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The Export Competitiveness of Global Cocoa Traders

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Abstract

Export competitiveness is an important indicator in the analysis of international trade flow, however, in empirical studies on agriculture it is often neglected. In this article we aim to analyse export competitiveness of global cocoa producers and to test the stability of the Balassa index as well as to identify the determinants behind different country performances. On a product basis, we have not found any article analyzing the competitiveness of cocoa in international trade. Our paper draws global cocoa trade data from the period 1992 to 2015. Results suggest that global cocoa trade is highly concentrated with Cote d'Ivoire, Ghana and Indonesia obtaining the highest comparative advantages in 1992-2015. However, duration and stability tests indicate that trade advantages have weakened for the majority of the countries concerned.

Keywords

Export competitiveness, cocoa trade, determinants, development.

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Introduction

Competitiveness is one of the most used and abused word in economics, containing many kinds of different interpretations. One strand of the literature combines international trade theories with those of macro level competitiveness and argues that competitiveness of nations can be interpreted and measures via trade based indices. Balassa (1965) was one of the early supporters of this theory, elaborating his famous index of revealed comparative advantages. Since this 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 number of papers dealing with trade of agri-food products are relatively small compared to those dealing with industrial products. The main reason is probably that agricultural markets are usually assumed to be perfectly competitive. The article analyses export competitiveness in global coca trade – this approach, at least to our knowledge, is currently missing from the literature. This paper, therefore, contributes to the existing literature in three ways. First, it applies the theory of export competitiveness on an agricultural product group. Second, it analyses a product which is important from a development economic perspective as cocoa is mainly produced and exported by developing countries. Third, the article aims to identify the factors lying behind export competitiveness.

The article is structured as follows. Section 2 presents an overview of the empirical literature, followed by a demonstration of methodology and data used. Section 4 summarizes the descriptive statistics of global cocoa trade, identifying key players and products. Section 5 describes the export competitiveness patterns of the major exporters together with stability tests. Section 6 concludes.

Empirical evidence

There has been considerable research towards improving the understanding of competitiveness in economics. As the evolution of the concept suggests, it has different meanings in different places and times – mainly due to the lack of a universally accepted definition. At the micro-economic (firm) 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, p. 294-295). Competitiveness at the firm level is closely related to the long-run profit performance of the firm and higher return on investment for owners (Yap, 2004). Wijnands et al. (2008, p. 3), similarly

defines firm competitiveness as the "ability to produce products/services that people will purchase over those of competitors".

In comparison, at the macro-economic level, competitiveness is much more poorly defined. Probably the most widely accepted definition today is the one given by the World Economic Forum (WEF) (2015, p4.), defining national competitiveness as 'set of institutions, policies and factors that determine the level of productivity of a country'. It is interesting, however, that an earlier WEF report identified competitiveness as 'the ability of a country to achieve sustained high rates of growth in GDP per capita' (WEF, 1996). This old definition reflects the early thinking on competitiveness, though GDP per capita is used even today as an index measuring competitiveness in WEF's reports. On the whole, national competitiveness is the ability of a nation to create and maintain a conducive environment for its firms to prosper (Bhawsar and Chattopadhyay, 2015). Competitiveness is measured on the open market, against other nations. Further, we can also say that competitive nations are economically successful, and have rising incomes or living standards.

As stated in the introduction, the analysis of export competitiveness of agricultural and food products is limited in the international literature. In a regional context, 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. Akmal et al. (2014) analyzed the competitiveness of Pakistan's basmati rice exports and found that the country was losing its position to world markets in one of its biggest export products, calling for a change in its trade strategy. Astaneh et al. (2014) searched for comparative advantage in Iran's stone fruits market and found that the country had strengthened her competitive positions, though it lacked comparative advantage in the majority of the years analyzed.

Bojnec and Fertő (2015) analyzed 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. The article also predicted a more long lasting advantage for Western-European countries, compared to Eastern-European ones. Fertő (2008) analyzed the evolution of agri-food trade patterns in Central European Countries and found the trade specialization across the region to be mixed. For particular product groups, greater variation was observed, with stable (unstable) patterns for product groups with comparative disadvantage (advantage). Török and Jámbor (2013) also analyzed he agri-food trade patterns of New Member States, 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 for most cases.

McLean et al. (2014) investigated regional integration in the Caribbean and found many countries and products to have a comparative advantage and potential to prosper. Korinek and Melatos (2009) analyzed revealed comparative advantages of MERCOSUR countries and found margarine, vegetable oils and coffee as the most competitive products in 1988 to 2004. In particular, Brazil and Argentina are leaders in comparative advantage in beef, both in fresh and preserved form.

In North America, Málaga and Williams (2006) found a lack of comparative advantage in agricultural and food export in Mexico. At the product group level, however, results suggested vegetables and fruits to have competitive positions. However, this competitiveness was decreasing for vegetables and increasing for fruits with time. Sarker and Ratnasena (2014) analyzed the comparative advantages of Canadian wheat, beef and pork sectors between 1961 and 2011, and found only the wheat sector to be competitive.

In a product-based context, Van Rooyen et al. (2010) used relative trade advantage indices to assess the competitive performance of the South African wine industry. Anderson (2013) analysed the comparative advantage of the Georgian wine industry with the Comparative Advantage Index and found high potentials, mainly in the European and Asian markets. Lakkakula et al. (2015) investigated the global trade competitiveness of rice by applying a shift-share analytical framework on global rice export data from 1997 to 2008 and found geographical structure and performance effects playing a crucial role in global rice export competitiveness. Bojnec and Fertő (2014) searched for the export competitiveness of the European dairy products on global markets and found different potentials by region and by the level of processing, suggesting that export competitiveness of the higher level of processed milk products for final consumption can be significant for export dairy chain

competitiveness on global markets. However, we have not found any article analyzing the export competitiveness of global cocoa traders.

Materials and methods

As discussed in the theoretical framework, probably the most well-known index analyzing export competitiveness of nations is Revealed Comparative Advantage (RCA), calculating the proportion of a country's share of exports for a single commodity to the exports of all commodities and the similar share for a group of selected countries, expressed by Balassa (1965) as follows:

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

where, X means export, i indicates a given country, j is a given product, t is a group of products and n is the group of selected countries. Hence, a revealed comparative advantage (or disadvantage) index of exports can be calculated by comparing a given country's export share by its total exports, with the export share by total exports of a reference group of countries. If RCA > 1, a given country has a comparative advantage compared to the reference countries, or in contrast, a revealed comparative disadvantage if RCA < 1.

Vollrath (1991) suggested three different specifications of revealed comparative advantage in order to eliminate the disadvantages (coming from asymmetric values) of the Balassa index. The first is the relative trade advantage (RTA) index, calculated as follows:

$$\mathrm{RCA_{ij}} = \left(\frac{X_{ij}}{X_{it}}\right) \Big/ \left(\frac{X_{nj}}{X_{nt}}\right) \quad (2)$$

where, RCA means the original Balassa index cited above and RMA stands for the revealed import advantage index, calculated by using import instead of export values in equation 1. The second approach of Vollrath is to calculate the natural logarithm of the Balassa index:

$$\mathrm{lnRXA_{ij}} = \ln(\mathrm{RCA_{ij}}) \quad (3)$$

The third approach is to measure the differences in logarithms of RXA and RMA indices as follows:

$$\mathrm{RC_{ij}} = \ln(\mathrm{RCA_{ij}}) - \ln(\mathrm{RMA_{ij}}) \quad (4)$$

where, RC is the revealed competitiveness index. In order to treat the asymmetric value problem of the Balassa-index, Dalum et al. (1998) transformed B index as follows, thereby creating the Revealed Symmetric Comparative Advantage (SRCA) index:

$$SRCA_{ij} = \left(RCA_{ij} - 1\right) / \left(RCA_{ij} + 1\right) \quad (5)$$

The SRCA takes values between -1 and 1, with values between 0 and 1 indicating a comparative export advantage and values between −1 and 0 a comparative export disadvantage. Since the SRCA distribution is symmetric around zero, potential bias is avoided (Dalum et al, 1998).

Proudman and Redding (1998) propose a weighted version of the RCA index (WRCA) for an individual product by taking the arithmetic mean of a country's RCA scores:

$$WRCA_{ij} = \frac{RCA_{ij}}{\frac{1}{N}\sum_{j-1}^{N} RCA_{ij}} \quad (6)$$

where, N is the total number of products. For a product, if its RCA value is greater than the average RCA value across all products, we would say country j has a comparative advantages in product i.

Hoen and Oosterhaven (2006) suggest another transformation of the original index as follows:

$$NRCA_{ij} = \frac{X_{ij}}{E_i E_j X_{ij}} - \frac{\left(E_i X_{ij}\right)\left(E_j X_{ij}\right)}{\left(E_i E_j X_{ij}\right)^2} \quad (7)$$

where, ARCA is the additive revealed comparative advantage index. If ARCA > 1, the country has a comparative advantage in the product concerned, and if ARCA < 1 then it will have a comparative disadvantage.

Yu et al. (2010) adopted an alternative measure to assess the dynamics of comparative advantage. The Normalised Comparative Advantage (NRCA) index is defined as follows:

$$NRCA_{ij} = \frac{X_{ij}}{E_i E_j X_{ij}} - \frac{\left(E_i X_{ij}\right)\left(E_j X_{ij}\right)}{\left(E_i E_j X_{ij}\right)^2} \quad (8)$$

Where X_{ij} represents actual exports and $\left(E_i X_{ij}\right)\left(E_j X_{ij}\right)$ stands for the comparative-average-neutral level in exports of commodity j for country i. If NRCA > 0, a country's comparative advantage on the world market is. The distribution of NRCA values is symmetric, ranging from -1/4 to +1/4 with 0 being the comparative-advantage neutral-point.

Although there are many pros and cons of the above mentioned indices, the paper concentrates on the original RCA index as it excludes imports, which are more likely to be influenced by policy interventions. Moreover, the high correlation given amongst the various indices above for our sample as well as paper size and interpretation constraints are further reasons to choose the RCA index.

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), survival function S(t) can be estimated by using the non-parametric Kaplan–Meier product limit estimator, pertaining to the product level distribution analysis of the SRCA index. Following Bojnec and Fertő (2008), a sample contains n independent observations denoted (t_i; c_i), where $i = 1, 2, \ldots, n$, and ti is the survival time, while c_i is the censoring indicator variable C (taking on a value of 1 if failure occurred, and 0 otherwise) of observation i. It is assumed that there are m < n recorded times of failure. We denote the rank-ordered survival times as t(1) < t(2) < … < t(m). For the purpose of our analysis let n_j 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 ˆS(t) = 1 if t < t(1)) as follows:

$$\hat{S}(t) = \prod_{t(i)<t} \frac{n_j - d_j}{n_j} \qquad (9)$$

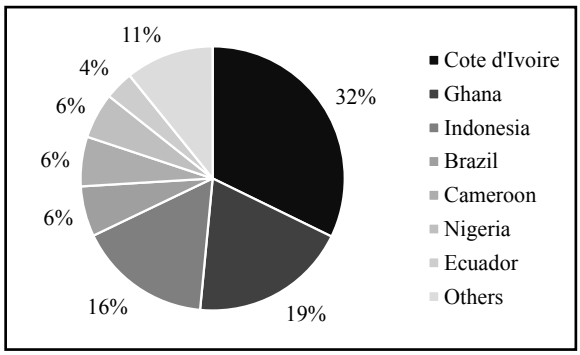
In order to calculate indices above, the article uses the World Bank WITS software based on COMTRADE, an international trade database developed by the United Nations at the HS six digit level as a source of raw data. The list of cocoa products can be found in the appendix. The chapter works with trade data for the period of 1992 to 2015.

However, we are aware that the methodology above has a number of limitations. First, trade data is not fully reliable due to various reasons. These include the following: trade values may not necessarily sum up to the total trade value for a given country dataset; countries may not necessarily report their trade values for each and every year; trade data may differ by the selection of classification; and imports reported by one country may not coincide with exports reported by its trading partner. Second, Balassa-based indices are sensitive to zero values (see equation 1, for instance). Third, outliers in results get omitted, dropping inconsistent indices and some useful data. However, based on the literature review and previous empirical works, our results well fit into past findings.

Results and discussion

The history of cocoa goes back to Mexico. Initially, cocoa was used by the Mayans as a local currency and in religious rituals, but they also prepared it as a drink. In the Age of Exploration, Spanish traders brought it to Europe and it was considered as a new medicine and an important caffeine source. The Spanish kept the secret for themselves and thereby created the biggest privilege in cocoa trading. When Europeans started to get to know and like it, its demand rised rapidly. To keep up with the increasing demand, European countries (Great-Britain, Germany and France) created their own plantations on their own lands, including their colonies too – this is where the history of African cocoa beans started (Coe and Coe, 2013).

As Figure 1 shows, global cocoa production is highly concentrated by country.



Source: own composition based on FAO database (2016)

Figure 1: Cocoa bean production, 2014, in percentage of total cocoa production.

The reason is quite simple - the area where cocoa can be grown is limited as cocoa tree requires high temperature, humidity and sunshine. In 2014 the biggest producer countries were Cote d'Ivoire, Ghana, Indonesia, Brazil, Cameroon, Nigeria and Ecuador – these countries gave almost 90% of global cocoa production. Despite the fact that cocoa comes from America, currently two-third of the production takes place in Africa.

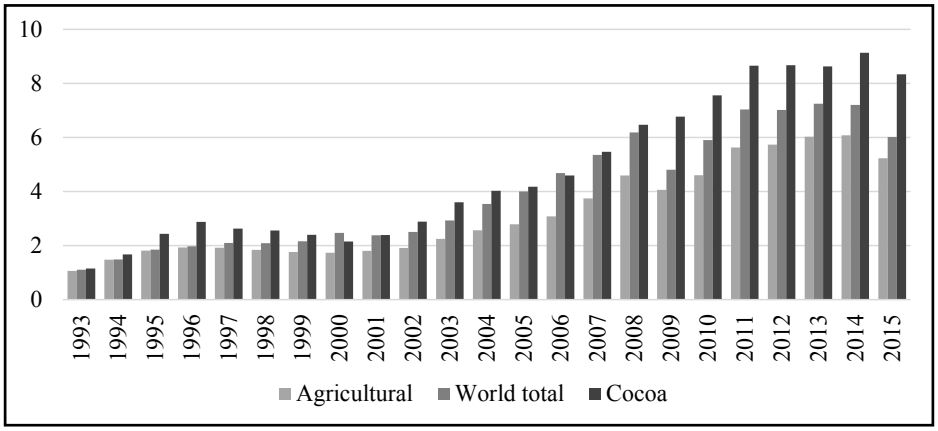
As Figure 1 suggests, producers are mainly developing countries, where farmers grow cocoa beans on small lands. However, volatile and low prices make the cocoa market unpredictable,

causing hard times for farmers. In order to help them and to keep cocoa production alive, a huge number of associations were founded globally. In 2013/14, Fair Trade organisations paid almost 11 million dollars premium for the producers, 37% of which was invested in the improvement of production and quality (Fairtrade, 2016).

In line with production changes, global cocoa export has been continuously increasing in the previous 20- 25 years (Figure 2). In this period, global cocoa export increased ten times in current prices - cocoa export in 1992 was 5 billion US dollars, while in 2014 this value increased to 46 billion dollars (although some decrease was observable in 2015). Meanwhile, total exports of the world increased by 6-7 times (from 2.5 trillion to $ 15 trillion dollars), while global agricultural exports increased 4-5 times (from 230 billion to 1,2 trillion dollars). Consequently, global cocoa export has increased to a greater extent than agricultural or total export growth from 1992 to 2015.

The analysis of global cocoa trade by country gives further insights to the trends above. Ten countries with diverse locations gave the majority of global cocoa trade in the period analysed with changing concentration patterns (Table 1). Basically, two kinds of countries can be differentiated here. On the one hand, some typical cocoa producer countries (Cote d'Ivoire, Ghana) are on the list, while on the other hand, some typical processors or re-exporters (Netherlands, Belgium, Germany) can also be seen. Note that producers are from the developing world and are mainly located in Africa, while processors and re-exporters are mainly located in Europe and North-America. Concentration of the TOP10 cocoa exporters has been quite stable over the period analysed – roughly two third of global cocoa export is given by these countries.

By combining biggest producers and exporters, the case of Cote d'Ivoire and Ghana should be highlighted. According to WITS data, cocoa



Source: Own composition based on World Bank WITS database (2016)

Figure 2: The evolution of global export of cocoa, agricultural and total products, 1993-2015 (1992=1).

1992-1997		1998-2003		2004-2009		2010-2015	
Netherlands	12%	Cote d'Ivoire	12%	Netherlands	12%	Germany	12%
Cote d'Ivoire	12%	Netherlands	11%	Germany	11%	Netherlands	11%
Germany	11%	Germany	9%	Cote d'Ivoire	10%	Cote d'Ivoire	9%
France	9%	Belgium	8%	Belgium	9%	Belgium	7%
Ghana	5%	France	7%	France	6%	France	5%
United Kingdom	5%	United Kingdom	4%	Ghana	4%	Nigeria	4%
Italy	4%	United States	4%	Italy	4%	Ghana	4%
United States	3%	Indonesia	3%	Indonesia	4%	United States	4%
Indonesia	2%	Ghana	3%	United States	3%	Italy	3%
Switzerland	2%	Canada	3%	Canada	3%	Poland	3%
TOP10	65%		65%		64%		63%

Source: own composition based on World Bank WITS database (2016)

Table 1: Top cocoa exporters in the world, 1992-2015, in percentage of total cocoa export.

export gave 30% and 14% of total export and 62% and 52% of agricultural export in the period analysed, respectively. This makes their economies highly dependent on agricultural exports – a typical case for many developing countries.

The product structure of global cocoa exports is also worth to be investigated (Table 2). In 2010-2015, the most traded cocoa export products were other cocoa-based food preparations, cocoa beans and cocoa butter, altogether giving 58% of global cocoa exports, suggesting a high level of concentration. The product structure of global cocoa exports has changed little over time. Concentration of these products are also high by country – for instance, Cote d'Ivoire, Ghana, Nigeria, Indonesia and Cameroon exported 75% of world's cocoa beans in 2011-2015. It is almost the same situation with cocoa butter or cocoa powder, coming from relatively few countries. The same situation is true for the processing: the largest processors – as the Cargill, ADM and Barry Collebaut, gave 41% of global cocoa processing in 2014. Moreover, 89% of the confectioner's market was comprised by 5 companies – Mars, Molendéz International, Nestlé, Hershey's and Ferrero (Potts et al., 2014).

Export competitiveness of global cocoa traders

The export competitiveness of global cocoa traders is analysed by the original Balassa index due to high correlations (not presented here) among different Balassa-based indices described in the methodology section. It is obvious that Cote d'Ivoire and Ghana had the highest Balassa indices in the period analysed, while three countries out of the ten biggest exporters had a comparative disadvantage in 2010-2015 (Table 3). Ghana experienced the biggest fall in the period analysed, while the majority of the countries show quite stable competitive patterns based on exports.

Products	1992-1997	1998-2003	2004-2009	2010-2015
Other food preparations, containing cocoa	24.5%	25.4%	27.0%	27.2%
Cocoa beans	18.7%	24.0%	21.6%	20.4%
Cocoa butter, fat and oil	14.0%	11.0%	12.7%	10.7%
Chocolate & other food preparations containing cocoa; more than 2kg	6.0%	8.9%	10.4%	9.5%
Chocolate and other food preparations containing cocoa; filled, 2kg or less	15.7%	9.5%	8.8%	8.9%
Chocolate and other food preparations containing cocoa; not filled, 2kg or less	11.2%	9.0%	7.8%	7.4%
Cocoa paste, not defatted	4.0%	5.2%	5.2%	6.8%
Cocoa; powder, (without sugar)	4.1%	5.3%	4.8%	6.4%
Cocoa paste, defatted	0.5%	0.4%	0.4%	1.0%
Cocoa shells and other cocoa wast	0.3%	0.5%	0.7%	0.9%
Cocoa; powder, (with sugar)	1.0%	0.8%	0.8%	0.7%

Source: own composition based on World Bank WITS database (2016)

Table 2: Export of cocoa products in the world, 1992-2015, in the percentage of the total cocoa export.

Country	1992-1997	1998-2003	2004-2009	2010-2015
Netherlands	6.57	5.96	5.36	5.17
Germany	1.70	1.27	1.40	1.96
Cote d'Ivoire	174.50	206.63	209.95	175.52
Belgium	n.a.	2.43	2.34	2.56
France	1.80	1.90	1.93	1.88
Ghana	110.12	165.03	90.71	42.20
United States	0.51	0.58	0.56	0.54
Italy	0.68	0.57	0.75	0.99
Indonesia	4.58	5.38	4.99	5.99
United Kingdom	1.32	1.39	1.42	0.86

Source: own composition based on World Bank WITS database (2016)

Table 3: Balassa indices by period, 1992-2015.

When analysing export competitiveness by product, further specialisation patterns become available (Table 4). It is apparent that cocoa shells, beans, paste and butter had the highest comparative advantages among product groups. Consequently, countries exporting these products had the highest comparative advantages, while concentrating on the export of other cocoa products have not proved to be beneficial. It is also evident here that indices for raw materials are much higher than for processed products, showing high potentials for developing countries in global cocoa exports.

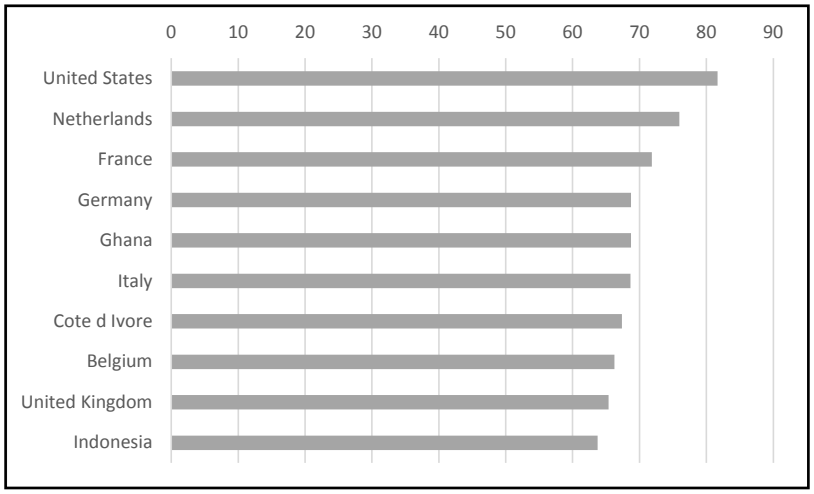
By combining exporters and products, it is also clear that producers like Cote d'Ivoire or Ghana had the biggest export competitiveness for raw cocoa materials. Conversely, distributor countries (Netherlands, Belgium or the UK) generally do not have as high (or do not have any) comparative advantage as producers, though their market positions are better.

The degree of mobility in Balassa indices is estimated by using the mobility index based on the Markov transition probability matrices (Figure 3). Results show a relatively low mobility of the Balassa index in global cocoa trade for the United States, the Netherlands and France, suggesting stable patterns of comparative (dis)advantages. Besides these countries, almost 70% of product groups with a comparative advantage remained persistent for Germany, Ghana and Italy, while lowest mobility measures pertained to Cote d'Ivoire, Belgium, United Kingdom and Indonesia, implying changing competitive potentials. In other words, these latter countries have experienced bigger changes in their cocoa export competitiveness than other countries listed.

Product	1992-1997	1998-2003	2004-2009	2010-2015
Cocoa beans	62.94	132.21	113.39	72.32
Cocoa shells	66.85	138.14	120.01	96.92
Cocoa paste, not defatted	15.96	56.82	53.56	42.11
Cocoa paste, defatted	11.47	40.31	22.13	7.70
Cocoa butter, fat or oil	13.43	23.77	18.47	16.92
Cocoa powder without sugar	3.75	8.54	10.14	7.70
Cocoa powder with sugar	1.57	3.17	1.44	5.08
Chocolate and other food containing cocoa, >2kgs	2.02	3.35	6.90	4.55
Chocolate and other food containing cocoa, filled, ≤2kgs	2.68	2.11	1.65	1.80
Chocolate and other food containing cocoa, not filled, ≤2kgs	1.24	1.48	1.70	2.28
Chocolate and other food containing cocoa, n.e.c.	1.75	1.90	1.94	2.27

Source: own composition based on World Bank WITS database (2016)

Table 4: Balassa indices for TOP10 cocoa exporters by product, 1992-2015.



Source: own composition based on World Bank WITS database (2016)

Figure 3: The mobility of Balassa indices, 1992-2015, by country, %.

Year	Survivor function	Belgium	Cote d Ivore	France	Germany	Ghana	Indonesia	Italy	Netherlands	United Kingdom	United States
1992	0.9909	1.0000	1.0000	1.0000	0.9924	1.0000	0.9659	1.0000	0.9886	1.0000	0.9621
1993	0.9811	1.0000	1.0000	1.0000	0.9846	1.0000	0.9392	1.0000	0.9808	0.9763	0.9317
1994	0.9653	1.0000	1.0000	0.9835	0.9724	1.0000	0.9159	0.9628	0.9727	0.9561	0.8932
1995	0.9469	1.0000	0.9827	0.9707	0.9597	1.0000	0.8881	0.9253	0.9643	0.9313	0.8545
1996	0.9258	1.0000	0.9648	0.9575	0.9467	0.9773	0.8599	0.8874	0.9555	0.9059	0.8157
1997	0.905	1.0000	0.951	0.9437	0.9285	0.9539	0.8352	0.8492	0.9464	0.8842	0.7767
1998	0.8831	1.0000	0.9366	0.9294	0.9098	0.9346	0.8099	0.8149	0.9320	0.8574	0.7335
1999	0.8585	0.9679	0.9165	0.9145	0.8855	0.9146	0.7969	0.7757	0.9221	0.8345	0.6904
2000	0.8351	0.9404	0.9009	0.8989	0.8553	0.8990	0.7833	0.7360	0.9168	0.8060	0.6551
2001	0.8103	0.9005	0.8845	0.8826	0.8242	0.8827	0.7643	0.6959	0.9113	0.7767	0.6273
2002	0.7840	0.8596	0.8615	0.8654	0.7921	0.8827	0.7494	0.6552	0.8935	0.7515	0.5865
2003	0.7533	0.8175	0.8314	0.8472	0.7588	0.8518	0.7232	0.614	0.881	0.7305	0.5455
2004	0.7162	0.7804	0.7999	0.828	0.7243	0.7808	0.6904	0.5721	0.8610	0.6918	0.5083
2005	0.6813	0.7352	0.7669	0.8074	0.6884	0.7486	0.6504	0.5296	0.8468	0.6632	0.4663
2006	0.6466	0.6884	0.7320	0.7854	0.6634	0.7146	0.6149	0.491	0.8314	0.6330	0.4197
2007	0.6107	0.6467	0.695	0.7616	0.6299	0.6929	0.5715	0.4514	0.8146	0.5947	0.3773
2008	0.5739	0.6026	0.6635	0.7357	0.6012	0.6535	0.5325	0.4155	0.7961	0.5541	0.3344
2009	0.5366	0.5635	0.6290	0.7070	0.5778	0.6026	0.491	0.3723	0.7857	0.5109	0.2997
2010	0.4968	0.5208	0.5909	0.6749	0.5516	0.5570	0.4538	0.3272	0.7738	0.4645	0.2588
2011	0.4525	0.4734	0.5479	0.6258	0.5315	0.5063	0.4126	0.2855	0.7598	0.4054	0.2165
2012	0.3990	0.4196	0.4981	0.5831	0.4953	0.4258	0.3657	0.2401	0.7252	0.3409	0.1722
2013	0.3386	0.3561	0.4226	0.5124	0.4652	0.3484	0.3103	0.1892	0.7032	0.2686	0.1304
2014	0.2709	0.2751	0.3266	0.4426	0.4230	0.3484	0.2398	0.1204	0.6713	0.1953	0.0771
2015	0.1798	0.1501	0.2375	0.3219	0.3461	0.3484	0.2398	0.0438	0.4882	0.1065	0.014

Source: own composition based on World Bank WITS database (2016)

Table 5: Kaplan-Meier survival rates for Balassa indices and tests for equality of survival functions in global cocoa trade, by most exported product, 1991–2015.

Regarding the duration of revealed comparative advantages in global cocoa exports, the non-parametric Kaplan–Meier product limit estimator was estimated. As described in the methodology section, equation 9 was run on our panel dataset and results confirm that in general the survival times are not persistent over the period analysed (Table 5). Survival chances of 99% at the beginning of the period fell to 1-49% by the end of the period, suggesting that a generally fierce competition exists in global cocoa trade. Results vary by country, though the highest survival times exist for the Netherlands and the lowest for the United States (processors of cocoa products). 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 cocoa exporters are absent (Table 5). On the whole, results suggest cocoa processing countries have had higher probabilities of retaining their original competitive positions than cocoa producers.

Conclusion

The article analysed the competitiveness of global cocoa traders between 1992 and 2015 and reached a number of conclusions. First, our results indicate that global cocoa trade has been continuously increasing in the previous 25 years with a high concentration on both the export and import sides by country and by product. Germany, the Netherlands and Cote d'Ivoire were the biggest cocoa exporters in the world in 2010-2015, while the United States, Germany and the Netherlands were leading the line in global cocoa imports. Most traded products were other cocoa based food preparations, cocoa beans and cocoa butter, altogether giving 58% of global cocoa trade in 2010-2015, suggesting a high level of concentration (TOP10 products gave 93% in the same period).

Second, our results also suggest that the Netherlands, Germany and Cote d'Ivoire had the highest comparative advantages in the period analysed, while at the product level, cocoa beans and cocoa shells led the line. It seems evident that countries concentrated on the export of these products were the most competitive in global cocoa markets.

Third, duration and stability tests indicated that trade advantages had weakened for the majority of the countries concerned. Research in the future might check other products and variables to extend these results and make them more valid.

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References

[1] Akmal, N., Akhtar, W., Shah, H., Niazi, M. A. and Saleem, T. (2014) „The Structure and Competitiveness of Pakistan's Basmati Rice Exports", *Asian Journal of Agriculture and Rural Development*, Vol. 14, No. 4, pp. 304–312. ISSN 1656-4383.

[2] Anderson, K. (2013) „Is Georgia the Next "New" Wine-Exporting Country? ", *Journal of Wine Economics*, Vol. 8, No. 1, pp. 1–28. ISSN 1931-4361. DOI 10.1017/jwe.2013.7.

[3] Astaneh, H.K ., Yaghoubi, M. and Kalateharabi, V. (2014) "Determining Revealed Comparative Advantage and Target Markets for Iran's Stone Fruits", *Journal of Agriculture, Science and Technology*, Vol. 16, No. 2, pp. 253–264. ISSN 1680-7073.

[4] Balassa, B. (1965) „Trade Liberalization and Revealed Comparative Advantage", *The Manchester School*, Vol. 33, No. 2, pp. 99-123. ISSN 1467-9957. DOI 10.1111/j.1467-9957.1965.tb00050.x.

[5] Bhawsar, P. and Chattopadhyay, U. (2015) „Competitiveness: Review, Reflections and Directions". *Global Business Review*, Vol. 16, No. 4, pp. 665-679. ISSN 0972-1509. DOI 10.1177/0972150915581115.

[6] Bojnec, Š., and Fertő, I. (2008) „European Enlargement and Agro-Food Trade", *Canadian Journal of Agricultural Economics*, Vol. 56, No. 4, pp. 563-579. ISSN 1744-7976. DOI 10.1111/j.1744-7976.2008.00148.x.

[7] Bojnec, Š., and Fertő, I. (2014) „Export competitiveness of dairy products on global markets: The case of the European Union countries", J*ournal of Dairy Science*, Vol. 97, No. 10, pp. 6151-6163. ISSN 0022-0302. DOI 10.3168/jds.2013-7711.

[8] Bojnec, Š., and Fertő, I. (2015) „Agri-Food Export Competitiveness in European Union Countries", *Journal of Common Market Studies*, Vol. 53, No. 3, pp. 476–492. ISSN 1468-5965. DOI 10.1111/jcms.12215.

[9] Coe, S. D. and Coe, M D. (2013) „*The True History of Chocolate*", Thames & Hudson; 3rd edition, pp. 280. ISBN 978-0500290682.

[10] Dalum, B., Laursen, K. and Villumsen, G. (1998) „Structural change in OECD export specialisation patterns: De-specialisation and 'stickiness", *International Review of Applied Economics*, Vol. 12, No. 3, pp. 423–443. ISSN 0269-2171. DOI 10.1080/02692179800000017.

[11] Domazet, T. (2012): „Regional cooperation striving for competitiveness and finance", *Ekonomika preduzeća*, Vol. 60, No. (5-6), pp. 290-300.

[12] Fairtrade (2016) „*Scope and Benefits of Fairtrade*". 7th edition, Fairtrade International.

[13] Fertő, I. (2008) „The evolution of agri-food trade patterns in Central European countries", *Post-Communist Economies*, Vol. 20, No. 1, pp. 1-10. ISSN 1463-1377. DOI 10.1080/14631370701865680.

[14] Hoen, A. R. and Oosterhaven, J. (2006) „On the Measurement of Comparative Advantage", *The Annals of Regional Science*, Vol. 40, No. 3, pp. 677-691. ISSN 0570-1864. DOI 10.1007/s00168-006-0076-4.

[15] Jámbor, A. and Babu, S. (2016) „*The Competitiveness of Global Agriculture: Policy Lessons for Food Security*", Springer, pp. 199. ISBN 978-3-319-44876-3.

[16] Korinek, J. and Melatos, M. (2009) „Trade Impacts of Selected Regional Trade Agreements in Agriculture", OECD Trade Policy Working Papers, No. 87, OECD publishing.

[17] Lakkakula, P., Dixon, B. L., Thomsen, M. R., Wailes, E. J. and Danforth, D. M. (2015) „Global rice trade competitiveness: a shift-share analysis", *Agricultural Economics*, Vol. 46, No. 5, pp. 667-676. ISSN 1574-0862. DOI 10.1111/agec.12162.

[18] Málaga, J.E. and Williams, G.W. (2006) „Mexican agricultural and food export competitiveness". TAMRC International Market Research Report No. IM-01-06.

[19] McLean, S., Pantin, M. and Skerrette, N. (2014) „Regional integration in the Caribbean. The role of trade agreements and structural transformation". ECLAC Studies and Perspectives Series No. 37.

[20] Ndayitwayeko, W. M., Odhiambo, M. O., Korir, M., Nyangweso, P. M. and Chepng'Eno, W. (2014) „Comparative Advantage of the Eastern and Central Africa in the Coffee Export Sector: the Case of Burundi". *African Crop Science Journal*, Vol. 22, No. 4, pp. 987-995. ISSN 1021-9731.

[21] Potts, J., Lynch, M., Wilkings, A., Huppé, G., Cunningham, M. and Voora, V. (2014) „The State of Sustainability Initiatives Review 2014 - Standards and the Green Economy". IISD, pp. 354.

[22] Sarker, R. and Ratnasena, S. (2014) „Revealed Comparative Advantage and Half-a-Century Competitiveness of Canadian Agriculture: A Case Study of Wheat, Beef, and Pork Sectors", *Canadian Journal of Agricultural Economics*, Vol. 62, No. 4, pp. 519-554. ISSN 1744-7976. DOI 10.1111/cjag.12057.

[23] Török, Á. and Jámbor, A. (2013) „Agri-Food Trade of the New Member States since EU Accession", *Agricultural Economics (Czech)*, Vol 59, No. 3. pp. 101–112. ISSN 0139-570X.

[24] Van Rooyen, J., Stroebel, L. and Esterhuizen, D. (2010) „Analysing Competitiveness Performance in the Wine Industry: The South African case". *AARES conference*, Adelaide, Australia, 7-9 February 2010, [Online] Available: https://www.adelaide.edu.au/wine-econ/events/2030workshop/pubs/van_WC0210.pdf [Accessed: 10 April, 2017].

[25] Vollrath, T. L. (1991) „A Theoretical Evaluation of Alternative Trade Intensity Measures of Revealed Comparative Advantage", *Weltwirtschaftliches Archiv*, Vol. 127, No. 2, pp. 265–280. ISSN 1610-2878. DOI 10.1007/BF02707986.

[26] Wijnands, J. H. M., Bremmers, H. J., Van Der Meulen, B. M. J. and Poppe, K. J. (2008) „An economic and legal assessment of the EU food industry's competitiveness", *Agribusiness*, Vol. 24, No. 4, pp. 417-439. ISSN 1520-6297. DOI 10.1002/agr.20167.

[27] World Economic Forum (1996) „*The Global Competitiveness Report 1995-1996*". Geneva, Switzerland.

[28] World Economic Forum (2015) „*The Global Competitiveness Report 2014-2015*". Geneva, Switzerland.

[29] Yap, J. T. (2004) „A Note on the Competitiveness Debate", Philippine Institute for Development Studies, Discussion Paper Series No. 2004-39.

Appendix

Product code	Description
180100	Cocoa beans, whole or broken, raw or roasted
180200	Cocoa shells, husks, skins and other cocoa wast
180310	Cocoa paste, not defatted
180320	Cocoa paste, wholly or partly defatted
180400	Cocoa butter, fat and oil
180500	Cocoa; powder, not containing added sugar or other sweetening matter (without sugar)
180610	Cocoa; powder, containing added sugar or other sweetening matter (with sugar)
180620	Chocolate & other food preparations containing cocoa; in blocks, slabs or bars weighing more than 2 kg or in liquid, paste, powder, granular or other bulk form in containers or immediate packings, content exceeding 2 kg
180631	Chocolate and other food preparations containing cocoa; in blocks, slabs or bars, filled, weighing 2 kg or less
180632	Chocolate and other food preparations containing cocoa; in blocks, slabs or bars, (not filled), weighing 2 kg or less
180690	Chocolate and other food preparations containing cocoa; n.e.c. in chapter 18 (other …)

Source: own composition based on World Bank WITS database (2016)

Appendix 1: Cocoa product codes and associated descriptions at the HS6 level.