

The Use of Constant Market Share (CMS) Model to Assess Brazil Nut Market Competitiveness

Giovanna Paiva Aguiar¹, João Carlos Garzel Leodoro da Silva¹, José Roberto Frega², Lorena Figueira de Santana¹, & Jaqueline Valerius¹

¹ School of Forestry Engineer, University of Parana, Curitiba, Brazil

² School of Applied Social Sciences, University of Parana, Curitiba, Brazil

Correspondence: João Carlos Garzel Leodoro da Silva, School of Forestry Engineer, University of Parana, Curitiba, Brazil. Tel: 55-(41)-9118-6332. E-mail: garzel@ufpr.br

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Abstract

This paper aims to evaluate the variation of market share explained by structural and competitive forces using the Constant Market Share (CMS) model. Assuming that a country should maintain its market share to keep competitive, the equation used in the model analyzes the export basket composition, exports destination, growth or shrinkage of the world market and the competitiveness effect. The overall loss of the Brazilian market share in a time series from 1998-2012 is given due to the barriers of potential European markets and reduction of the market growth of the product with shell. In a different way, the increase in exports of shelled nuts to markets with higher growth rates contributed to a favorable outlook for Bolivian and Peruvian markets, which had a market share gain on the period.

Keywords: international market, non-timber forest products, Amazon

1. Introduction

The Brazil's nut extraction had great importance on the economic, social and political formation of Amazon region. It is between the most commercialized products in the national and international market (Silva, Santos, Gama, Noce, & Leão, 2013; Barbosa & Moret, 2015). The extractivism and processing of the nuts sustains several communities from Amazon and moves their regional economy at the same time that promotes the forest conservation (Sá, Bayma, & Wadt, 2008; Homma, 2012; Bayma, Malavazi, Fonseca Andrade, & Wadt, 2014).

As the collect of nuts do not require the cut of trees, this activity is considered, virtually, without environmental impacts and directly connected to the tropical forest preservation (Wadt, Kainer, Staudhammer, & Serrano, 2008; Santos et al., 2010; Newing & Harrop, 2000; Zuidema, 2002).

Brazil nuts has some advantages among other non-timber forest products, such as low perishability, generation of a considerable quantity of employment and high international demand (Zuidema, 2002). According to Food and Agriculture Organization of the United Nations (FAO) (2000), the Brazilian nut trade has about US\$ 2.5 billion of annual turnover and accounts for 2% share.

Only three countries—Brazil, Bolivia and Peru—export Brazil nuts, being Bolivia and Brazil the largest. Although most of the trees are found in Brazil, Bolivia has a big harvest due to its lower labor costs. In a market well established with universal standardized specifications, transportation costs represent the major part of total costs and this value is added to transportation and shelling of nuts.

Despite the importance of the non-timber forest products (NTFP), there is a gap of studies about the role of these products as a source of regional economic growth (Stoian, 2000). There are challenges on the extractivism of Brazil nuts, not only about the social and ecologic aspects of the activity but also in the economic sphere.

Furthermore, this product has experienced a loss of international market share over the last year. The income generated from the extractivism of Brazil nut still is too low for the maintenance of the families that depend on

that activity, which, in general, seek other activities such as agriculture and livestock as a way to complement it (Escobal & Aldana, 2003).

On the other hand, competitiveness is seen as a key factor to achieve success in industries of a country inserted on an international scenario. Although there is no consensus about the concept of competitiveness, from the view of performance, it can be expressed as the capacity of a firm to formulate and implement strategies that allow them to enlarge or conserve a sustainable position on the market (Fajnzylber, 1988; Santos et al., 2010; Almeida, 2010a; Farina, 1999; Ferraz, 1989).

The ability of a country to maintain and expand its participation on the international market also contributes to elevate the level of income of its population (Fajnzylber, 1988). In this sense, studies about competitiveness allow the comparison between industries of a country, or the same industry among different countries, and those who present better patterns of world market.

Thus, it is possible to identify competitive advantages and disadvantages of the industry with the objective of subsidizing decision-making both on the elaboration of public and private policies as productive practices.

One of the methods used to analyze the competitiveness of a country or an external market sector is the Constant Market Share (CMS), considered a widely used index due to its ease of application and intuitive appeal. This model attributes the growth of exports to structural forces or to competitiveness (Richardson, 1971).

In this sense, the present paper aims to study the competitiveness of Brazil nuts in shell and shelled in the international market, identifying the determinant factors of competitiveness on the market through the CMS model.

2. Material and Methods

2.1 Database

For this study were collected data, from 1998 to 2012, of quantity (kg) and value (USD) of Brazil nut exports, in shell and shelled.

The period was chosen according to the availability of data collected in the UnComtrade database (2013), maintained by the Statistical Division of the United Nations. The unit price was calculated by dividing the value of exports by the quantity exported each year, according to Equation (1), suggested by Almeida, Bittencourt, Santos, Eisfeld, and Souza (2009):

$$P = \frac{VV}{QV} \quad (1)$$

Where, P = price (US \$/kg); VV = total exports/imports (US \$); QV = total volume exported/imported (kg) (m).

As consulted, the database of the Central Bank of Brazil (BCBr) (2013) provided the annual time series of nominal exchange rate in Brazil.

Already, the annual time series of the Consumer Price Index (CPI) was collected in the database of Federal Reserve Economic Data (FRED, 2013), so that the export data—in dollars—could be deflated.

2.2 The Constant Market Share Model

The model of constant market share was drawn up initially by Tyszynski (1951) and refined by Learner and Stern (1970), and Richardson (1971a, 1971b). The “rule of constant share”, which led to the model, states that the country should maintain its market share to keep competitive. Therefore, differences observed in a certain time interval between the market shares—expected and the real market share—might be explained by structural and competitive forces (Leamer & Stern, 1970).

The CMS model defined by the equation 1 as in Leamer and Stern (1970) has structural forces represented by effects of the world market growth (a), the export basket composition (b), export destination (c), and the competitiveness effect (d):

$$\Sigma(V^1 - V^0) = rV^0 + \Sigma_i(r_i - r)V_i^0 + \Sigma_i\Sigma_j(r_{ij} - r_i)V_{ij}^0 + \Sigma_i\Sigma_j(V_{ij}^1 - V_{ij}^0 - r_{ij}V_{ij}^0) \quad (2)$$

(a) (b) (c) (d)

Where,

V^0 = Exported value by country in the period 0; V^1 = Exported value by country in the period 1; i = exported product; j = Country destination of exports; r = Rate of world exportation growth between periods 0 and 1.

The first effect presented on the equation attributes the change of exports of a country to the growth or shrinkage of the world market (a). The second effect, export basket composition (b), considers which goods the country

exports and the world market growth of these goods to explain the variation on exports. As a result, if the export basket is, mainly, composed by goods with growth rates higher than the average the effect will be positive.

Therefore, the effect of the destination of exports (c) will be positive if the country has exported more to fast growing markets and negative if the destinations of exports are stagnant markets. In this case, a market is considered stagnant when your growth rate is lower than the average global growth rate of the exports of the same product.

Finally, the competitiveness effect (d) is the residue of the equation. All the variation that cannot be assigned to the other factors will be a result of a gain or loss of competitiveness. Thus, the term competitiveness is used in substitution to all the others uncountable effects included in it, as technology, quality and product differentiation.

On this article, the export basket of each country was composed by Brazil nut with shell and shelled, therefore the export basket effect was considered on the analysis. Thereby, this effect will be positive to those countries who export the type of nut whose world exportation (r_i) has grown more than the world average of both types (r).

Table 1 below demonstrates some of the authors that used the CMS model in their studies.

Table 1. List of authors and publications utilizing constant market share (CMS) model

Author (s)	Studies
Amaral, Gomes, Coronel, & Silva (2013)	Studied the competitiveness of Mercosur countries in the export of soybeans.
Parapinski (2012)	Examined the effects of global market growth, export destination and competitiveness by applying the CMS method for exports of Brazilian wood furniture during the period 1991-2010.
Sereia, Camara, & Anhesini (2012)	Used as a method to study the competitiveness of Brazilian coffee production between 1990 and 2007.
Skriner (2009)	Analyzed the development of the competitiveness of the market and the agenda of exports of Austrian goods 1990-2006.
Wu, Wang, & Lin (2016)	Used the model CMS to analyze the factors that affect the changes in exports of primary forest products in the US and China between 2005 and 2012.
Dieter & Englert (2007)	Analyze the competitiveness of the German forest industry sector against the background of the international timber markets.
Pandiella (2015)	Spain's share of the global market for goods exports into competitiveness and structural effects (<i>i.e.</i> the impact of specialization, either in product or geographical terms) over 1996-2013.
Marini (2010)	Application of Constant Market Share Analysis for the Study of Firm Profitability
Devereux et al. (2015)	Exchange Rate Pass-Through, Currency of Invoicing and Market Share
Türkekul, Güden, Abay, & Miran (2010)	Used constant market share analysis to determine the competitiveness of Turkey, Spain, Italy, Greece and Tunisia, <i>i.e.</i> the world's primary olive oil producers, in markets in the USA, Australia, Canada, Brazil and Japan in the periods 2000-2004 and 2005-2008.
Singh (2014)	Investigates the major sources of India's exports performance during the post-liberalization period (1991-2011) by using constant market share model.

2.2.1 Period of Analysis

To apply the CMS model, different authors adopt different criteria to define the years or periods to use on the analysis. Thus, while some choose to evaluate the CMS results from one year to another (Almeida, 2010; Parapinski, 2012), others use the average values from the periods composed by two or more years on the calculations (Carvalho, 1997; Sereia et al., 2002; Coelho & Berger, 2004; Coronel, Machado, & Carvalho, 2009; Silva et al., 2013; Dyadkova & Momchilov, 2014).

This study used the period of three years, distributed equidistantly, from three to three years, during the data series of fifteen years (1998-2012). The three trienniums chosen correspond to important facts of the international market of Brazil nuts, such as:

Period 1: from 1998 to 2000—On the year of 1998 the European Union established their maximum limits of aflatoxins by the EC 1525/98, on lower values than those practiced by other countries, such as USA and Brazil.

Period 2: from 2004 to 2006—In 2003 the European Union has restricted by the EC 493/03 the import of Brazil nuts with shell coming from Brazil. This regulation had impacts on the structure of international commerce of the product, and its effects may be seen on Brazilian exports, mainly from 2004.

Period 3: from 2010 to 2012—In 2010 the European Union established new limits of aflatoxins to the Brazil nuts (EC 165/10), raising the maximum content allowed. This period corresponds yet to the beginning of recovery of global markets after the American economic crisis of 2008.

3. Results

The CMS results can be observed on Table 2 in percentage and on Table 3 in terms of absolute value. The effect that most contributed to the elevation of Brazilian exports of Brazil nuts, between the periods 1 and 2, was the world market growth, responding for 733,98% of positive variation (Table 3).

Another effect that contributed to the growth of Brazil exports on the same period was the destination of exports (Tables 2 and 3). According to Learner and Stern (1970), when this effect is positive means that the country has concentrated its exports on growing markets. In Brazil's case, this positive effect was mainly promoted by four countries: South Africa, Belgium, Russia and Bolivia.

The agenda effect, by your turn, contributed negatively to the growth of Brazilian exports on the first period (Tables 2 and 3). The explanation to this can be found on Table 4, which shows that the growth rate of world exports of in shell nuts (-24%) was smaller than the growth rate of total world exports of nuts (59%). As Brazilian companies export more of the product with shell, on the first period (1998-2000), the effect was negative.

Table 2. Percentage contribution of each constant market share effect to the variation in Brazilian exports between first and second triennium (1998-2000/2004-2006) and between second and third periods (2004-2006/2010-2012)

Periods	P1-P2*	P2-P3*
Growth	733,98%	106,50%
Agenda of exports	-459,85%	-7,69%
Destination	99,16%	-1,09%
Competitiveness	-273,29%	-197,72%
Σ Effects	100%	-100%

Note. P1 = First period (1998-2000); P2 = second period (2004-2006); P3 = Third period (2010-2012).

Finally, the competitiveness effect was also negative for the Brazilian exportation of Brazil nuts between the first and second periods (Tables 3 and 4). This effect compares the growth of exports in the period to how they should have been if the country kept its quote on the market. Therefore, the negative competitiveness presented by Brazil between 1998-2000 and 2004-2006 indicates that the country did not kept its quote on market to some important countries. In this case, the downfall on exports of shelled nuts to US, Germany, United Kingdom and Spain pushed the value of this effect down.

Table 3. Contributions in dollars (\$) from each effect of constant market share for changes in value of brazil exports between periods 1998-2000 to 2004-2006 and 2004-2006 to 2010-2012

Periods	P1-P2	P2-P3
Change in exports	2.184.470,98	-11.604.553,72
Growth effect	16.033.550,39	12.358.924,01
Agenda of exports effect	-10.045.202,96	-892.615,84
Destination effect	2.166.137,41	-126.568,46
Competitiveness effect	-5.970.013,85	-22.944.293,43

In turn, the CMS model, when applied to the second and third periods, demonstrated a reduction of US\$ 11,604,553.72 on Brazilian exports of nuts with shell (Table 3). This reduction was caused by the effects: agenda, destination and competitiveness that negatively contributed with -7,69%, -1,09% and -197,72%, respectively (Table 2).

Although being negative, the agenda effect (US\$ -892,615.84) was smaller than it was on the first period, when reached US\$ -10,045,202.96 (Table 3). This happened because besides the world growth rates (42%) had not

been so superior to shelled nuts (33%), as occurred on first period (Table 4), the Brazilian companies exported, on average, more shelled nuts on the triennium of 2004-2006.

Table 4. Growth rates of Brazilian nuts exports in shell, shelled and total between periods 1998-2000 to 2004-2006 and 2004-2006 to 2010-2012

Periods Nut type	P1-P2			P2-P3		
	In shell	Shelled	Total	In shell	Shelled	Total
World	-24%	9%	5%	33%	43%	42%
Brazil	-23%	48%	8%	24%	81%	-39%

Already the destination effect, that had been positive relatively to the preview period, was negative between 2004-2006 and 2010-2012 (Tables 2 and 3). Although Brazilian companies has exported to high growth rates markets, as Hong Kong, Peru and Netherlands, the value of exports was not enough to compensate the decay on growth rates of imports on some of main buyers such as USA and Bolivia.

Between second and third triennia, Brazil's competitiveness was negative again, but this time in bigger measure than on the first and second periods (Tables 2 and 3). Thus, the loss of Brazil's participation on market of countries as Netherlands and China in the market of product with shell, and USA, Netherlands, Australia, New Zealand and Spain on shelled nuts exports permitted a negative competitiveness of US\$ -22,944,293.43.

It is important to highlight that even though the CMS model is assigned to different effects the variation of a country exports on a time period, and gives a value to competitiveness of the country in question, the model is not able to justify the reason of the raise or decline of competitiveness. So, by the formula that calculates the competitiveness effect, it is known that the difference on market share of a country that cannot be explained by none of the other effects is attributed to competitiveness, but what did this country to be more or less competitive in determined period?

Lerner and Stern (1970) explain that the gain or loss of competitiveness can be simultaneously attributed both to factors from the point of view of demand and supply. Thus, from the demand point of view the authors mention the inflation of the exportation prices, the difference of quality between products of different countries, marketing efficiency of each one and the capacity to realize sales when they are demanded. Already, from the supply point of view they quote the difference on inflation and on the exchange rate of each country, availability of factors of production and the elevation or reduction on productivity.

4. Conclusions

The Brazilian exports were negatively affected by the export agenda effect and competitiveness on the first interval and by agenda effect, destination and competitiveness on the second sub period.

In view of this, it was concluded that it may be advantageous for Brazilian companies and, therefore, for Brazil, to gain a share in the market for shelled Brazil nut, which has a higher rate of growth in the international market.

By being more competitive in exports of higher value-added products, the country could be exporting the shelled product at a higher price, gaining more space in the international market and bringing more income and development to its territory, especially for the extractive communities that depend of the chestnut for its sustenance.

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