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Original Article

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Competitiveness of Brazilian Tropical Wood on the International Market

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ABSTRACT

This work analyses Brazilian tropical wood exports, taking into consideration their performance and competitiveness from 2004 to 2011. The present paper aims to: a) determine the competitiveness of exports of goods: sawn wood and tropical plywood; and b) compare the performance of both products. The Constant Market Share model and the Revealed Comparative Advantage Index (RVAI) estimated competitiveness and performance. The results show that sawn wood has proven to be the only product to provide competitive gains over the analyzed period.

Keywords: sawn wood, plywood, exports, market share.

1. INTRODUCTION

Economic globalization is reflected in the international market, which favors exporter countries accessing new customer markets, leading to a more demanding and selective environment. This new dynamic has been pushing exporter countries to become more aware of their clients' expectations, whether they be established or potential customers, aiming to maintain competiveness and increase market share.

The Brazilian tropical wood market has always been ranked as one of world's largest producers, and, until 2011, among the top exporters of the International Tropical Timber Organization (ITTO). However, in recent years, Brazil has been experiencing the effects of the competiveness of the international market. In 2010, the quantity of exported tropical timber showed a 60% reduction, when compared to 2007 levels. Plywood rates decreased to 75%, in 2010, when compared to exports in 2007 (ITTO, 2012). The problem intensified after the 2008 crisis.

This competiveness study is relevant because it allows us to use specific methods and models to compare companies, sectors and countries with the best international rates, aiming to identify the competitive advantages and disadvantages that can contribute to the development of policy initiatives and production practices.

The Constant Market Share is a useful tool to measure the competiveness of a country from the performance perspective. The CMS can categorize export performance into four types: (1) international market growth; (2) schedule composition; (3) export destination; and (4) competiveness, which helps to identify the effects of export evolution and helps to verify the effectiveness of the policies adopted (Almeida et al., 2012).

The CMS model has been gaining room in the forestry sector, which can be seen in research by Castillo & Laarman (1984) regarding sawn wood from conifers; Medeiros & Fontes (1994) for cellulose; Angelo et al. (2000) for tropical sawn wood; Noce et al. (2003) for coniferous and deciduous lumber; Coelho & Berger (2004) for furnishings; Valverde et al. (2006) for cellulose and Almeida et al. (2012) for coniferous sawn wood.

The Revealed Comparative Advantage Index (IVCR) allows us to confirm if the participation of a given product in the export market of its country is higher than the participation in the global market. Hence, the value of this indicator should be higher than the unit. The IVCR, although widely used to measure competiveness, is not used for comparison between countries. Such an index works as an indicator of the specialization level of a certain sector or product in a certain country (Nilsson et al., 2007).

In this context, descriptive studies into the performance of Brazilian exports of tropical timber products, their approach to introduction into the international market and the competiveness of products from this raw material are required, since the decline in the world market makes the environment more competitive.

This research aims to estimate the competiveness of Brazilian tropical timber exports, particularly, sawn wood and Brazilian plywood, by comparing competiveness between the two products.

2. MATERIAL AND METHODS

2.1. Constant market share

The CMS model was proposed by Leamer & Stern (1970) and used by Richardson (1971) and Almeida et al. (2010). The model was widely promulgated by Richardson (1971) and has been used in studies regarding market growth and performance, and studies into the factors that influence a nation's exports, over a given period.

In the forestry sector, among studies that involve Constant Market Share analysis, the research by Coelho & Berger (2004), studied the furniture sector; Valverde et al. (2006), analyzed the performance of Brazilian cellulose exports; Dieter & Englert (2007), investigated the German forestry industry; Noce et al. (2007), researched the international plywood market; Carvalho et al. (2009) investigated Brazilian paper exports; Almeida et al. (2012) studied Brazilian and Canadian sawn wood exports; Parapinski (2012) studied the dynamics of timber furniture exports; and Aguiar (2014), researched the performance of Brazilian chestnut exports.

The Constant Market Share – CMS - analysis period includes the period from 2004 to 2011, divided into 2 sub-periods of four years. The value of each sub-period is given by the sum of the values of four

years that are part of its composition. The investigated sub-periods were:

1) from 2004 to 2,007 – the period prior to the U.S and European economic crises; and

2) from 2008 to 2011 – crisis and post-crisis periods.

A CMS model simplification, removing the composition effect of the schedule that equals zero, because it represents a commodity at a specific time (sawn wood and plywood), as presented in Equation 1.

$$\sum\left(V_{ij}^{'}-V_{ij}\right)=rV_{ij}+\sum_i\sum_j\left(r_{ij}-r_i\right)V_{ij}+\sum_i\sum_j\left(V_{ij}^{'}-V_{ij}-r_{ij}V_{ij}\right) \quad (1)$$

(a) (b) (c)

in which: $V_{ij}^{'}$ = commodity *i* export value (sawn wood or plywood) from a country focused on market *j*, during period 2; V_{ij} = commodity *i* export value (sawn wood or plywood) from a country focused on market *j*, during period 1; *r* = growth rate percentage of worldwide exports for commodity *i* between countries 1 and 2; and r_{ij} = growth rate percentage of worldwide export values for commodity *i* for country *j*, from period 1 to period 2.

The effects are defined by Richardson (1971):

a) **Growth effect on the global market:** development is observed to identify if the exports of a country grew according to the same growth rate as the international market, in other words;

b) **Export destination effects:** changes caused by commodity exports for relatively dynamic growing markets, in other words, growth caused by market distribution of a country; and

c) **Residual effect representing competiveness:** the residual market reflects the difference between effective growth of exports, and, what would have occurred with the exports if a country maintained its participation for every commodity, in the buyers markets. The measuring of this residual market relates to changes in relative prices, hence, importers tend to replace the consumption of goods, where prices rise by consuming cheaper products.

2.2. Revealed comparative advantage index

The Revealed Comparative Advantage Index, proposed by Balassa (1965) calculates if the export participation of a certain product, on the export schedule of an analyzed country is, higher or lower for the participation of the country in the global market. In other words, this indicator demonstrates whether the input of a certain product reveals advantages or disadvantages regarding the export schedule of the studied country.

Therefore, the calculation can be performed using Expression 2:

$$IVCR=\frac{\frac{X_{ij}}{X_{ik}}}{\frac{X_j}{X_k}} \quad (2)$$

in which: IVCR – is the Revealed Comparative Advantage Index; X_{ij} – is the Brazilian export values for sawn wood and plywood; X_{ik} – represents global exports of sawn wood and plywood; X_j – is the value of Brazilian exports; X_k – represents the total value of global exports.

2.3. Data source

The Data sources used in this study were taken from annual temporal series, from 2000 to 2011. To calculate the CMS, data was collected from UnCOMTRADE (2013), values for IVCR were collected from Brazil's Foreign Market Secretary (SECEX - Secretaria de Comércio Exterior do Brasil) (Brasil, 2013) and from the World Trade Organization – WTO.

3. RESULTS AND DISCUSSION

Analyzing Brazilian export growth sources for sawn wood and tropical plywood, during the studied period, showed that global exports of sawn wood and tropical plywood decreased by 16 and 26%, respectively, during the sub-period from 2008 to 2011, when compared to 2004-2007. The constant market share of tropical sawn wood in Brazil went from 7.4%, from 2004 to 2007, to 5.17%, from 2008 to 2011, while plywood showed poor results, decreasing from 0.96 to 0.43% over the analyzed period, resulting in a 50% loss on the global market (Souza, 2013).

The global exports of tropical sawn wood decreased by 14.6%, during the sub-period from 2008 to 2011, when compared to 2004 to 2007 (Table 1). Tropical plywood decreased by 67% over the same period, as shown on Table 1.

Table 1. Components of gain and loss in exports of tropical sawn wood and tropical plywood in Brazil over the period 2004-07 and 2008-11.

	Sawn wood		Plywood	
	Value (US$ million)	Value (%)	Value (US$ million)	Value (%)
Exports 2004-07	958		159	
Exports 2008-11	573		53	
Period Variation	-385	-40	-106	-67
Effects				
Global commerce	-156	-40	-41	-39
Destiny	-53	-14	-9	-8
Competiveness	-175	-46	-56	-53

Source: UnCOMTRADE (2013), calculations by the authors.

Among the effects responsible for Brazil's export performance on the global market, competiveness was the main reason for the decline in exports for both analyzed products, according to Table 1. This explains the factors responsible for Brazil's performance for sawn wood and tropical plywood exports, during the studied period of time.

3.1. The growth effects on the global market

The growth outcomes for the global market indicates that the increase in exports for a country occurs due to global export growth (Grams et al., 2013). Therefore, the results observed on Table 1 indicate a lack of growth on the global market for sawn wood and tropical plywood, during the study period.

According to FAO (2010), in North American markets in 2008, the construction of new houses decreased by 35% when compared to 2007 and the non-residential market shrank by 15%. In the case of the European Union, residential construction decreased by 7%, and in 2008, the construction of new houses dropped by 13.4%.

Part of Brazil's performance on sawn wood exports, during the 2008-2011 period, can be attributed to the real state crisis in the United States, which started in 2007, which was the key factor for the global financial crisis (Santana et al., 2010).

For tropical sawn wood, if Brazil had maintained the same market share from 2004 to 2007, over the 2007/2008 period, the country would have stopped exporting US$156 million. Such a value would have contributed to a drop in Brazilian exports. This effect's performance directly influenced the retraction of the construction market in the United States and Europe.

Concerning tropical plywood, this effect contributed to a 39% reduction. If Brazil had maintained the same share during the previous sub-period (2004-2007), the country would have stopped exporting this quantity, due to a reduction in the global market. As stated previously, global exports dropped by 26% during the 2008 to 2011 period, in comparison to 2004 to 2007.

3.2. The destination effect on exports

According to Grams et al. (2013), the destination effect on exports will be positive if a certain country directs its exports toward dynamic markets, during the analyzed period, while it will be negative in stagnant regions.

The positive percentage for the destination factor indicates that exports were focused on countries undergoing economic growth. However, in this study negative values (Table 1) represent exports focused on markets with growth rates lower than the average for all other countries.

The negative destination effect obtained for Brazil, allowed academics to conclude that its exports needed to find newer, more dynamic markets, as suggested by Angelo et al. (2000).

Performing a comparative analysis, it is possible to observe that the lower destination index (Table 1) was obtained by tropical sawn wood (-53), when compared to the tropical plywood (-9), during the study period. This allows us to assume that plywood exports were focused on dynamic markets, while sawn wood exports were concentrated on stagnant markets.

Souza (2013) studied the competiveness of Brazilian sawn wood, and the results showed that Brazil's main partners were directly affected by the economic crisis in 2008. Countries such as China that were not as affected, also reduced their exports, recording a 20.6% decrease on total exports and a 44.6% drop for Brazilian imports. France and the United States reduced their exports by 32.2% and 69.7%, respectively, during the study period (2008-2011).

For tropical sawn wood, the destination effect of exports was responsible for the 14% drop in exports. This result suggests that Brazil focused exports on countries whose growth rates were lower than the global average, or that were not growing at all.

As for tropical plywood, the destination effect caused an 8.22% drop in exports. This negative effect, as for sawn wood, indicates that Brazil focused its exports on stagnant economies, mostly the United States, the center of the economic crisis, after 2008. According to the UnCOMTRADE (2013), during this period, the reduction in Brazilian plywood exports to the American market was around 80%, and Brazil's main partners reduced their exports, except for Venezuela and Argentina that grew 34.8% and 8.7%, respectively.

Another factor that influenced the reduction of plywood exports was the growing participation of China, mostly, in the North American market. China, starting from 2005, became a threat, with lower prices, principally for plywood. Consequently, China grew via European and American markets, and other exporter countries had to change their plywood market share (Vieira et al., 2012).

3.3. The competiveness effect

The competiveness effect indicates that an economy is competitive for the manufacture of a certain product when, it at least, meets efficiency and quality standards (Grams et al., 2013). This result indicates that Brazil's competiveness on the global market is low, for both sawn wood and plywood. The factors that lead to these results are related to the characteristics of the Brazilian timber industry. In general, the companies that make up this industry are small scale, financially fragile, with inefficient management, technologically backward and have historically been focused on the domestic market. Therefore, their efficiency standards and resource use were not equal to current levels, when compared with fellow producers.

The difference between export growth defined by the CMS and the effective growth of exports is attributed to the competiveness effect. The measuring of this effect relates to price changes. When a country does not maintain its share of the global market, competiveness becomes negative. In other words, importers tend to replace the consumption of products, where price increases by consuming products of relatively lower price (Grams et al., 2013).

The competiveness effect was the major contributing factor to the drop in Brazilian export performance for sawn wood. This effect corresponds to 45.62% (Table 1) of the decreasing rates from 2008 to 2011 due to competition issues. Therefore, it is important to emphasize that there was no growth in competiveness for Brazil, when comparing the 2008-11 sub-period to 2004-07.

According to Santana et al. (2010), the main reason for the decrease in tropical wood exports over recent years was the impact of the global financial crisis, causing the value of the dollar to drop relative to the main currencies, including the Real. Additionally, the demand for wood products decreased in all importer markets in Brazil. In the words of Almeida et al. (2012), Canadian businesspeople attributed the drop in competiveness for sawn wood exports to a lack of demand on the global market, mostly in the United States, Canada's main buyer.

By using the regression model to determine the variables responsible for Brazil's competiveness, Almeida et al. (2010) argued that Brazil relied on exchange rates for competiveness for sawn wood exports. This shows that the exchange rate affects the forestry sector as a whole. This study was corroborated by Santana et al. (2010), who argued that one of the most important factors for sawn wood exports was the impact caused by the dollar crisis, resulting in its devaluation amongst the main currencies, including the Real.

In addition to the unfavorable exchange rate for exports, from 2008 to 2011, another factor, the FOB US$/m^3 price of Brazilian tropical sawn wood may have affected Brazilian competiveness. During the same period, the price was 19% higher than the global average (ITTO, 2012).

As for plywood, the competiveness effect was responsible for 53.03% of the exports decrease, and, once again, was the main influence on export performance. It is important to remember that the drop in exports for Brazilian plywood was constant starting from 2005, therefore, during the period prior to the global financial crisis.

Price is one of the variables that affects export performance, and was not favorable for Brazilian tropical plywood. This presented an average price of US$560,00/m^3, during the 2008-2011 sub-period, while the global average recorded was US$520,00/m^3. This could be the cause for the low performance of this product amongst the exports. According to Brasil et al. (2004) plywood presents price-elasticity depending on demand. The increase in demand for this product (*ceteris paribus*) is proportional to its price reduction.

Eisfeld & Berger (2012) analyzed market industry structure for wood panels (plywood, OSB and MDF) in Paraná (Brazil). Based on the results found for plywood, the authors concluded that plywood is used for its superior quality, when compared to other cheaper substitutes, such as OSB. However, it is considered to be a product that has been replaced by other panels. Global consumption decreased in recent years, due to a lack of feedstock and elevated production costs.

Tropical plywood has been undergoing a reduction of feedstock offer, due the intense monitoring of deforestation, and its replacement with other wood panels, such as MDF and OSB. The production slowdown for Brazil's importer markets, unfavorable exchange rates and China growing on top of Brazil's markets, affect overseas plywood markets. Another important factor, which occurred in 2006, was the increase in taxes on Brazilian plywood by Brazil's main partner, the United States, which discouraged the product's importation, making plywood more competitive in that market.

China also became a threat to Brazilian products, with lower prices, mostly for plywood. Chinese competiveness was favored by low production costs, with benefited from cheaper labor and government stimulation of companies (Mattos et al., 2008). Noce et al. (2007) highlighted China's ascent in the international plywood market which began in 1998/2000, in which it increased exports by 550.97%. Currently, China is providing products for the European Union market at competitive prices (ITTO, 2012), which makes it more challenging for other plywood exporting countries to compete at a global level.

3.4. Revealed comparative advantage index

The IVCR calculation takes into account all sectors of the economy. Assuming that a segment increases its export volume, to a greater extent than other segments, it is said that this segment obtained revealed comparative advantages.

Sawn wood revealed comparative advantages (Figure 1), however, its competiveness decreased. The product's performance was better from 2002 to 2004. During 2004, the IVCR value was 12.35% above the unit. After 2004, there was a constant decrease until 2011, except in 2007, the year when Brazil obtained the greater value on exports for sawn wood, according to UnCOMTRADE (2013).

With a 4.68 IVCR, in 2011, sawn wood was competitive, even with an average reduction of 7% from 2000 to 2011. The drop in IVCR value for 2011 when compared to 2000 was 58%.

The production of tropical sawn wood is experiencing a loss of competitiveness due, in part, to internal factors such as an increasing difficulty to exploit the Amazon rainforest for environmental reasons. On the other hand, Almeida et al. (2010), calculating the competitiveness of sawn wood production from forest plantations, found a better situation highlighting a loss of competitiveness due to the exchange rate, a factor external to the timber industry business environment.

Using the Revealed Comparative Advantage method, Petrauski et al. (2012) analyzed competiveness of sawn wood (coniferous and non-coniferous) of the greater

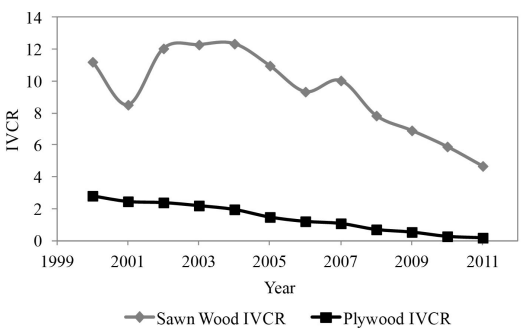

Figure 1. Evolution of Revealed Comparative Advantage Index for tropical sawn wood and tropical plywood of Brazil, during 2000-2011.

global exporters, from 2000 to 2007. Studies revealed that Brazil did not increase the IVCR during the analyzed period, maintaining it at the seventh highest value. The authors also suggested strengthening commercial contacts with South America, Europe and China as a strategy to increase this index. Considering the ascension of the Chinese market, the increasing demand for sawn wood in this country grew from 6 to 22 million m^3, during the analyzed period, 2000-2007.

When comparing the competitiveness of Brazil in the production of sawn wood and plywood, it can be said that sawn wood is performing better, the reason being that this segment depends mainly on the cost, variety and abundance of the raw material, factors in which Brazil is competitive. For plywood companies, factors related to technology and labor qualification are preponderant to competition in the wood panel market. In addition, the more efficient use of wood in MDF and OSB panel production has reduced the competitiveness of plywood.

Plywood presented a continuous downward trend over the analyzed period (2000 to 2011), as seen in Figure 1. The IVCR fell 94% when comparing 2011 to 2000. The annual reduction was 20.55%. The product presented a revealed competitive disadvantage towards the end of the series. Plywood has been losing competiveness, according to data from SECEX (Brasil, 2013), as it is one of the main reasons for its replacement for other products that compete with it in the same segment, in other words, construction and furniture. The main reasons for the decrease in plywood competitiveness are the gain in scale and consolidation of the OSB and MDF panels as the main substitutes for plywood in civil construction and furniture production, respectively.

Gonuguntla (2007) used the Balassa method (VCR), from 1996 to 2005, to compare New Zealand's performance on the plywood market, along with Canada and Russia. According to the study, the three countries increased their competiveness for this category. Canada and Russia grew by 52% and New Zealand's comparative advantage increased by 20%. However, New Zealand had the main competitive level, with a 447 IVCR, in 2005, when compared to 147 for Canada and 214 for Russia. Canada went from a comparatively disadvantaged position in 1996, to a comparative advantage in 2005. These numbers show greater competiveness for these countries, when compared to the Brazilian product index.

The IVCR result indicated that if a country has a comparative advantage for a certain product, it threatens its participation on the national and international exporter schedule (Balassa, 1965). In this case, Brazilian tropical plywood, which has been decreasing since 2008, prior to the global crisis, ended up influencing it faster than the unit itself, producing comparative disadvantages due to endogenous factors of the segment.

4. CONCLUSIONS

The results indicated that plywood and sawn wood from the tropical forest have been losing competitiveness over the last two decades. This loss of competitiveness is directly related to the increasing difficulty to exploit and sell tropical timber in from the Amazon, as well as Brazil's cost, mainly due to the cost of energy, logistics and credit difficulties in the country.

Comparatively and within their respective markets, the plywood competitiveness is even worse that sawn wood. The reason is the emergence of OSB and MDF panels, which are more efficient and already established for several uses in civil construction and furniture manufacturing. Sawn wood is a product with lower added value and its competitiveness is highly influenced by the cost, variety and abundance of raw materials, which maintains Brazil as a reference in the global market. On the other hand, aspects inherent to technological innovation and labor qualification, which are more important for higher value-added industries, mean that the plywood segment has not kept up with its competitors.

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