fabrics of cotton, containing 85% or more by weight of cotton, weighing more than 200 g/m², of yarns of different colours, denim (HS 520942).

⁶⁷ Cotton T-shirts and singlets (HS 610910).

TABLE 3

Variations in relative prices of Brazil and in margin of preference for Mexico

Product	Six-digit tariff code ^a	Gains (losses) by Brazil vis-à-vis Mexico (US\$)		Variation in Brazil's relative price (%)		Variation in margin of preference for Mexico (%)	
		1992/1996	1992/2001	1992/1996	1992/2001	1992/1996	1992/2001
Orange juice	SH 200911	-43 932 374	-22 434 594	-1.57	-21.43	10.38	22.85
Woven fabrics	SH 520942 ^b	-30 921 202	-30 451 452	-14.32	-13.20	8.34	7.99
T-shirts	SH 610910	-10 958 807	-14 314 872	-20.12	-54.45	7.97	5.91
Washbasins	SH 691090	-5 531 216	-9 054 295	-36.42	-43.94	1.97	1.13
Iron and steel	SH 720711	-17 321 615	-42 809	-22.29 ^c	-53.56	0.52	-0.30
Iron and steel	SH 720712	-117 301 374	-31 041 226	-15.85	-12.42	0.16	0.22
Bars	SH 721420 ^b	-5 423 918	-2 113 210	-15.54	-26.34	0.14	0.14

Source: Prepared by the authors on the basis of data from the U.S. International Trade Commission (ITC).

^a HS 200911: frozen orange juice; HS 520942: woven fabrics of cotton, containing 85% or more by weight of cotton, weighing more than 200 g/m², of yarns of different colours, denim; HS 610910: cotton T-shirts and singlets; HS 691090: ceramic sinks, washbasins, washbasin pedestals, baths, bidets, water closet bowls, flush tanks, urinals and similar sanitary fixtures other than porcelain and china; HS 720711: semi-finished products of iron or non-alloy steel, containing by weight less than 0.25% of carbon, of rectangular (including square) cross-section, the width measuring less than twice the thickness; HS 720712: semi-finished products of iron or non-alloy steel, containing by weight less than 0.25% of carbon, of rectangular (other than square) cross-section; and HS 721420: bars and rods of iron or non-alloy steel, containing indentations, ribs, grooves or other deformations produced during the rolling process or twisted after rolling.

^b The figures for U.S. imports under this heading in 1992 were obtained by applying the WTO conversion table, owing to changes in the six-digit tariff classification between 1992 and 1996.

^c Figures for the period 1994 to 1996, inasmuch as Mexico did not export to the United States in 1992 and 1993.

share of the market between 1992 and 1996, with Mexico accounting for 76% of that loss. From 1996 to 2001, even though the drop in Brazil's relative price was greater than the increase in the margin of preference for Mexico, Brazil continued to lose market share. However, losses in this period cannot be attributed to Mexico but rather to Costa Rica and Belize.⁶⁸

The other three headings are semi-finished steel products. The increases in the margins of preference for Mexico for these products were relatively small between 1992 and 1996 (less than 1%), but even so, Brazil lost substantial market share during the period, despite a significant drop in the relative prices of Brazilian products after allowing for import duties. For the product in which Brazil experienced the greatest losses between 1992 and 1996,⁶⁹ the losses were significant between 1992 and 1996, followed by a slight recovery in the country's share of the U.S. import

market between 1996 and 2001. Mexico's weight in Brazilian losses reached a level of 50% between 1992 and 1996, decreasing during the following period; however, it remained above 40% between 1992 and 2001. Accordingly, although the increase in margins of preference for Mexico was marginal, the drop in Brazil's relative prices⁷⁰ suggests that NAFTA played a dominant role in Brazil's losses to Mexico between 1992 and 1996. For the other two products,⁷¹ Mexico played a role in Brazil's loss of market share between 1992 and 1996, but its significance was slight or none in the losses between 1992 and 2001.⁷²

⁷⁰ This drop did not occur simply between the initial and final years, but rather followed a gradual trend throughout the period 1992-2001.

⁷¹ HS 720711: semi-finished products of iron or non-alloy steel, containing by weight less than 0.25% of carbon, of rectangular (including square) cross-section, the width measuring less than twice the breadth; and HS 721420: bars and rods of iron or non-alloy steel, containing indentations, ribs, grooves or other deformations produced during the rolling process or twisted after rolling.

⁷² Mexico accounted for 80% of Brazil's lost market share in iron bars (HS 721420) between 1992 and 1996, but this percentage

⁶⁸ In the full period from 1992 to 2001, Mexico was responsible for 33% of Brazil's total losses in orange juice exports.

⁶⁹ HS 720712: semi-finished products of iron or non-alloy steel, containing by weight less than 0.25% of carbon, of rectangular [other than square] cross-section.

Thus, although Brazilian losses to Mexico between 1992 and 1996 could be attributed to NAFTA as Brazilian prices became gradually more competitive with those of Mexico, the loss of competitiveness by Mexico in

1996-2001 prompted other countries to occupy the market share lost by Brazil. These two products, however, accounted for only 3% of Brazilian losses to Mexico in the total losses of the sample.

VI

Conclusions

Disaggregated analysis of a market's imports by product and country of origin makes it possible to identify and quantify losses (gains) of market share by an exporting country vis-à-vis each of its competitors in that market, and to link those losses (gains) to competitiveness indicators based on the prices of the exporting countries.

As a result of the loss of market share by Brazilian exports in the U.S. import market between 1992 and 1996, Brazil lost export revenue in an amount potentially in excess of US\$ 2.2 billion, compared with the figure actually recorded in 1996. Brazil's losses attributable to the competitiveness effect are estimated at US\$ 2 billion for the period, equivalent to 90% of the total lost market share or 27% of the value exported in 1992. The two countries most involved in Brazil's net losses of competitiveness during the period were Mexico (26%) and China (12%).

dropped to 12.5% between 1992 and 2001. The main country responsible for Brazil's losses during the latter period was Japan, followed by Mexico, the Czech Republic and Slovakia. In Brazil's losses of semi-finished products of iron or non-alloy steel, containing by weight less than 0.25% of carbon, of rectangular (including square) cross-section, the width measuring less than twice the breadth (HS 7207211), Mexico accounted for 27% between 1992 and 1996 but did not have any impact between 1992 and 2001, since it was a net loser of market share during that period. Germany accounted for 43% of Brazilian losses between 1992 and 1996, followed by Canada with 19%.

Between 1992 and 2001, Brazil gained market share in the amount of US\$ 1.1 billion through the competitiveness effect, although this was only possible thanks to Brazil's increased share in U.S. imports of small aircraft. All the other sectors taken together posted losses from this same effect for a total of US\$ 162 million. Brazil's market gains during the period were associated with losses by Japan, the United Kingdom, Canada and France, which accounted for 64% of Brazil's net gains by country. China (33%) and Mexico (19%), on the other hand, were the main countries responsible for Brazil's net losses.

A detailed analysis of price trends in Brazil and Mexico for a representative sample of products revealed that, although the real exchange rate performance favoured Mexican exports to the United States between 1992 and 1996, accounting for nearly one half of Brazil's losses to Mexico, Brazilian prices –after allowing for import duties– were increasingly more competitive with those of Mexico. Accordingly, Brazil's losses to Mexico attributable to the NAFTA effect are estimated at US\$ 300 million, equivalent to 13% of Brazil's net losses for the period analysed, or approximately 3.5% of Brazilian exports to the United States in 1996. Although still relatively low, this percentage is significantly higher than the estimates of trade diversion from Brazil to Mexico made prior to the implementation of NAFTA.

(Original: English)

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