

COMPETITIVENESS IN THE INTERNATIONAL BEEF MARKET: AN ANALYSIS OF THE BRAZILIAN AND AUSTRALIAN MARKETS

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ABSTRACT: *Beef cattle production is the major Brazilian agribusiness sector, as a supplier for both the domestic and the international markets. Given the importance of Brazil in this segment, this study aims to analyze the competitiveness of the Brazilian and Australian beef market between 1998 and 2009 by using indexes of global marketplace positioning, competitiveness indexes and the Michaely index, as well as the coefficient of divergence. Another aim of this study was to evaluate the production structure of both countries. The results showed that Australia is more competitive throughout the analyzed period, except for 1999, when Brazil was more competitive because of the devaluation of the real against the dollar, which boosted Brazilian exports. The results of the analysis of the production structure show that there are differences between the production methods in Brazil and Australia.*

KEY WORDS: *Beef cattle production, International Trade, Agribusiness.*

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1. INTRODUCTION

Beef cattle production in Brazil has grown as regards both production and productivity as a result of agricultural expansion in the Midwest and Southeast regions. Therefore, Brazil has achieved world prominence as one of the largest producers and

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exporters of beef. However, the extensive production method which is predominant in Brazil compromises meat quality and hinders trade with other international markets.

Despite this scenario, technologies are being developed in Brazil to improve the means of production. Innovations that are worth of notice include strategic supplementation, crossbreeding of genetically superior breeds, use of new varieties of fodder for animal feeding, ear tags for animal identification, and vaccines, among other methods that have improved beef production system. Also in this respect, Reis (2003) points out that the beef cattle production in Brazil has different production systems (confinement, semi-confinement and extensive), and such disparity in the production methods results in changes in the levels of productivity. These production differences are caused by several factors, such as spatial organization of land use, productive capital structure, soil fertility, climate, and type of technology employed, particularly. High levels of productivity and quality are achieved in modern cattle farms, where appropriate technology is adopted.

In contrast, the quality of beef cattle in Australia meets international standards because the Australian beef production method is quite adequate. Tools such as beef traceability¹ and beef certification² are used; for this reason, this country is a worldwide reference in beef cattle production.

Although there are differences between Brazil and Australia as regards beef production, they both stand out as major *players* in the international beef market. In 2009, according to the *Food and Agriculture Organization of the United Nations* (FAO, 2011), Brazil's share in total beef exports was of 12.34%, followed by Australia's share of 11.44%. Table 1 shows the share of both countries in the international beef market between 1998 and 2009.

Table 1 shows the Brazil and Australia have been increasing their share in the international beef market in terms of export values. However, an analysis of the quantity sold by Brazil, and the increased volume exported in the period between 1998 and 2009 shows that Brazil's share is bigger than Australia's. While the former achieved a growth rate of 476.97%, the latter increased only by 5.13% over the same analysed period.

In this context, this study aims to analyze the competitiveness of both countries (Brazil and Australia) in order to specify which one is more competitive and if it is marketed by the traded amount or by the added value. The specific objectives are the following: i) to determine the market share of each country in the international beef market in the period between 1998 and 2009, and ii) to calculate and compare methodological rates in order to specify which country has competitive advantage.

This study is organized into four sections other than this introduction. Section 2 discusses the theoretical background for the present study; Section 3 explains the

¹ Traceability can be defined as the mechanism that enables the identification of product's origin from the field to the final consumer, which may or may not have gone through one or more transformations as in the case of minimally processed foods (ROCK; LOPES, 2002).

² Certification is required for some control measures such as staff training, record of identified treatments, records of transaction and cattle mobility, prevention against leather damage, adequate transportation, chemical labelling and storage of materials, safe use of chemical products, treatment records, food storage and internal verification procedures (ROCHA; LOPES, 2002).

methodological procedures and the source of data; Section 4 analyzes and discusses the obtained results; finally, Section 5 makes some concluding remarks about the study.

Table 1. Brazilian and Australian share in world exports in value (US\$ 1.000) and quantity (tonnes)

YEAR	BRAZIL		AUSTRALIA	
	Exported value	Exported Quantity	Exported value	Exported Quantity
1998	539.070	246.456	1.822.562	1.191.886
1999	808.458	381.092	1.976.007	1.182.920
2000	783.188	410.779	2.111.434	1.208.058
2001	1.008.676	645.045	2.344.046	1.265.526
2002	1.089.924	757.924	2.273.788	1.236.017
2003	1.507.643	1.022.792	2.396.207	1.142.745
2004	2.428.669	1.433.574	3.456.910	1.263.517
2005	2.964.685	1.650.729	3.627.789	1.272.533
2006	3.816.876	1.864.211	3.727.925	1.314.219
2007	4.263.834	1.956.881	3.802.863	1.284.627
2008	4.991.491	1.599.938	4.304.275	1.289.908
2009	3.732.079	1.421.991	3.458.340	1.253.147

Source: FAO (2011)

2. THEORETICAL BACKGROUND

The Classical School of Economics has drawn upon the ideas of Adam Smith and David Ricardo to provide Economics with a focus for the systematic analysis of trade between countries.

In 1776, Adam Smith published *An Inquiry into the Nature and Causes of the Wealth of Nations*. In this book, Smith outlines guidelines for the trade between nations, and crucial differences can be observed between Smith and the mercantilists.

Based on the comparison of labour productivity, Smith formulated the theory that became known as Absolute Advantages, whose basic assumption is that two nations could have gains from trade if they decided to trade with each other.

According to Salvatore (1999), the principle of Absolute Advantage posits that nations should specialize in the intensive *commodity* which they could produce with greater absolute advantage rather than the *commodity* which they produce with less absolute disadvantage.

The Theory of Absolute Advantage did not fully explain the basis of trade and, according to Rainelli (1998), it had a major limitation: if a country did not offer any absolute advantage, it could not trade.

David Ricardo developed the theory of Adam Smith further by introducing, in the Principles of Political Economy, the Law of Comparative Advantage. For Ricardo, even if a nation has an absolute disadvantage in the production of both *commodities*,

they could still trade, since that nation could specialize in the production of their *commodity* of lower absolute disadvantage.

For Maia (2001) and Gonçalves *et al.* (1998), the Theory of Comparative Advantage does not explain the contemporary international trade, since it does not consider the role performed by technology, product differentiation, increasing returns to scale. Moreover, the Theory of Comparative Advantages assumes that there is only one factor of production; that trade takes place between two countries; that transport costs are absent; and that the Trade Balance is always equilibrated.

The Neoclassical Theory emerged with the publication of the article *The Effects of Foreign Trade on the Distribution of Income* in 1919, written by Swedish economist Eli Heckscher. Heckscher's article had not been analyzed or discussed until Swedish economist Bertil Ohlin analyzed it and published the book of *Inter-Regional and International Trade* in 1933, with the assumptions of the Neoclassical Theory of International Trade.

According to Salvatore (1999) and Williamson (1998), the Heckscher-Ohlin theorem can be summarized as follows: a country will export *commodities* that use its abundant factor of production intensively and import *commodities* that require the use of its scarce factor and higher production cost.

The big difference between the Classical and the Neoclassical Theory of International Trade, in accordance with Brum (2002) and Ferrari Filho (1997), is that the neoclassical economist avoid the Ricardian model, based on a single factor of production, and adopt an analysis that takes into consideration all production factors, the intensively of their use and the nature of their interaction with production resources, in addition to the technology individual countries use in production.

The Heckscher-Ohlin theorem is based on the following assumptions: there are two nations and two factors of production (capital and labour); technology is available worldwide; *commodity* X is labour-intensive and *commodity* Y is capital-intensive in the two trading countries; the two *commodities* are produced under constant returns to scale; production has incomplete specialization in both countries; the countries share identical and homothetic preferences; there is perfect competition in both countries; there is perfect mobility of production factors in both countries, but no international mobility of factors; there are no costs, tariffs and barriers to trade; all resources are fully employed in both countries, and international trade between both countries is equilibrated. It can thus be stated that countries tend to export goods produced with the intensive use of factors that they own in abundance, and import products that intensively use the production factors that are rare for them.

The assumptions made by Heckscher-Ohlin had great importance and influence on subsequent models of international trade. However, as the globalization process expanded, new models and new theories of international trade emerged in order to try to explain the new appropriation of international trade, particularly the Linder theory, the Product Cycle, developed by Vernon, and the Model of Technology Lag, postulated by Posner.

The development of trade relations between countries reveals that competitiveness is considered to be an important cause and effect of trade between nations. The economic transformations that occurred in the 1980s and 1990s fostered a

more comprehensive view of competitiveness, in which international trade and competitiveness are affected not only by a country's factor endowments, but also by other variables such as exchange rate, costs and productivity.

3. METHODOLOGY

3.1. Position in World Market (S)

This indicator allows describing if a country is gaining, losing or maintaining their position in the global market. The present study focuses on beef. The result of the indicator is expressed as a percentage, and may take values between -100 and 100; the higher the value achieved, the more intense is a country's share in the international market of the product in question (GOMES, 2011).

$$S_{ki} = 100 \times \left(\frac{X_{ki} - M_{ki}}{X_i} \right)$$

where:

S_{ki} : Position in the world market of product "i" from country "k".

X_{ki} : Value of exports of product "i" from country "k".

M_{ki} : Value of imports of product "i" from country "k".

X_i : Value of global exports of product "i".

3.2. Competitiveness Index (CI)

This index compares the competitiveness of two countries ("j" and "m") exporting a product ("i") to a market ("k"). The formula takes into account the relevance, in a country's export basket, of the item whose competitiveness is to be measured, as well as the competitor country's share in a given market. This is what is known as effective or ex-post competitiveness (BATISTA, 1999).

$$IC_{j,m}^k = 100 \times \sum_{i=1}^n \times \left\{ \frac{M_{i,j}^k \times M_{i,m}^k}{M_j^k \times (M_i^k - M_{i,j}^k)} \right\}$$

where:

$IC_{j,m}^k$: is the competitiveness index of exporting country "j" compared to competitor country "m" in market "k";

$M_{i,j}^k$: are the imports of product "i" from country "j" by market "k";

M_j^k : are the imports from country "j" by market "k";

$M_{i,m}^k$: are the imports of product "i" from country "m" by market "k";

M_i^k : are the imports of product "i" by market "k";

3.3. Coefficient of Divergence (CD)

This index measures the similarity of the distributions of export sectors between pairs of countries. When the coefficient of divergence is equal to 100, the analysed nations have identical commercial structures; in contrast, when the index is null, these structures differ (DÍAZ MORA, 2001).

$$CD_{AB} = \left[1 - \left(\frac{\sum_i |S_{iA} - S_{iB}|}{2} \right) \times 100 \right]$$

where:

CD_{AB} : coefficient of divergence of countries A and B;

S_{iA} : represents the share of product or sector “i” in country A’s exports;

S_{iB} : represents the share of product or sector “i” in country B’s exports;

3.4. Michaely Index (MI)

For Depetris *et al.* (2010), the Michaely Index is a measure of international trade specialization which takes into account both the exports and imports of a product; it ranges between -1 and 1.

$$MI_{ki} = \frac{X_{ki}}{X_k} - \frac{M_{ki}}{M_k}$$

In which:

MI_{ki} : Michaely Index of product “i” from country “k”

X_{ki} : Value of the exportations of product “i” from country “k”.

X_k : Total value of the exports of country “k”.

M_{ki} : Value of the imports of product “i” from country “k”

M_k : Total value of the imports from country “k”

3.5. Source of data

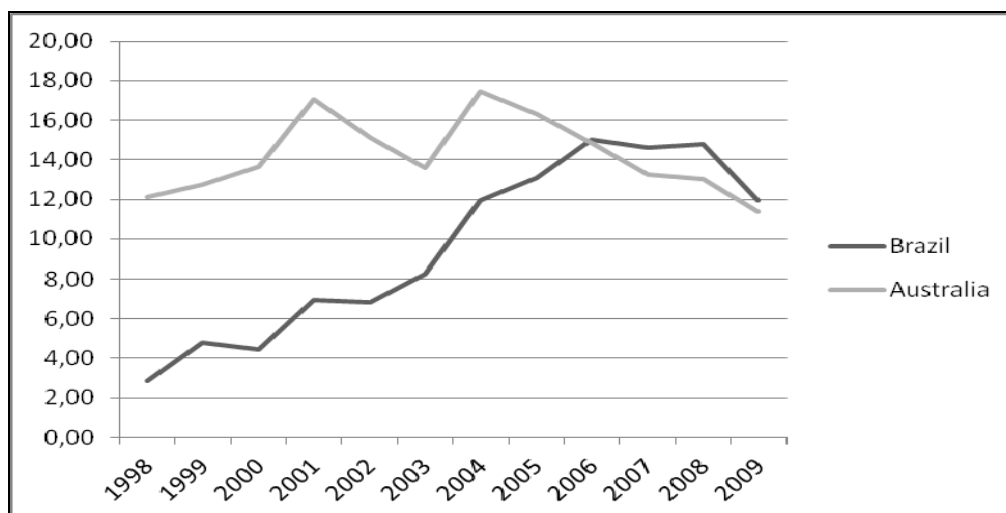
The data used in this study were collected on the FAOSTAT database, covering the period between 1998 and 2009 for the purposes of analysis. Data were comprised of the total value of total world beef imports; the total value of Brazil’s world exports; the total value of Australia’s world exports; the total value of Brazil’s world beef exports; and the total value of Australia’s world beef exports, with the home country’s world exports being equivalent to imports of goods and services from the home country by the rest of the world.

4. ANALYSIS AND DISCUSSION OF THE RESULTS

4.1. Analysis of Market Positioning

This sub-section briefly seeks to compare the position of Brazil and of Australia in the international beef market in the period between 1998 and 2009. The

results presented below were obtained through the Index of Market Positioning (S) and are shown in percentage terms in Figure 1.



Source: Research results

Figure 1. Position of Brazil and Australia in the world beef market from 1998 to 2009

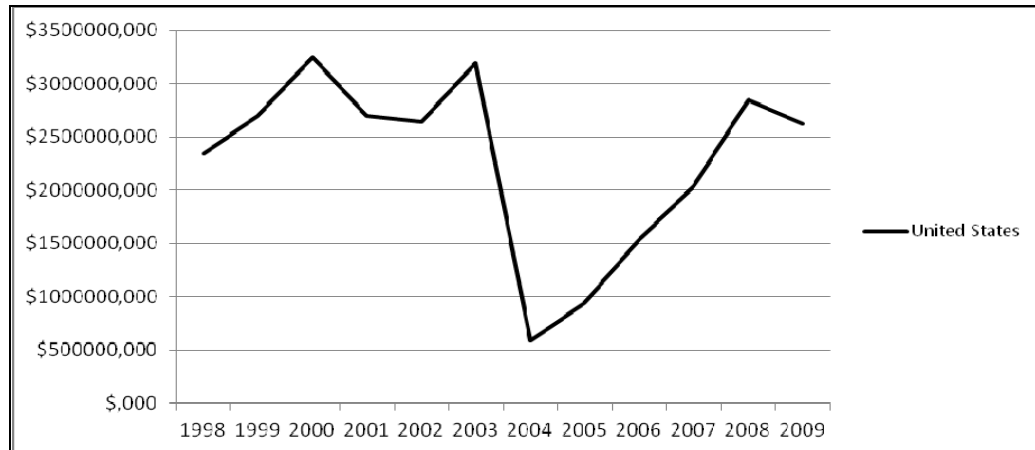
Figure 1 shows that the share of the Brazilian beef increased in the international market during the period analyzed while the beef produced in Australia has remained as a consolidated product in the world market since the early 2000s. From the year 2008 onwards, the share of both countries has decreased in the international beef market, a fact Baldwin (2009) associated with the international financial crisis, which affected the market not only of agricultural products, but also that of other economic sectors.

Kume (2010) cites some studies that sought to establish the relationship between the deepening international financial crisis and the decline in trade among nations: Kei-Mu (2009) observes that as a result of the crisis, the income of the US population and American imports have been reduced, thus reducing the exports of countries that are trading partners with the United States. Mora and Powers (2009) point out that the reduced availability of resources³ granted by banks to finance imports of economic agents from different nations has also caused the decline in exports and imports of world economies. Finally, Kume (2009) also explains that the reduced industrial production across nations also caused a reduction in the volume of international trade.

Figure 1 illustrates a reduction in the Australian market share in the overall international trade of beef and an apparent stability of the share of the Brazilian economy in the same market between 2004 and 2009. This occurs as a result of the

³Resources made available to importers by banks are known as 'letter of credit' and such administrative procedure occurs as follows: banks take on the responsibility of effecting the payment to exporters and expect to obtain the repayment from the importing firms (MORA e POWERS, 2009).

growth in beef exports of the United States after the sanitary crisis occurred in that North America country. Figure 2 shows the behaviour of bovine meat exports to other countries from 1998 to 2009.



Source: FAO (2011)

Figure 2. U.S. beef exports (in thousand dollars)

Therefore, the next subsections will analyze competitiveness between Brazil and Australia as well as discuss the reasons why Brazilian beef exports have increased.

4.2. Analysis of the Competitiveness Index

4.2.1. Brazil

The analysis of the index in this subsection will take into account Brazil as an exporting country and Australia as a competitor country.

The highest rate of Brazilian competitiveness against Australia was in 2004 (0.503), which can be explained by the fact that the value of Brazilian exports had the largest increase in 2004 compared to the previous year: 61.09%. The analyses below were made between periods, and comparisons were made with data of the start and end years of the period; the variables considered were the total value of world beef imports and the total values of Brazilian and Australian beef exports.

Between 1998 and 2001, competitiveness rate grew by 117, 6%; during this period, world imports declined by 8.48%. Australian exports grew by 28.61% while Brazilian exports increased by 70.07% - a greater expansion than that of the competitor country. From 2001 to 2004, competitiveness rate grew by 57.1%, and world beef imports increased by 43.91%. In this period, Brazilian beef exports also outnumbered Australian ones: 140.77% compared to 47.47%, respectively.

According to Franchini (2006), Brazil⁴ ranked second among the largest beef producers in the world from 1990 to 2005, with such position in the global scenario

⁴For Junqueira (2006), the growth in Brazilian bovine meat production was due to improvements in nutrition, pasture and investments in genetics.

being a result of the increased production volume (by 89%); in contrast, beef production of all other nations grew only by 13% in the same period. Moreover, Brazil increased its share in the international beef market during the period analyzed and such growth happened because of an increase in the volume of Brazilian beef exports.

Table 2. Competitiveness index of Brazil

YEAR	COMPETITIVENESS INDEX
1998	0,147
1999	0,228
2000	0,205
2001	0,320
2002	0,296
2003	0,308
2004	0,503
2005	0,476
2006	0,488
2007	0,417
2008	0,389
2009	0,318

Source: Research results



Source: Research results

Figure 3. Brazilian competitiveness index

In the last period of analysis (2004 to 2009), there was a reduction in the rate by 36.77% while world imports grew by 53.26%; Australian exports increased by 0.04% and Brazilian exports increased by 53.66%. The decrease in the competitiveness rate can be explained by the increase in beef exports from the U.S. and India. Figure 3

shows a better overview of the behaviour of the Brazilian Competitiveness Index in the analyzed period.

Junqueira (2006) points out that the increase in beef exports was due to the growth of foreign sales of fresh beef, while processed beef lost ground. Also according to Junqueira, processed beef accounted for about 72% of Brazilian beef exports in 1998, while fresh beef, for approximately 76% of exports in 2005; as a result, Brazil managed to expand trade relations with other countries such as Russia and the United States. However, Brazil could have made a bigger profit out of beef sales if it had added value to the product.

4.2.2. Australia

This section describes the analysis of the Australian Competitiveness Index, considering Australia as an exporting country and Brazil as a competing nation, as shown by Table 3.

Table 3. Competitiveness index of Australia

YEAR	COMPETITIVENESS INDEX
1998	0,149
1999	0,214
2000	0,220
2001	0,337
2002	0,296
2003	0,317
2004	0,643
2005	0,604
2006	0,583
2007	0,465
2008	0,401
2009	0,313

Source: Research results

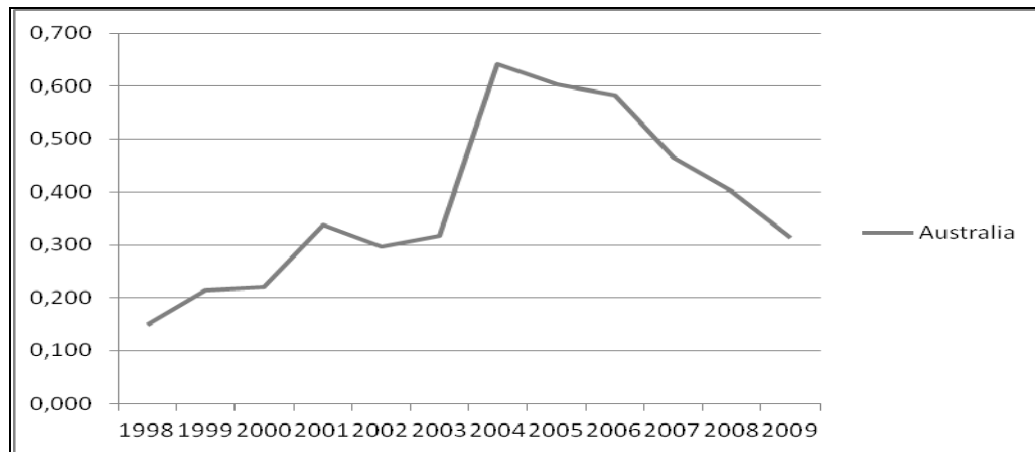
The highest rate of Australian competitiveness against Brazil also occurred in 2004, representing a value of 0.643. In that year, Australia had a highest increase in the volume of exports (44.26%) compared to the previous year.

Between 1998 and 2001, Australia's competitiveness rate grew by 126.1%, even though Brazilian exports outnumbered Australian ones in that period. The increase in the Australian competition index was due to the fact that the market share of Australia's world beef exports rose more than that of Brazil's in the analyzed period.

According to Pereira (2009), outbreaks of *bovine spongiform encephalopathy* in the United States and Canada in the early 2000s benefited Australian exports, which were targeted at markets that could not be supplied with U.S. and Canadian beef.

Buainain and Batalha (2007) reported that Australia exported mainly to Asian countries, including Japan, whose consumer market is very demanding.

Between 2001 a 2004, competition rate rose by 90.80%, for the same reason observed in the previous period. Finally, from 2004 to 2009, the rate decreased by 84.97%. This reduction occurred because the share of Australian beef exports in overall exports gradually declined over those years. Figure 4 offers a clearer picture of the behaviour of the Australian index.

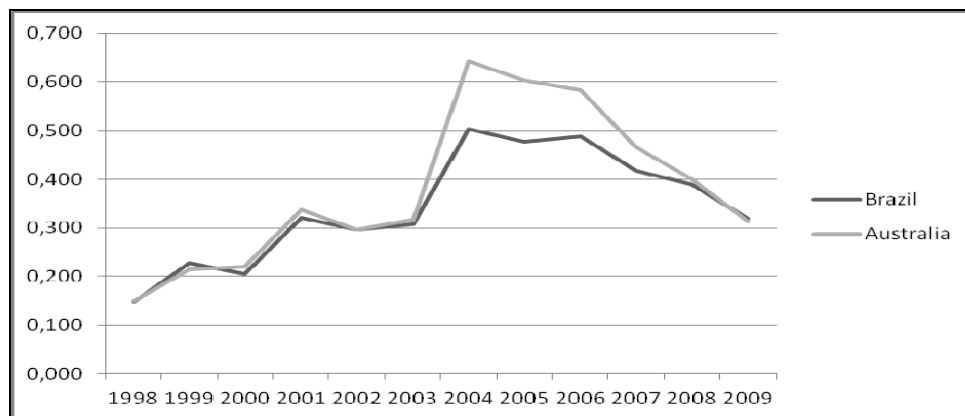


Source: Research results

Figure 4. Australian competitiveness index

4.2.3. Brazil and Australia

This subsection describes the behaviour of the competitiveness indexes of Brazil and Australia in the period from 1998 to 2009, as shown in Figure 5.



Source: Research results

Figure 5. Competitiveness indexes of Brazil and of Australia

Figure 5 shows Australia's predominance over Brazil in the beef market throughout the analyzed period, except for 1999, when the Brazilian competitiveness rate was higher than the Australian one. This can be explained, according to Reis (2003), by the devaluation of the real against the dollar, which boosted Brazilian beef exports, which rose by 36.31% compared to the previous year.

Junqueira (2006) confirms that although Brazil exports a bigger amount of beef than Australia, Australian revenue from beef sales to other countries is higher because of it offers higher quality, standardized products. Table 4 clearly shows the amount earned by some beef-exporting countries in the year 2004, thus confirming the disparity in revenue between Brazil and Australia.

Table 4. Average price per tonne of beef exported in 2004

<i>Country</i>	<i>US\$/ton</i>
United States	3.671,27
Australia	3.520,50
Uruguay	2.526,54
Argentina	2.518,37
Brazil	2.122,07

Source: FAO, apud Junqueira (2006).

The downward trend in the indexes of both countries from the year of 2004 onwards is explained by the rise of the United States and India in the world's beef market. According to FAOSTAT (2011), the U.S. economy had a share of about 8.72% while India had a share of 3.42 % of the total world beef exports in the year 2008.

4.3. Analysis of the Coefficient of Divergence

The section below analyzes the coefficient of divergence, as shown in Table 5. The analysis considered Brazil as country A and Australia as country B. According to Table 4, the index had negative values in all the analyzed period, achieving the value zero in 2007, and reaching values other than 100 across the whole period. This indicates that there are differences between the trade structures of Brazil and Australia, thus indicating a disparity between the productive systems of both countries.

According to Filho (2006), the international beef market is divided into two blocks of countries that have export producer surplus. The first group is known as "Non-FMD circuits", which are free of sanitary problems, with Australia being included. The other group is known as "FMD Circuits", comprised of countries which are not free of the FMD disease, for example, Brazil. Filho explains that beef belonging to the first group is sold at higher prices than beef from the second group.

Moreover, Pereira (2009) reports that Australia has the most favourable sanitary conditions to prevent the spread of diseases such as FMD (food-and-mouth disease) among cattle, and both the government and cattle farmers from Australia maintain surveillance programs to prevent the contamination of the animals. Pitelli (2004) points out that Australia has one of the tightest control mechanisms against

infectious diseases in cattle and buffaloes and has not had an FMD outbreak since 1872.

Table 5. Coefficient of divergence between Brazil and Australia

YEAR	COEFFICIENT OF DIVERGENCE
1998	-105,956
1999	-92,843
2000	-114,367
2001	-102,021
2002	-81,281
2003	-55,033
2004	-88,317
2005	-61,184
2006	-22,766
2007	-0,805
2008	-10,154
2009	-8,680

Source: Research results

Miranda (2001) reports that Australia has been increasing its share in the world market as a result of product diversification, with higher value being added to beef products. This business strategy increases remuneration of the links of the Australian production chain and makes such chain more competitive.

According to Pigatto et al (1999), the Brazilian beef production chain is unstructured, and they claim that organization is required between the links so that the chain can gain competitiveness in international markets. Jank (1996) points out that the lack of organization of the supply chain is one of the factors that results in lack of traceability by the producer. In his turn, Almeida (2009) challenges the the existing differences between cattle raising farms: while some have high production efficiency, others have extractive characteristics.

Buainain and Batalha (2007) stress the barriers that Brazil has to transcend in order to improve competitiveness in the beef production chain: overcome sanitary barriers; develop quality standards that can earn recognition of export markets; form a better coordinated chain, overcome limiting such as export quotas, tariffs and subsidized competition, and, finally, place products with higher added value in the international market.

4.4. Michaely Index analysis

Finally, competitiveness between Brazil and Australia is verified by means of the Michaely index, but Brazilian and Australian beef imports are also taken into consideration. The results are shown in Table 6.

Table 6. Results of the Michaely Index for Brazilian and Australian beef from 1998 to 2009

YEAR	BRAZIL	AUSTRALIA
1998	0,00895	0,03282
1999	0,01543	0,03544
2000	0,01250	0,03714
2001	0,01632	0,03780
2002	0,01667	0,03440
2003	0,01944	0,03168
2004	0,02406	0,04283
2005	0,02397	0,03718
2006	0,02700	0,03222
2007	0,02579	0,02673
2008	0,02453	0,02285
2009	0,02350	0,02228

Source: Research results

The values in Table 6 show that Australia was a more competitive country than Brazil concerning beef exports to international markets for most of the analyzed period, and particularly between 1998 and 2007, while Brazil was more competitive than Australia in terms of beef exports in the years 2008 and 2009.

However, Australia was more competitive than Brazil during most of the analyzed period, as a result of efficient management of the beef supply chain by responsible economic agents, as discussed previously. In contrast, as regards adding value to beef, Brazil lags behind the standards required by the best beef markets, for example, Japan and the European Union. Tirado *et al* (2008) sees the ineffective sanitary inspection in the beef production process as the main obstacle for Brazil to supply the best markets with quality beef.

5. CONCLUSION

The results of this study show that Australia is more competitive in the international beef market than Brazil, although Brazilian exports outnumbered Australian exports after 2006. This is the result of the efficient work performed by the Australian Government, which invested in the sector after facing international health crises, especially in the 1990s. As a consequence, long-term, significant changes occurred in the production system. In addition, Australia ranked as the leading beef exporter in terms of quality and high price.

The results for production structure in both countries show differences between the Brazilian and Australian supply chains, indicating that Brazil's Beef Agribusiness System (SAG) needs to be improved and managed in order to match the standards of the production and surveillance method used in Australia.

In summary, Brazilian beef cattle industry needs investments from public and private organizations in order to better coordinate and organize the links that form the

production chain, thus making Brazilian products more competitive on the international scenario.

This study has shed light on the Brazilian and Australian beef market. However, many other aspects can be analyzed; for example, advanced studies can be conducted to identify factors associated with beef market competitiveness. In addition, scenarios can be simulated through Computable General Equilibrium models and Space Allocation models in order to signal prospective gains that Brazil may have in view of declines in tariff and non-tariff barriers that imposed by the main import markets.

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