The agricultural competitiveness of the CIS countries in international trade

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Abstract:

The competitiveness of agriculture in international trade is a relatively understudied field in the literature, especially in Central Asia. The aim of the paper is to analyse the comparative advantage patterns in the agriculture of the Commonwealth of Independent States. Results suggest that agriculture still plays an important role in the region and the majority of countries are net food importers. Moldova, Kyrgyzstan and Armenia had the highest Balassa indices with cereals as leading export products and Belarus, Ukraine and Azerbaijan are also having some comparative advantage at the same time. Based on trade performances, several country groups were set up. Armenia, Kyrgyzstan and Moldova showed similar characteristics, while Russia with Kazakhstan as well as Belarus with Ukraine demonstrated similarity. Comparative advantages, however, have not turned out to be persistent according to stability and duration tests as survival chances fell significantly from 2000-2003 to 2012-2015.

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Introduction

After the collapse of the Soviet Union, Commonwealth of Independent States (CIS) countries have undergone transition from a centrally planned to a market economy. In this context, agricultural production and trade have been one of the most important areas affected by policy change (Lerman et al, 2004; Csaki & Forgacs, 2008). As agriculture is still an important sector from many aspects in these countries, the in-depth analysis of the sector is justified by itself. However, there is a lack of comprehensive analysis of CIS countries agriculture (Kozar et al, 2016).

Before the analysed period, fundamental changes have taken place and the former Soviet countries have faced with severe distortions caused by transition or privatisation (Buchenrieder et al., 2009). From 2000, economic growth has accelerated, mostly driven by the energy sector, therefore agriculture became less and less important in the Central Asian countries (Mogilevskii & Akramov, 2014). According to Ahrend (2004), it is particularly true for Russia where revealed comparative advantage was limited to some raw materials and energy based products. However, this sector still plays an important role in the CIS countries compared to the developed world. It is worth mentioning that Russia and Ukraine has been able to restructure their trade flows to new markets by 2001, while other CIS countries mainly traded amongst themselves (Freinkman et al., 2004). It is important to distinguish between CIS and non-CIS countries as the ideal skills are different in the former one: importance of personal relationships, Russian fluency or lack of need to meet international standards (Gorton & White, 2009).

A number of research using different types of competitiveness indices can be found on country level. One of the OECD's book analysed agricultural comparative advantage on country level (OECD, 2011). Among the CIS countries Armenia, Azerbaijan, Kazakhstan, Kyrgyzistan, Moldova, Tajikistan, Turkmenistan, Ukraine and Uzbekistan had agricultural comparative advantage in 1997, although this list was shortened to Armenia, Azerbaijan, Kyrgyzistan, Moldova and Ukraine in case of processed products. On the same lists in 2007, Armenia, Belarus, Kyrgyzistan, Moldova, Tajikistan, Ukraine, Uzbekistan (agriculture) and Armenia, Belarus, Kyrgyzistan, Moldova, Ukraine (processed products) can be found. Cimpoies (2013) used Balassa index and relative trade advantage for Moldova for the period of 2007-2011 and found 10 positive values out of the 24 agri-food products. The results indicated that Moldova has some advantage in diary, vegetable, tobacco and beverages production. On the other hand, competitiveness decreased dramatically for sugar or oil seeds due to old technologies, low quality and efficiency. Karasova (2016) calculated cluster comparative advantage for different Ukrainian products and cereals and oilseed (mainly sunflower) turned to be highly competitive. Qineti at al. (2009) analysed the Slovak and EU-27 agri-food trade with Russia and Ukraine. Based on Balassa indices they have not found comparative advantages over Russia and Ukraine, the median value of B index is lower than 1 and showed decreasing trend. Ishchukova and Smutka (2013) have received high and stable Balassa values for Russia in cereals (around 4), oilseeds (almost 3) and tobacco (around 2) sector. It is worth mentioning that regional values showed huge differences, far lower RCA values for the same product in EU than in CIS relation. One of its reason is geographical location. In terms of primary and processed products, the former ones resulted slightly higher values (e.g. 1.2 compared to 0.9 in 2010). However, it should be kept in mind that competitiveness issues are hindered by low competitiveness of CIS agricultural producers and low level of national support not only in the CIS countries but also in Russia (Erokhin et al., 2014).

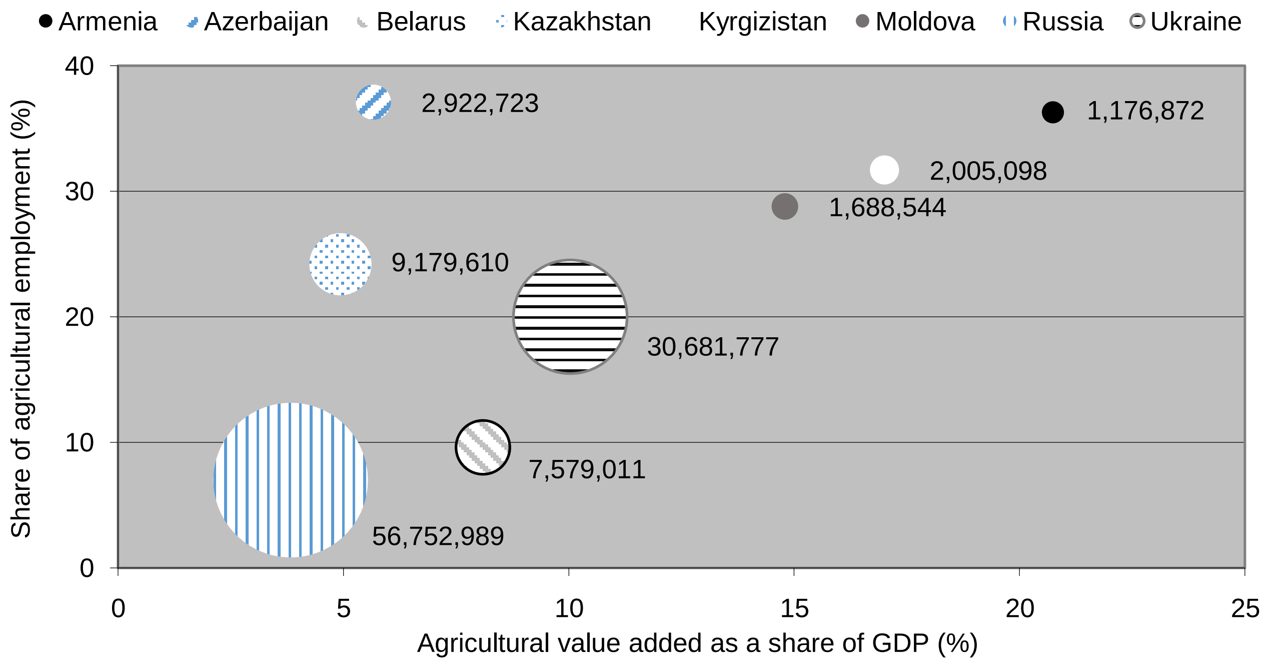
Wijnands et al. (2015) carried out a comprehensive study on the competitiveness of CIS and EU agrifood chain and found low competitiveness in almost all food sectors by using EU's major food producers as a benchmark. Based on relative net trade advantage, the analysed CIS countries showed high values for raw materials, especially for pork and poultry (Russia, Kazakhstan), cereals and oilseeds (Ukraine), potatoes (Ukraine and Belarus) and tomatoes (Belarus). As a matter of processed products, again Ukraine performed the best (strong values for cereals, oilseeds and above average values for pork and potatoes sector) followed by Belarus (above average values for pork, potatoes and tomatoes). The overall conclusion of the study is that the major factor behind the competitiveness of CIS agrifood sector is low prices due to cheap resource endowments.

The paper focuses on the competitiveness of the CIS countries in international trade in 2000-2015. Armenia, Azerbaijan, Belarus, Kazakhstan, Kyrgizistan, Moldova, Russia and Ukraine are included in the sample, while Uzbekistan, Tajikistan and Turkmenistan are excluded due to lack of appropriate data. The paper is structured as follows. First, the main characteristics of the CIS agriculture and trade are highlighted, followed by the demonstration of methods and data used. The third part of the paper analyse the comparative advantages of CIS agricultural trade together with their stability and duration. The final part concludes.

1. CIS agriculture and trade

In order to measure the relevance of agriculture, three indicators were used: value added as a share of GDP (%), share of agricultural employment (%) and the size of agricultural production (million international dollar[1]). The following comparative diagram summarises these indicators (Figure 1).[2]

Figure 1: Basic indicators of agriculture in the CIS, 2013



Source: Authors' composition based on World Bank (2016) WDI database and FAO (2016) database

It is evident from Figure 1 that agriculture plays more important role in the CIS region than in the developed world. This is especially true for Armenia where the important role of the agricultural sector is reflected in the high share of agricultural value added in GDP as well as the high share of employment. At the other end, agriculture of Russia represents only 3.8% of GDP and 7.0% of employment. The case of Azerbaijan should

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[1] International dollar is a theoretical currency used by FAO, World Bank, IMF or UN. It combines exchange rate, purchasing power parity and international average prices of commodities. It shows the purchasing power that the US dollar had in the United States at the given year. Therefore it is better for comparisons, but can not be directly converted to other currencies simply using exchange rates.

[2] The size of the circles reflect to the size of agricultural production measured in international dollar. The exact values are also represented on the diagram. The middle of the circle shows x (agricultural value added as a share of GDP) and y (share of agricultural employment) values.

also be highlighted here - agriculture is the second largest employer after services (37.1% and 48.5% respectively), though it only contributes to the national GDP by 5.7%, implying serious efficiency problems.

Regarding the size of agricultural production, Figure 1 suggests that Russia and Ukraine have the largest production potentials, followed by Kazakhstan and Belarus. The sum of the remaining four countries' production is more or less equal to the Belarussian production.

The role of agriculture can also be measured by its share in total exports. It is evident from Table 1 that agriculture gives the most significant share in total exports in Moldova (44% in 2012-2015), followed by Ukraine (32%) and Armenia (26%). In other words, almost half, third and quarter of every foreign exchange earned via export was coming from agriculture in these countries, respectively. At the other side of the coin, agricultural export gave less than 7% of total exports in 2012-2015 in Russia, Kazakhstan and Azerbaijan.

Table 1: Share of agricultural export in total merchandise export, 2000-2015

Country	2000-2003	2004-2007	2008-2011	2012-2015
Armenia	14.10%	14.20%	18.13%	25.61%
Azerbaijan	4.83%	3.90%	2.20%	3.44%
Belarus	11.25%	10.18%	11.42%	15.26%
Kazakhstan	7.08%	4.10%	3.53%	3.99%
Kyrgyzstan	10.87%	17.45%	12.21%	12.55%
Moldova	63.84%	50.02%	43.95%	44.26%
Russia	7.61%	6.15%	5.71%	6.52%
Ukraine	12.89%	13.26%	20.47%	31.81%

Source: Authors' composition based on WTO (2016) database

As to CIS agricultural export, a continuous growth can be seen in every country, though to a different extent (Table 2). On the one hand, countries like Azerbaijan or Ukraine increased their agricultural export more than seven times from 2000-2003 to 2012-2015, while on the other hand, respective growth in Moldova was 'only' 2,5 times. However, it should be clearly seen that the magnitude of the Russian and Ukrainian agricultural export is not comparable to any country in the region.

Table 2: Agricultural export of the CIS, 2000-2015, million USD at current prices

Country	2000-2003	2004-2007	2008-2011	2012-2015
Armenia	63	138	185	378
Azerbaijan	107	368	608	841
Belarus	925	1842	3342	5419
Kazakhstan	709	1373	2216	2823
Kyrgyzstan	57	153	222	236
Moldova	395	550	723	983
Russia	8572	16717	23845	30131
Ukraine	2340	5151	11302	17255

Source: Authors' composition based on WTO (2016) database

Analysing agricultural trade balances gives further insights to the patterns described above (Table 3). First, it can be seen that the CIS region has traditionally been a net importer of agricultural goods, although due to the notable expansion of Ukrainian exports, the region as a whole achieved a surplus in 2014 and 2015 (1.1 and 9.4 billion USD, respectively). Second, in the period analysed, agricultural trade deficit of the CIS countries has increased with four exceptions: Kazakhstan and Kyrgyzstan turned to be net importers from net exporters, while Belarus became a net exporter. Third, Moldova was able to keep its net exporter position with no significant changes over the examined period. Last but not least, it was just Ukraine, Belarus and Moldova having an agricultural trade surplus in 2012-2015.

Table 3: Agricultural trade balance of the CIS, 2000-2015, million USD at current prices

Country	2000-2003	2004-2007	2008-2011	2012-2015
Armenia	-152	-239	-551	-442
Azerbaijan	-163	-254	-670	-772
Belarus	-294	-249	75	825
Kazakhstan	106	-324	-882	-1366
Kyrgyzstan	9	-97	-394	-588
Moldova	225	175	76	228
Russia	-1135	-2822	-11927	-8744
Ukraine	796	1781	4942	10515
Total	-607	-2031	-9332	-345

Source: Authors' composition based on WTO (2016) database

As to agricultural export by product, cereals were definitely the most important agricultural commodity of the region, giving one third of its exports (Table 4). Cereals were followed by animal or vegetable fats and oils, dairy products, fish and oil seeds in the period analysed. These top 5 product groups gave almost two third of the value of agricultural exports of the region in 2012-2015, suggesting high and increasing concentration.

Table 4: TOP 5 agricultural product groups in CIS exports, 2000-2015

Product group	2000-2003	2004-2007	2008-2011	2012-2015
Cereals	26.50%	26.85%	29.46%	31.80%
Animal or vegetable fats and oils	7.74%	8.46%	13.71%	14.62%
Dairy products	8.46%	10.19%	8.29%	6.90%
Fish	7.48%	4.11%	6.80%	6.84%
Oil seeds	5.47%	3.25%	5.78%	5.81%
Total	55.66%	55.07%	64.04%	65.96%

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

2. 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):

$$B_{ij}=RCA_{ij}=\left(\frac{X_{ij}}{X_{it}}\right)\bigg/\left(\frac{X_{nj}}{X_{nt}}\right) \qquad (1)$$

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.

Moreover, the paper uses VARHCA hierarchical agglomerative clustering approach. In order to get the ranking of the countries' performance in the trade of the related agricultural and food products, the paper applied the method of variable clustering around latent variables (Vigneau & Qannari, 2003). For the calculations the software Tanagra (v1.4.50) was used. This method arranges attributes into homogenous clusters using hierarchical clustering by computing similarities with the correlation coefficient and associates each cluster of attributes with a synthetic component. These components can be interpreted easier with respect to the objects than the original data. Using Principal Components would lead to a different solution as rotated principal components can refer to different and overlapping groups of variables (Vigneau & Qannari, 2003). VARHCA utilises an iterative process in which attributes can change groups at the different stages of the algorithm. The method starts with an initial hierarchical clustering of the attributes. At the second stage each group is represented by the first component from the Principal Component Analysis. In the final step, new clusters are formed according to their latent component, each attribute would belong to that group which has the highest correlated component with the attribute.

Furthermore, the sum of ranking differences (SRD) method, developed by Héberger and its validation has been solved by Héberger and Kollár-Hunek (Héberger 2010; Héberger and Kollár-Hunek, 2011), has been applied to rank countries based on the Balassa indices of the 24 agri-food products. SRD measures the distance between two rankings by computing the sum of absolute values of rank differences (SRDs). In case of same rankings the SRD will be 0. The method requires to provide a golden standard ranking as a basis for comparison which was Russia in our case. The smaller the SRD value is the closer the ranking is to the golden standard. The validation of SRD methodology is performed using 3,000,000 simulated random numbers and permutation tests (compare ranks with random numbers, CRRN). In the case of higher number of indices (n > 8), the normal distribution, as a good approximation, can be used for estimating the theoretical SRD distribution function (Héberger and Kollár-Hunek, 2011).

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 ˆS(t) = 1 if t < t(1)):

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

The paper employs CIS agricultural trade data of the World Bank (2016) World Integrated Trade Solution (WITS) database at HS-6 level between 2000 and 2015 on agricultural products (chapters 1-24, see Appendix for the name of the product categories). 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.

3. Comparative advantages of CIS agriculture

The competitiveness of CIS agriculture in international trade can be measured by calculating the Balassa indices described above (Table 5). Moldova, Kyrgyzstan and Armenia had the highest Balassa indices in the majority of the years analysed for agricultural trade with Belarus, Ukraine and Azerbaijan having some comparative advantage at the same time. However, Russia and Kazakhstan had a revealed comparative disadvantage in all periods except for 2000-2003. Note that competitiveness has been diminishing from 2000-2003 to 2012-2015 in the vast majority of the cases and especially in Moldova and Azerbaijan. These results are generally in line previous findings as described in the introduction section.

Table 5: Balassa indices for CIS countries agricultural export, by country, 2000-2015

Country	2000-2003	2004-2007	2008-2011	2012-2015
Armenia	8.80	4.96	7.47	9.15
Azerbaijan	11.59	6.75	1.08	1.69
Belarus	1.71	2.27	2.34	2.17
Kazakhstan	1.05	0.75	0.74	0.76
Kyrgyzstan	9.35	9.46	6.86	9.31
Moldova	33.79	29.54	22.22	18.50
Russia	0.29	0.25	0.27	0.36
Ukraine	2.95	3.05	1.98	2.01

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

When analysing comparative advantages by product, further specialisation patterns become available (Table 6). It is apparent that all of the most important product groups identified in Table 4 had a comparative advantage in all period analysed, though to a different extent. On the one hand, the very high comparative advantages of animal or vegetable fats and oils as well as oil seeds seem to have diminished significantly, while that of cereals modestly. On the other hand, comparative advantages of dairy and fish products have somewhat increased from 2000-2003 to 2012-2015.

Table 6: Balassa indices for CIS countries agricultural export, by most important product group, 2000-2015

Product group	2000-2003	2004-2007	2008-2011	2012-2015
Cereals	4.14	3.32	3.07	3.06
Animal or vegetable fats and oils	14.35	3.39	4.42	3.96
Dairy products	2.19	2.75	2.91	2.97
Fish	1.21	1.99	3.45	4.37
Oil seeds	17.71	8.08	4.53	4.20

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

Based on the Balassa indices above, cluster analysis was run on the different product groups. In our dataset, VARHCA detects 5 clusters (Table 7). All attributes seemed to be well assigned to their groups based on the correlations. The orthogonality between the clusters was also investigated by calculating the correlation among the components. We obtained independent factors, therefore clusters are well represented by their components and the total explained variance is sufficiently large (almost 86%). The most influential attributes from all clusters are 9, 14, 12, 24, 5, 11 and 4 regarding R-squared value and correlation.

As to individual clusters, ten product groups pertain to the first cluster, out of which suggesting that coffee, vegetable plaiting materials, edible fruits, vegetable preparations, beverages, sugar, cereal preparations, live trees and cereals were the most important ones, focusing on crop production. The second cluster mainly focuses on residues from waste, tobacco and miscellaneous edible preparations and products of animal origin, resulting in processed animal products. The third cluster consists of oils seeds, animal and vegetables oils as well as luc and gums – the focus is oil-based products. The fourth cluster focuses on processed vegetable products, while the fifth on raw animal products.

Table 7: Cluster analysis on CIS Balassa indices in agri-food trade by product group

Cluster	Attributes (Product Groups)	R-squared	Correlation to the first PCA	Latent Components from the clustering approach				
				c1	c2	c3	c4	c5
Crop products	9	0.977	0.989	0.325				
	14	0.963	0.981	0.322				
	8	0.944	0.972	0.319				
	2	0.934	0.966	0.318				
	20	0.937	0.968	0.318				
	22	0.928	0.964	0.317				
	17	0.932	0.965	0.317				
	19	0.907	0.952	0.313				
	6	0.872	0.934	0.307				
	10	0.870	0.933	0.307				
Processed animal products	23	0.779	0.883		0.384			
	24	0.936	0.968		0.421			
	21	0.895	0.946		0.411			
	5	0.919	0.959		0.417			
	7	0.856	0.925		0.402			
	1	0.909	0.953		0.414			
Oil based products	12	0.944	0.972			0.623		
	15	0.751	0.866			0.555		
	13	0.738	0.859			0.551		
Processed vegetable products	11	0.846	0.92				0.662	
	18	0.816	0.904				0.650	
	3	0.27	-0.52				-0.374	
Raw animal products	4	0.819	0.905					0.707
	16	0.819	0.905					0.707
Explanation of total variation		85.70%		38.60%	22.10%	10.10%	8.10%	6.80%

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

Based on the table above the CIS countries can be clearly classified into four groups (Table 8.). Armenia, Kyrgyzstan and Moldova had comparative advantage mainly on the attributes belong to first, second and fifth clusters. Moldova has the highest comparative advantage on attributes in the first cluster. Armenia and Moldova have especially high potentials in beverages production, while Kirgizstan is found to excel in vegetables and residues production, belonging to cluster 2. At the other end, Armenia has the lowest values on product groups belonging to cluster 4. This is due to the high value of the 3rd attribute which has a negative loading on its component and to the low values on attribute 11 and 18.

Azerbaijan is somehow different from other countries, it has the highest values on attributes (12, 15, 13) in the oil-based cluster. Russia and Kazakhstan have comparative disadvantage on almost all attributes, underlying the characteristics of these two economies mentioned before (moderate share of the agriculture in the export, net importers in agricultural and food products etc.) Belarus and Ukraine have mainly comparative advantages on attributes (only 11, 18) of cluster 4, referring to the success in the production of the various grains for the milling industry. Belarus, at the other end, has found to have high potentials in the raw animal products cluster, thanks to its dairy industry.

On the whole, our method finds that Russia and Kazakhstan (Group 1), Belarus and Ukraine (Group 2), Azerbaijan (Group 3) and Armenia, Kyrgyzstan and Moldova (Group 4) can be classified into four different groups according to their revealed comparative advantages in agri-food trade.

Table 8: Clusters and groups of the CIS countries

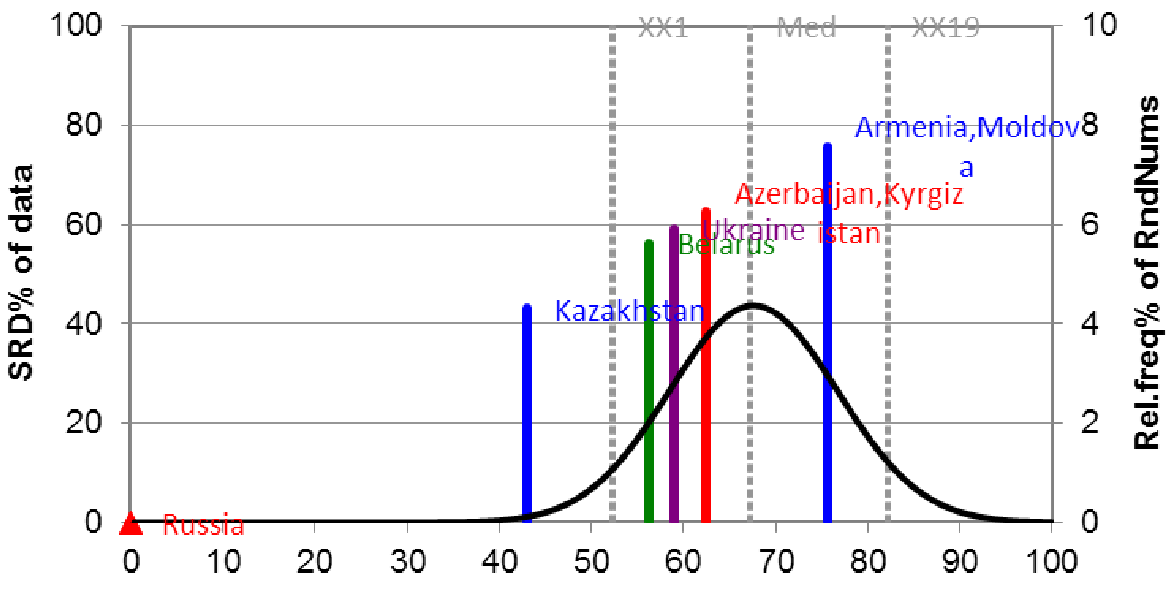
	Crop products	Processed animal products	Oil based products	Processed vegetable products	Raw animal products	Country Groups
Armenia	**-1.07**	**-0.48**	-1.25	**-2**	**-0.56**	4
Azerbaijan	-1.41	-1.43	**3.19**	-1	**-0.24**	3
Belarus	-1.42	-1.3	-1.24	**0.74**	**2.21**	2
Kazakhstan	-1.61	-1.58	-1.08	-0.35	-1.45	1
Kyrgyzstan	**-0.27**	**5.47**	**1.01**	**-0.19**	**1.7**	4
Moldova	**7.93**	**1.68**	**1.32**	**1.02**	**0.5**	4
Russia	-1.82	-1.59	-1.37	-1	-1.47	1
Ukraine	-0.33	-0.77	-0.57	**2.78**	-0.7	2

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

Based on the above, we were also interested in the differences among countries in revealed comparative advantages, taking Moldova as a best practice. Following the work of Vigneau and Qannari (2003), the variable clustering around latent variables (VARHCA) method was also applied. Clustering variables in our case is more useful because there are several attributes (24 product categories) and quite a few objects (only 8 countries). This method was used for feature selection in order to determine the group of the most relevant attributes and for representing attribute groups with one factor (dimensionality reduction).

The country ranking is visible in Figure 2 and is in line with the previous country groupings. Russia and Kazakhstan are the farthest from Moldova in their comparative advantage potentials, followed by Belarus, Ukraine, Azerbaijan, Kyrgyzstan and Armenia. Note, however, that market potentials and market positions realised are not the same as the example of Russia suggests.

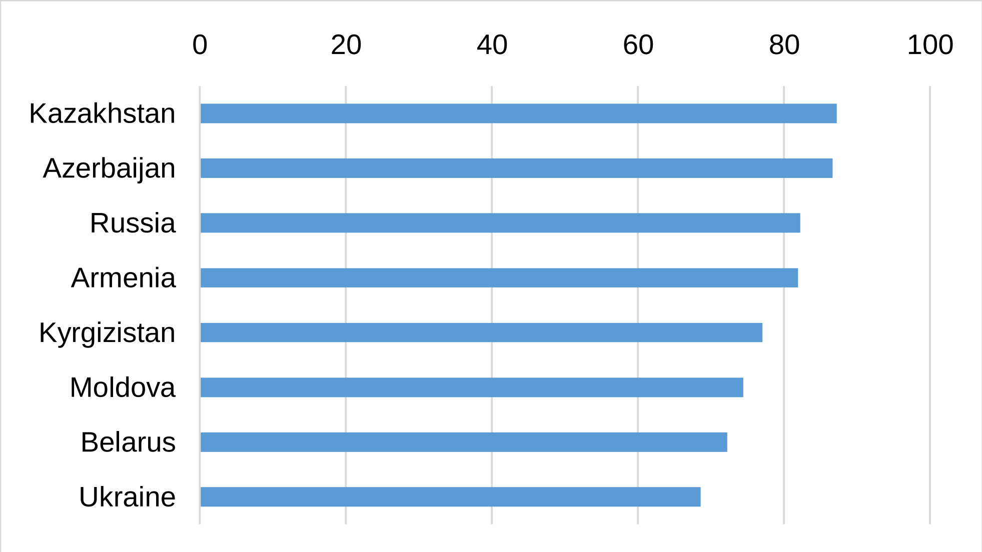
Figure 2: Ranking of the CIS countries, based on their agri-food trade performance, compared to Moldova



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

All the above shows quite unstable competitive patterns as also underlined by Figure 2. In order to further test the stability, the Markov transition probability matrices were used, indicating a relatively low mobility of the Balassa index in CIS agricultural trade for Kazakhstan, Azerbaijan, Russia and Armenia, implying stable patterns of comparative (dis)advantages. Besides these countries, more than 70% of product groups with a comparative advantage remained persistent for Kyrgyzstan, Moldova and Belarus, while lowest mobility measures pertained to Ukraine, implying highly changing competitive potentials (Figure 3).

Figure 3: The mobility of Balassa indices, 2000-2015, by country, %



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

The changing structure of agricultural trade based competitiveness is also evident from duration tests. 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 9). Survival chances of 94-98% at the beginning of the period fell to 1-11% by the end of the period, suggesting that fierce competition exists in CIS agricultural trade.

Table 9: Kaplan-Meier survival rates for Balassa indices and tests for equality of survival functions in CIS agricultural trade, 2000–2015

Years	Survivor function	Armenia	Azerbaijan	Belarus	Kazakhstan	Kyrgyzstan	Moldova	Russia	Ukraine
2000	0.9527	0.9846	0.9622	0.9507	0.9469	0.9514	0.9745	0.9385	0.9556
2001	0.9054	0.9641	0.9230	0.9015	0.8915	0.8952	0.9487	0.8784	0.9112
2002	0.8590	0.9340	0.8883	0.8496	0.8387	0.8482	0.9231	0.8211	0.8667
2003	0.8118	0.9035	0.8494	0.7964	0.7895	0.8069	0.8933	0.7631	0.8194
2004	0.7602	0.8672	0.8013	0.7387	0.7353	0.7601	0.8586	0.7025	0.7695
2005	0.7105	0.8258	0.7513	0.6889	0.6795	0.7215	0.8233	0.6448	0.7195
2006	0.6593	0.7746	0.6985	0.6443	0.6235	0.6757	0.7775	0.5864	0.6711
2007	0.6074	0.7150	0.6434	0.5977	0.5629	0.6341	0.7407	0.5303	0.6191
2008	0.5524	0.6623	0.5738	0.5493	0.5044	0.5782	0.7085	0.4725	0.5595
2009	0.4936	0.6024	0.5059	0.5016	0.4420	0.5154	0.6508	0.4144	0.4989
2010	0.4350	0.5412	0.4342	0.4480	0.3890	0.4516	0.6036	0.3565	0.4356
2011	0.3695	0.4734	0.3681	0.3778	0.3254	0.3777	0.5417	0.3000	0.3669
2012	0.2978	0.4056	0.2958	0.3040	0.2492	0.3001	0.4828	0.2338	0.2947
2013	0.2186	0.3273	0.2189	0.2259	0.1710	0.2037	0.3949	0.1625	0.2175
2014	0.1331	0.2344	0.1300	0.1372	0.0773	0.1019	0.2791	0.0879	0.1335
2015	0.0300	0.0833	0.0227	0.0378	0.0068	0.0626	0.1120	0.0085	0.0307

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

Results vary from country to country, suggesting that the highest survival times exist for Moldova, while the lowest for Russia. However, there is no clear pattern observable between the change in survival times and the rank in CIS agricultural exports. The equality of the survival functions across regional 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 regional agricultural exporters are absent (Table 9).

Results above are also important from a trade policy perspective. Political and economic regionalisation are creating new trade patterns, acting towards harmonization of member states' trade policies. The Eurasian Customs Union and preferential trade agreements with the EU play a key role in realizing comparative advantages on the market. Most of the countries are relying heavily on Russia in their agricultural trade, while some of them diversify their export markets (Kozar et al, 2016). In either case, identifying the changing nature of competitive potentials is a key to future success.

Conclusions

The paper analysed the competitiveness of CIS agriculture. Major conclusions are as follows. First of all, agriculture still plays an important role in the region, especially in Armenia, Kyrgyzstan and Moldova. Most of the analysed countries are net importers of agricultural goods, however Belarus became net exporter, while Moldova was able to keep its surplus with Ukraine showing a significant growth in agricultural exports. As to the share of the sector in total exports, Moldova, Ukraine and Armenia led the line with almost half, third and quarter of every foreign exchange earned via export was coming from agriculture in these countries, respectively. The major agricultural export commodity of the region is undoubtedly cereals, giving almost a third of total agricultural exports.

Regarding competitiveness, Moldova, Kyrgyzstan and Armenia had the highest Balassa indices in the majority of the years analysed for agricultural trade with Belarus, Ukraine and Azerbaijan having some comparative advantage at the same time. It is apparent that all of the most important product groups had a comparative advantage in all period analysed, though to a different extent. Based on the trade performances, several country groups were set up. Armenia, Kyrgyzstan and Moldova showed similar characteristics, while Russia with Kazakhstan as well as Belarus with Ukraine also demonstrated similarity. The only "outlier" was Azerbaijan, standing alone and differing from all the other CIS countries. Comparative advantages, however, have not turned out to be persistent according to stability and duration tests run on our panel dataset. Research in the future might want to analyse and understand the possible reasons behind the results presented above as well as potentially compare CIS to other neighbouring countries in this regard.

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Appendix

PRODUCT GROUPS BY HS2 CLASSIFICATION	CODE
Live animals	1
Meat and edible meat offal	2
Fish and crustaceans, molluscs and other aquatic invertebrates	3
Dairy produce, birds' eggs, natural honey, edible products of animal origin not elsewhere specified or included	4
Products of animal origin, not elsewhere specified or included	5
Live trees and other plants, bulbs, roots and the like, cut flowers and ornamental foliage	6
Edible vegetables and certain roots and tubers	7
Edible fruit and nuts, peel of citrus or melons	8
Coffee, tea, mat and spices	9
Cereals	10
Products of the milling industry, malt, starches, inulin, wheat gluten	11
Oil seeds and oleaginous fruits, miscellaneous grains, seeds and fruit, industrial or medicinal plants, straw and fodder	12
Lac, gums, resins and other vegetable saps and extracts	13
Vegetable plaiting materials, vegetable products not elsewhere specified or included	14
Animal or vegetable fats and oils and their cleavage products, prepared edible fats, animal or vegetable waxes	15
Preparations of meat, of fish or of crustaceans, molluscs or other aquatic invertebrates	16
Sugar and sugar confectionery	17
Cocoa and cocoa preparations	18
Preparations of cereals, flour, starch or milk, pastrycooks' products	19
Preparations of vegetables, fruit, nuts or other parts of plants	20
Miscellaneous edible preparations	21
Beverages, spirits and vinegar	22
Residues and waste from food industries, prepared animal fodder	23
Tobacco and manufactured tobacco substitutes	24