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COMPETITIVENESS IN GLOBAL AGRI-FOOD TRADE: THE CASE OF PEANUTS

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Abstract

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Since the prominent work of Balassa, a vast amount of literature is dedicated to the analyses of revealed comparative advantages of global trade, while comparative advantages in the peanut industry are scarcely investigated. The aim of our paper is to analyse the revealed comparative advantages of global peanut trade as well as the duration and stability of Balassa indices by applying Markov transition probability matrices and Kaplan-Meier survival function. The source of data is global peanut exports at HS6 level for 1996–2015. Results suggest that India, China and Argentina are the biggest exporters of peanuts, dominated by the unroasted shelled type, in the world. The Balassa indices, however, were the highest for Senegal, Nicaragua and Argentina in the period analysed. Advantages, in general, seem to have weakened for a majority of the countries as evidence from mobility indices as well as from the stability tests.

Key words: revealed comparative advantage, peanut, trade, stability, duration

Introduction

Competitiveness is a central topic in modern economics with various definitions, interpretations and measurement methods. There are basically two levels at which competitiveness can be interpreted – micro and macro. At the micro-economic level, the understanding of competitiveness is pretty straightforward – it is "the ability of firms to consistently and profitably produce products that meet the requirements of an open market in terms of price [and] quality" (Domazet, 2012, pp. 294-295). In comparison, at the macro-economic level, competitiveness is much more purely defined. The most widely accepted definition nowadays is the one given by the World Economic Forum (WEF) (2015, p 4.), defining national competitiveness as 'set of institutions, policies and factors that determine the level of productivity of a country.

The development of the concept of competitiveness at the macro-level is inseparable from international trade theories, seeking to answer the question why nations trade with each other. One of the most influential answers to this question is the theory of comparative advantage, originating from the seminal work of Ricardo (1817). In the Ricardian model, production technology differences are the basis of comparative advantage and therefore production and trade is not driven by low cost, but by the most effective use of resources. Ricardo suggests, even if a country is more productive in absolute terms, it should just specialize in those products which it has a comparative advantage in (or in which they are relatively more productive). It follows that technological superiority (that is, high labor productivity) is not a guarantee for competitiveness – it just works together with comparative advantages.

Balassa (1965) was one of the early supporters of this theory, elaborating his famous index of revealed comparative advantages. Since his seminal work, a vast amount of literature is dedicated to the analyses of revealed comparative advantages of global trade. Despite the apparent importance of the topic, however, the majority of studies are focused on industrial products, while agri-food sectors are usually neglected in empirical works.

The article analyses revealed comparative advantages in global peanuts trade – this approach, at least to our knowl-

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edge, is currently missing from the literature. This paper, therefore, contributes to the existing literature in three ways. First, it applies the theory of revealed comparative advantages on a specific agricultural product group. Second, it analyses a product which is important from a development economic perspective as peanuts are mainly produced and exported by developing countries. Third, the article aims to identify the factors lying behind comparative advantages.

The article is structured as follows. Section 2 provides an overview of the empirical literature, followed by a demonstration of methodology and data used. Section 4 summarizes the descriptive statistics of global peanuts trade, identifying key players and products. Section 5 describes the comparative advantage patterns of the major exporters together with stability tests for analyzing the duration of their advantages. Section 6 discusses the possible factors behind different competitiveness potentials, while the last section concludes.

Literature review

As to research on the revealed comparative advantages in agri-food sectors, Ndayitwayeko et al. (2014) analyzed the comparative advantage of the Eastern and Central African (EAC) coffee sector and revealed that EAC countries, though to a diminishing extent, had comparative advantage in global coffee exports from 2000 to 2012, with Uganda and Kenya leading the group. Serin and Civan (2008) found that Turkish fruit juices and olive oils to be highly competitive in European markets. Qineti et al. (2009) analysed the competitiveness and comparative advantage of Slovak and EU agri-food trade in relation with Russia and Ukraine and concluded that comparative advantage had been lost for a number of product groups over time.

Török and Jámbor (2013) investigated the EU New Member States agri-food trade patterns and highlighted that almost all countries experienced a decrease in their comparative advantage after the EU accession, though it still remained at an acceptable level in most cases. Bojnec and Fertő (2014) analysed the competitiveness of agri-food exports of European countries, and found majority of countries and products to have an advantage globally. The most successful nations in this regard were the Netherlands, France and Spain.

Akmal et al. (2014) analysed the competitiveness of Pakistan's basmati rice exports and found that the country is losing its positions on world markets in one of its biggest export products, which situation is calling for a strategy change from the decision makers. Disdier al. (2015) analysed comparative advantages of agri-food products in the Asian and Pacific region and found that Australia and New Zealand had strong comparative advantages in fruit and vegetables, beverages and the dairy market. Jámbor and Babu (2016) analysed the comparative advantages and specialisation of agri-food sectors at the global level and found the Netherlands, Spain and Denmark to be the most competitive nations.

Regarding the comparative advantages of peanuts trade, Wu (2010) analysed Chinese export structure and competitiveness of peanut and peanut products and found high competitive potentials on world markets. In contrast, Zhang and Liu (2008) identified declining comparative advantages in Chinese peanut trade, though on a different timeframe. Global evidence on the competitiveness of peanut trade, at least to our knowledge, is missing from the current literature.

Methodology

The paper is based on the seminal work of Balassa (1965) in terms of scientific methods. Balassa's measurement of comparative trade advantage is calculated by different index numbers based on the concept of Ricardian trade theory. The original index of revealed comparative advantage defined as follows (Balassa 1965):

$$B_{ij} = RCA_{ij} = \left(\frac{X_{ij}}{X_{it}}\right) \Big/ \left(\frac{X_{nj}}{X_{nt}}\right), \quad (1)$$

where X means export, i indicates a given country, j is a given product, t is a group of products and n is a group of countries. It follows that a revealed comparative advantage (or disadvantage) index of exports can be calculated by comparing a given country's export share of its total exports with the export share in total exports of a reference group of countries. If the value of B index higher than 1, a given country has a comparative advantage compared to the reference countries or, in contrast, a revealed comparative disadvantage if B less than 1.

The Balassa-index is criticised because it usually neglects the different effects of agricultural policies and exhibits asymmetric values. Trade structure is distorted by different state interventions and trade limitations while the asymmetric value of the B index reveals that it extends from one to infinity if a country enjoys a comparative advantage, but in the case of comparative disadvantage, it varies between zero and one, which overestimates a sector's relative weight. However, there are many other specifications of the RCA index available – see Jámbor and Babu (2016) for more details.

The paper also checks the stability and duration of the RCA index in two steps. First, Markov transition probability matrices are calculated and then summarized by using the mobility index, evaluating the mobility across countries and time. Second, following Bojnec and Fertő (2008), a survival function S(t) can be estimated for by the using the non-parametric Kaplan–Meier product limit estimator, which pertains

to the product level distribution analysis of the RSCA index. Following Bojnec and Fertő (2008), a sample contains n independent observations denoted (t_i; c_i), where i = 1, 2, . . . , n, and t_i is the survival time, while ci is the censoring indicator variable C (taking on a value of 1 if a failure occurred, and 0 otherwise) of observation i. Moreover, it is assumed that there are m < n recorded times of failure. Then, we denote the rank-ordered survival times as t(1) < t(2) < … < t(m). Let nj indicate the number of subjects at risk of failing at t(j) and let d_j denote the number of observed failures. The Kaplan–Meier estimator of the survival function is then (with the convention that $\hat{S}(t) = 1$ if t < t(1)):

$$\hat{S}(t) = \prod_{t(i)<1} \frac{n_j - d_j}{n_j} \quad (2)$$

The paper employs global peanut trade data of World Bank (2016) World Integrated Trade Solution database at HS-6 level between 1996 and 2015 with the following product codes included: 120210, 120220, 150810, 150890 and 230500. The paper concentrates on the export side of the revealed comparative advantage index (B or RCA index) to exclude imports, which is more likely to be influenced by agricultural policy interventions.

Descriptive Statistics

Groundnut (popularly known as peanut) is one of the world's most important oilseed crops. China and India were the major producers of groundnut in 2014, according to FAO data, giving 27% and 11% of global peanut production, respectively. They were followed by Nigeria (6%), the United States (4%) and Sudan (3%) – the top five producers thereby gave more than 50% of global peanut production in 2014, suggesting a high level of concentration.

As to global peanut exports, India, China and Argentina were the biggest exporters in the period analysed, together giving 50% of all products exported – the top10 countries, however, showed 87% of concentration (Table 1). More specifically, between the periods of 1996-2000, 2001-2005, 2006-2010, and 2011-2015, India, China, Argentina, United States, Netherlands, Nicaragua, Brazil, Senegal, Belgium and France, represented 84.5%, 84.8%, 86.5%, and 89.6% of the world total exports of peanuts products, respectively.

Note that some countries like Belgium, Netherlands, and France, are not among the main producers of peanuts but due to technological advancements in those countries, they were able to transform the raw peanuts (imported from other main producers in Africa; Nigeria, Ghana, The Gambia, and Malawi) into other value added products, suggesting re-export patterns.

As to global peanut imports, Netherlands, which was the 5th major exporter of peanuts, is also the leading importer of the same crop (Table 2). It does not produce peanuts but it imports in excess and transform them into value added products to be re-exported again to earn foreign exchange. France and China, two of the major exporters of peanuts, are the 5th and 10th countries in global peanut imports. France, like Netherlands, does not produce peanuts but imports in excess and re-export in the form of value added products (Table 3).

Germany and the United Kingdom were also big importers or peanuts, suggesting high levels of peanut consumption. Note that concentrations of the 10 biggest peanut importers were 56%, 42%, 45% and 49% in the sub-periods analysed, respectively.

Regarding peanut export by product, it is obvious that the most traded/exported peanut products is the shelled un-

Table 1
Top 10 exporters of peanuts in the world, 1996-2015, by country (in 1000 US$)

Country	1996-2000	2001-2005	2006-2010	2011-2015	1996-2015
India	109 281	113 676	292 058	750 758	316 443
China	207 584	312 231	279 241	258 054	264 278
Argentina	236 599	118 127	243 917	373 779	243 105
United States	187 992	145 669	201 733	390 780	231 543
Netherlands	87 987	83 853	129 453	283 013	146 077
Nicaragua	20 430	40 439	76 864	138 850	69 146
Brazil	4433	22 045	65 625	171 159	65 815
Senegal	35 174	44 130	43 865	70 086	48 314
Belgium	9644	40 146	42 398	45 403	34 398
France	27 736	24 705	22729	19457	23 657
Concentration	85%	85%	87%	89%	87%

Note: Countries are listed in decreasing order based on their 1996-2015 averages
Source: Own calculations based on WITS (2016) data

Table 2
Top 10 importers of peanuts in the world, 1996-2015, by country (in 1000 US$)

Country	1996-2000	2001-2005	2006-2010	2011-2015	1996-2015
Netherlands	170 215	203 937	311 506	527 314	303 243
Germany	103 992	94 952	145 598	211 834	139 094
United Kingdom	107 499	93 666	113 238	146 309	115 178
Indonesia	74 309	42 235	123 831	218 582	114 739
France	130 738	92 170	99 938	99 300	105 537
Italy	75 292	75 746	107 509	142 420	100 242
Mexico	52 341	70 257	116 383	151 632	97 653
Canada	81 925	71 566	96 216	126 273	93 995
Russian Federation	27 731	35 718	99 196	147 562	77 552
China	14 097	10 121	51 630	187 191	65 760
Concentration	56%	42%	45%	49%	48%

Note: Countries are listed in decreasing order based on their 1996-2015 averages
Source: Own calculations based on WITS (2016) data

Table 3
Balassa indices for most important global peanut exporters, 1996-2015

	1996-2000	2001-2005	2006-2010	2011-2015	1996-2015
Argentina	30.49	16.99	21.06	20.67	22.30
Belgium	1.72	1.71	1.98	1.85	1.82
Brazil	0.70	1.06	2.03	4.32	2.03
China	3.01	2.34	1.17	0.61	1.78
France	0.71	0.69	0.74	0.66	0.70
India	11.35	13.67	11.26	5.22	10.38
Nicaragua	65.82	239.19	266.07	194.76	191.46
Netherlands	1.13	0.78	0.98	1.48	1.09
Senegal	554.21	775.66	420.44	334.10	521.10
United States	0.71	0.57	0.64	1.25	0.79

Source: Own calculations based on WITS (2016) data

roasted type, a very common form of peanuts in African, Asian and European markets, giving more than 75% of all peanuts in 2011-2015 (Figure 1). Shelled unroasted peanuts also prevail in global imports – 74% of all peanuts imported consisted of this type.

Comparative Advantages – Patterns and Stability

With calculation of Balassa indices, the specialisation of global peanut trade becomes apparent (Figure 2). First, it is clear that Nicaragua and Senegal had the highest comparative advantages in all periods analysed among the most important peanut exporters in the world, suggesting high potentials for competitiveness. Argentina and India also had relatively high comparative advantages in global peanut exports, while similar numbers for other countries analysed have varied significantly. Note that China, despite being one of the biggest global peanut exporters, has generally decreasing and low comparative advantages.

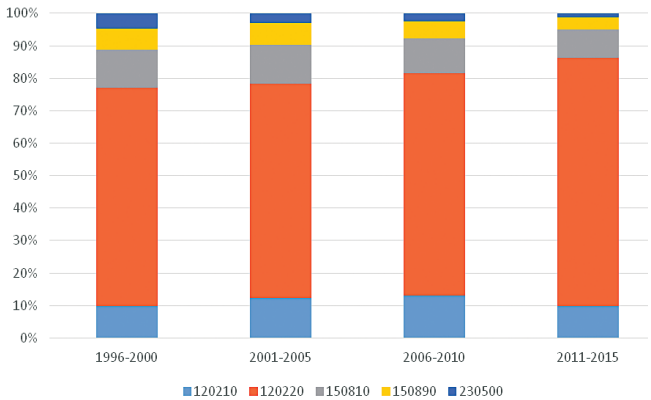

Fig. 1. Global peanut exports, 1996-2015, by product (in 1000 US$)

Note: 120210 -- Ground-nuts in shell, not roasted or otherwise; 120220 -- Shelled ground-nuts, not roasted or otherwise; 150810 -- Crude ground-nut oil; 150890 -- Ground-nut oil (excluding crude) and fractions; 230500 -- Oil-cake and other solid residues, of ground-nut
Source: Own calculations based on WITS (2016) data

The degree of mobility in the RCA indices is estimated by using the mobility index based on the Markov transition probability matrices (Figure 2).

Results show a relatively low mobility of the RCA index in global peanut trade for Nicaragua and Senegal and India, suggesting stable competitive potentials. More than 70% of product groups with a comparative advantage remained persistent for Belgium, France and Brazil, while lowest mobility measures pertained to China, the United States, Argentina and the Netherlands.

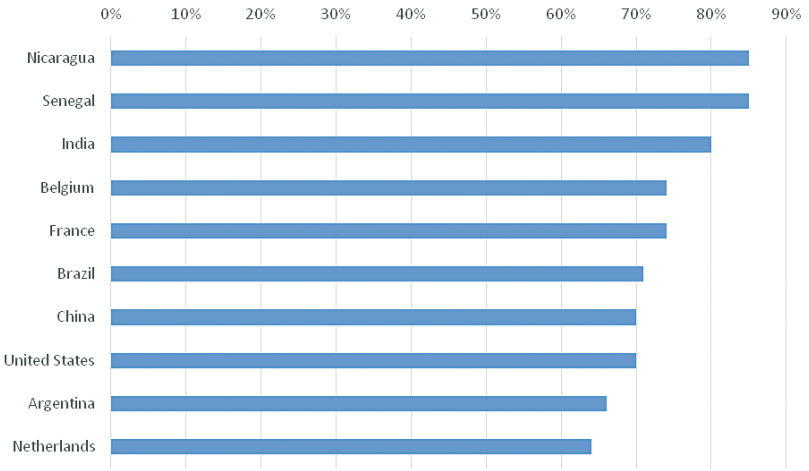

Fig. 2. The mobility of RCA indices, 1996-2015, by country, %

Source: Own calculations based on WITS (2016) data

Table 4

Kaplan-Meier survival rates for Balassa indices and tests for equality of survival functions in global peanut trade, by product, 1996-2015

Years	Survivor function	120210	120220	150810	150890	230500
1996	0.9816	0.9785	0.9848	0.984	0.9882	0.9731
1997	0.9651	0.9565	0.9743	0.9676	0.9701	0.9567
1998	0.9469	0.9339	0.9634	0.9509	0.9454	0.9398
1999	0.9222	0.8991	0.9464	0.9278	0.9202	0.9166
2000	0.8944	0.8693	0.9287	0.8921	0.9006	0.8807
2001	0.8631	0.8387	0.9039	0.8560	0.8667	0.8499
2002	0.8322	0.8072	0.8845	0.8190	0.8321	0.8179
2003	0.8069	0.7811	0.8505	0.8064	0.8107	0.7850
2004	0.7776	0.7472	0.8292	0.7795	0.7882	0.7440
2005	0.7467	0.7045	0.8142	0.7512	0.7643	0.7015
2006	0.7141	0.6600	0.7979	0.7061	0.7391	0.6720
2007	0.6763	0.6134	0.7802	0.6669	0.7031	0.6256
2008	0.6377	0.5725	0.7607	0.6335	0.6556	0.5769
2009	0.5925	0.5378	0.7281	0.5792	0.5950	0.5338
2010	0.5475	0.5095	0.6916	0.5213	0.5419	0.4870
2011	0.5023	0.4883	0.6363	0.4588	0.4843	0.4559
2012	0.4505	0.4257	0.5727	0.3899	0.4450	0.4319
2013	0.3769	0.3229	0.5154	0.3120	0.3836	0.3723
2014	0.2894	0.2209	0.4381	0.2340	0.2877	0.2979
2015	0.1654	0.0982	0.3067	0.0936	0.1726	0.2085
Log-rank test	0.0000					
Wilcoxon test	0.0000					

Source: Own calculations based on WITS (2016) data

Regarding the duration of revealed comparative advantages in global peanut exports, the non-parametric Kaplan–Meier product limit estimator was estimated. As described in the methodology section, equation 2 was run on our panel dataset and results confirm that in general the survival times are not persistent over the period analysed (Table 4). Survival chances of 98% at the beginning of the period fell to 17% by the end of the period, suggesting that fierce competition exists in global peanut trade. Results vary by product group, suggesting that the highest survival times exist for unroasted peanuts in shell, giving the vast majority of global peanut trade.

The equality of the survival functions across the top 10 countries can be checked using two non-parametric tests (Wilcoxon and log-rank tests). Results of the tests show that the hypothesis of equality across survivor functions can be rejected at the 1% level of significance, meaning that similarities in the duration of comparative advantage across most important global peanut exporters are absent (Table 4).

Conclusions

The paper analysed the competitiveness of peanuts in global trade, giving special attention to its duration and stability. The paper has reached a number of conclusions. First, by analysing characteristics of global peanut trade, it turned out that India, China and Argentina were the biggest exporters of peanut in the period analysed, together giving 50% of all products exported – the top10 countries, however, gave 87% of concentration. At the other side of the coin, Netherlands, Germany and the United Kingdom were the biggest importers, mainly with re-exporting purposes. Second, our analysis has made it clear that the most traded/exported peanut products is the shelled unroasted type globally, giving more than 75% of all peanuts in 2011-2015. Third, the calculation of Balassa indices showed that Nicaragua and Senegal had the highest comparative advantages in all periods analysed among the most important peanut exporters in the world. However, results show a relatively low mobility of the RCA index in global peanut trade for Nicaragua and Senegal and India, suggesting stable competitive potentials. Last but not least, according to survival tests, survival chances of 98% at the beginning of the period fell to 17% by the end of the period, suggesting that fierce competition exists in global peanut trade.

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