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Agro-food trade competitiveness of Central European and Balkan countries

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ABSTRACT

This paper investigates the level, composition, and differences in agro-food relative trade advantages/disadvantages for eight Central European and Balkan countries on the European Union (EU) markets and their implications for food policy. Higher and more stable relative trade advantages are found for bulk primary raw agricultural commodities and less for consumer-ready foods, implying competitiveness shortcomings in food processing and in international food marketing. Duration analysis shows that the EU enlargement has a negative impact on agro-food relative trade advantages for all eight analyzed countries. Estimations imply that the duration of agro-food relative trade advantages are the highest for Hungary and Poland, and for Bulgaria in differentiated products, indicating their agro-food trade potentials in the EU-15 markets.

Introduction

The globalization of economic activities and survival by microeconomic units, sectors and nations require their ability to compete in open domestic and international trade. Participation in international trade is important to explore ways of improving efficiency and international competitiveness. Our focus is on the agro-food trade of Central European and Balkan countries (CEBCs), where agricultural and food markets during the previous communist regime were an example of government subsidized production and trade protected by tariffs and non-tariff barriers. During the pre-EU accession period these markets had been deregulated since the beginning of the 1990s (e.g., Olper and Raimondi, 2008). Transition from central planning to a market economy, trade liberalization, free trade agreements, regional European reintegration and rapid adjustments to EU membership might have induced substantial changes in the structures of agro-food trade flows and changes in comparative advantages. However, research on comparative trade advantages for agro-food trade in CEBCs is still relatively rare (except for Bojnec and Fertő, 2007). This has motivated our research to investigate agro-food trade developments and trade advantages between CEBCs and the EU during the pre- and post-enlargement period in order to derive broader policy implications for agro-food trade, food policy and sustainable agro-food sector development.

The article contributes to the existing literature in at least four significant directions. First, it contributes to a better understanding of the relative trade advantages of CEBCs in agro-food products on the EU markets at different stages of their integration. Stern and Deardorff (2006) argued that the non-participating countries in multilateral trade negotiations and outside of preferential trading arrangements are more likely to lose. Therefore, we aim to identify whether gains from freer trade vary depending on the implementation of the European Agreements and trade adjustment paths between the EU and analyzed CEBCs during the pre- and post-enlargement periods. Second, the article aims to indicate ways in which agro-food trade for the analyzed CEBCs has developed and is likely to evolve or change, and how this might influence magnitude and directions in agro-food sector restructuring and rural development. Third, we analyze agro-food trade of CEBC-8 at different stages of European integration: the CEBC-5, which entered the EU-25 in 2004 (the Czech Republic, Hungary, Poland, Slovakia, and Slovenia), then Bulgaria and Romania, which entered the EU-27 in 2007, and Croatia, which is still outside the EU. Fourth, the results might be of broader relevance to those with a direct involvement in agro-food commercial trading, then also to strategy and policy makers in food policy, as the empirical results are evaluated with policy implications for competitive agro-food trade and food policy.

The rest of the article is structured as follows. We first discuss concepts of comparative advantages, and then describe European enlargement and trade arrangements that are relevant for agro-food trade between the CEBC-8 and the EU. Next, we present the methodology and describe the data used. The final section sums up the main findings and discusses agro-food policy implications.

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Trade based measures of competitiveness

The concept of competitiveness has been widely used in economic research and economic policy from various points of view over the last decade, but there is little agreement on its definition (e.g., Porter, 1990; Krugman, 1994). The diversity of concepts and measures of competitiveness largely pertains to the variety of policy analysis needs, perspectives and objectives of the research.

Competitiveness can be analyzed at three different levels: national or macroeconomic level, industrial or branch level, and firm or micro-economic level. Another aspect of competitiveness exists with regard to the spatial geographical dimension of the investigation, comparing enterprises or trade within a region of a particular country, or between countries.

National competitiveness is related to the concept of comparative advantage. The theory of comparative advantage predicts that trade flows exist as a result of relative cost differences between trading partners. It suggests that countries are competitive in goods and services in which they have a relative cost advantage. The only difference between comparative advantage and competitiveness is that the latter includes market distortions, whereas the former does not. In agricultural markets there are policy distortions, and thus competitiveness takes a more realistic view about the world (e.g., Barkema et al., 1991). Lafay (1992) underlined two additional differences between comparative advantage and competitiveness. First, competitiveness usually involves a cross-country comparison for a particular product, while comparative advantage is measured between products within a country. Second, competitiveness is subject to changes in macroeconomic variables, whereas comparative advantage is structural in nature. Thus empirical analyses that focus on comparative advantage and competitiveness may lead to different results (e.g., Fertő and Hubbard, 2003).

Both comparative advantage and competitiveness are based on the concept of general equilibrium, which can take into account all interdependencies of an economy. A considerable part of the research in this area investigates only one part of the economy, e.g., trade patterns of an industry, and approximates economy-wide interdependencies linked to economic growth and the concept of welfare maximization.

We are concerned with competitiveness at the branch level. The ability to compete on international and domestic markets depends on comparative advantages. Therefore, we employ trade data to contribute to a better understanding of the evolution in the comparative advantage by employing trade based measures of competitiveness for the agro-food sector of Central European and Balkan countries.

European enlargement and trade arrangements

The CEBCs had different socio-economic and political histories even during the communist period of a centrally planned system. Prior to the fall of the Berlin wall in 1989, except for the former Yugoslavia – which at that time formed a substantial bridge between the former clearing Council of Mutual Economic Assistance (CMEA) and the Western markets during the 1970s and the 1980s – the other CEBCs had limited co-operation with the Western markets.[2] Some other CEBCs (e.g., Hungary and Poland) had stipulated trade and economic co-operation agreements with the EU at the end of the 1980s (e.g., Tovias, 1991).

The transition from a centrally planned system to a market economy started in the CEBCs at different times. In the former Yugoslavia, Poland, and Hungary this process began during the 1980s. However, the most important factors for the East–West European reintegration and the development of freer trade were: the euphoric economic and political events in the CEBCs in 1989–1990, the collapse of the CMEA in mid-1991 and the CEBCs' transition to democracy, which was initiated in the 1990s. Therefore, during the 1990s an important policy discussion developed concerning the integration of CEBCs into the EU as the challenging economic and political issues (EU-Commission, 1997).[3]

The EU concluded the interim Europe Agreements with CEBCs by granting wider use of trade concessions and preferential trading agreements for market access, technical assistance and assistance for restructuring of certain sectors. The Europe Agreements granted preferential trade concessions on agricultural and food products. The Association Agreements allowed for wider use of trade conditional and defence measures for market access as obstacles to freer trade (e.g., food safety rules and rules of origin for agricultural and food products). The liberalization of trade did not appear as a major shock to the EU's agricultural markets, as trade with CEBCs amounts to a very small proportion of the EU sectors. In contrast, CEBCs became significant importers of EU food and agricultural products. A crucial trade feature of CEBCs is the similarity of their competitive structures as a result of the similarity of their agro-food economies.

The renegotiation of the Association Agreements for further opening of trade started in 1995, in order to be consistent with the EU-15 enlargement and the General Agreement on Tariffs and Trade Uruguay Round Agreements. In 1997, the first negotiations with the CEBCs for EU membership had started. This has encouraged developing competitive production and made progress in relative trade advantages and trade specialization. Greater specialization based on international competitiveness and greater reliance on comparative advantages might occur by the trade creation effects, increased trade competition and structural changes, which might reflect on agro-food trade.

Methodology and data

We investigate levels, compositions and patterns in directions of development of agro-food trade and relative trade advantage indices using the EU-15 as the benchmark of comparisons: revealed comparative export advantage index, relative import specialization index, and relative trade advantage index. The concept of 'revealed' comparative advantage was introduced by Liesner (1958), redefined and popularized by Balassa (1965) to identify a country's weak and strong export sectors. The Revealed Comparative Export Advantage (RXA) index is defined as:

$$\mathrm{RXA}_{ij} = \left(X_{ij} \Big/ \sum_{t,t\neq j} X_{it} \right) \Big/ \left(\sum_{n,n\neq i} X_{nj} \Big/ \sum_{n,n\neq i} \sum_{t,t\neq j} X_{nt} \right),$$

where X represents exports, i is a country, j is a commodity, t is a set of commodities, and n is a set of countries. Despite several critical caveats, such as the asymmetric value problem and problem with logarithmic transformation (De Benedictis and Tamberi, 2004), the RXA index remains the popular tool in empirical trade analysis. Vollrath (1991) emphasises two other problems: the 'double count-

[2] The former Yugoslavia was not a member of the CMEA, but it had some barter/clearing agreements with the CMEA members and gained benefits from preferential trade access to the EU markets during the 1970s and the 1980s until the break up of the former Yugoslavia in 1991. The EU concessions for levy and customs reduction on the former Yugoslavia's meat and livestock products, fruit, tobacco and wine were particularly important.

[3] A specific situation existed for the former German Democratic Republic and its reunification into Germany and incorporation into the EU in 1991. In 1995, the EU-12 was expanded to encompass three European Free Trade Agreement member countries (Austria, Finland and Sweden).

ing' in the product and/or country considered and the importance of simultaneous consideration of the import side. To avoid double counting, the commodity j is excluded from X_{it} and X_{nt}, and the country i is excluded from X_{nj} and X_{nt}, respectively. In our case X_{ij} describes CEBC's exports for a particular agro-food product j to the EU-15 countries, while X_{nj} is total merchandise exports of CEBCs without the subject country i to EU-15. X_{it} denotes the EU-15's agro-food exports without a given agro-food product j, and X_{nt} indicates total merchandise exports by EU-15 countries (without the agro-food product j and the country i), which are used as the benchmark of comparison. The RXA index is based on observed trade patterns. It measures a country's exports of a commodity relative to its total exports and to the corresponding export performance of a set of countries, e.g., the EU-15. If RXA > 1, then a comparative export advantage is revealed, i.e. a sector in which the country is relatively more specialized in terms of exports.

Vollrath (1991) offered the relative trade advantage (RTA) index, which accounts for exports and imports simultaneously. It is calculated as the difference between RXA and its counterpart, the relative import specialization (RMA) index:

$$\mathrm{RTA}_{ij} = \mathrm{RXA}_{ij} - \mathrm{RMA}_{ij}$$

and

$$\mathrm{RMA}_{ij} = \left(M_{ij} \Big/ \sum_{t,t\neq j} M_{it}\right) \Big/ \left(\sum_{n,n\neq i} M_{nj} \Big/ \sum_{n,n\neq i}\sum_{t,t\neq j} M_{nt}\right).$$

where M represents imports. Thus,

$$\mathrm{RTA}_{ij} = \left[\left(X_{ij} \Big/ \sum_{t,t\neq j} X_{it}\right) \Big/ \left(\sum_{n,n\neq i} X_{nj} \Big/ \sum_{n,n\neq i}\sum_{t,t\neq j} X_{nt}\right)\right] - \left[\left(M_{ij} \Big/ \sum_{t,t\neq j} M_{it}\right) \Big/ \left(\sum_{n,n\neq i} M_{nj} \Big/ \sum_{n,n\neq i}\sum_{t,t\neq j} M_{nt}\right)\right].$$

If RTA > 0, then a relative trade advantage is revealed, i.e. a sector in which the country's trade is relatively more competitive. Similarly to the RXA index, the RTA index is based also on observed trade patterns. It measures a CEBC's exports and imports of a commodity relative to its total exports and imports, respectively, and to the corresponding export and import performance of a set of countries (EU-15), which are used as the benchmark of comparison.

We classify the RTA index in three categories: RTA < 0 refers to all those product groups with an absence of relative trade advantage or to products with relative trade disadvantage. RTA = 0 refers to all those product groups at a break-even point without relative trade advantage or relative trade disadvantage. RTA > 0 refers to all those product groups with a relative trade advantage. These boundaries are consistent with a theoretical interpretation appropriate for cross-country comparisons. Recently, the RXA index, the RMA index and RTA index have become popular tools to analyze both the merchandise trade (e.g., Amiti, 1998; Proudman and Redding, 2000; Hinloopen and Van Marrewijk, 2001; Redding, 2002) and also the agro-food trade pattern (e.g., Eiteljörge and Hartmann, 1999; Bojnec, 2001; Fertő and Hubbard, 2003).

Baldone et al. (2007) shed light on the other issue for use of the revealed comparative advantage indices, namely the effects of international fragmentation of production on relative trade advantages. They use outward processing trade and the inward processing trade data from the Eurostat Comext database to identify the impacts of international fragmentation of production on trade. Some recent studies also attempt to estimate the extent of this phenomenon using data on trade flows generated by international fragmentation together with national input–output tables and by presenting some case studies (Feenstra, 1998; Hummels et al., 2001; Yi, 2003). However these options are not available for our purpose due to data constraints. Thus, to check for potential issues due to vertical specialization we use Rauch (1999) product classification to classify agro-food trade into three commodity groups: homogeneous products that are traded on organized exchanges, reference priced products not sold on exchanges but whose benchmark price exists, and differentiated products for all other products. We assume that differentiated products are only the subject to final trade. We calculate RTA indices for all agro-food trade (as a benchmark) and for agro-food trade with only differentiated products (as a final) to check a potential effect of fragmentation on RTA indices. Moreover, to gain more in-depth details on agro-food trade, following Chen et al. (2000) we classify agro-food trade into four commodity groups by the degree of processing: bulk raw commodities, processed intermediates, consumer-ready food, and horticulture.

We aim to answer the question of the length of duration of the revealed comparative advantages at product level. To answer this question we employ the duration analysis. The reference parameters for evaluating the dynamics are the start year and the end year. We estimate survival functions focusing on the RTA index across agro-food product groups. The survival function, $S(t)$, is estimated non-parametrically using the Kaplan–Meier product limit estimator. The derivation is as follows. It is assumed that a sample contains n independent observations denoted $(t_i; ci)$, i = 1,2,...,n, where t_i 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. Moreover, it is assumed that there are $m < n$ recorded times of failure. Then, we denote the rank-ordered survival times as $t(1) < t(2) < \cdots < t(m)$. Let nj denote the number of subjects at risk of failing at $t(j)$, and let dj denote the number of observed failures. The Kaplan–Meier estimator of the survival function is then:

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

with the convention that $\hat{S}(t) = 1$ if $t < t(1)$. Given that many observations are censored, then we note that the Kaplan–Meier estimator is robust to censoring and uses information from both censored and non-censored observations.

We also check the equality of survival functions for the RTA index across agro-food product groups using two non-parametric tests: log-rank test and Wilcoxon test. First, the log-rank test is defined as $E_{ij} = n_{ij}d_j/n_j$, where the expected number of failures occurs in group i at time t_j, under the null hypothesis of no difference in survival among the r groups. The chi squared test statistic is calculated as quadratic from $\mathbf{u}'\mathbf{V}^{-1}\mathbf{u}$ using the row vector.

$$\mathbf{u}' = \sum_{j=1}^{k} W(t_j)(d_{1j} - E_{1j}, \ldots, d_{rj} - E_{rj})$$

and the $r \times r$ variance matrix $\mathbf{V}$, where the individual elements are calculated by

$$BfV_{il} = \sum_{j=1}^{k} \frac{W^2(t_j) n_{ij} d_j (n_j - d_j)}{n_j(n_j - 1)} \left(\delta_{ij} - \frac{n_{ij}}{n_j}\right)$$

where $i = 1, \ldots, r$, $l = 1, \ldots, r$, and $\delta_{il} = 2$ if $i = l$, and 0 otherwise. The weight function (W_{tj}) is what characterizes the different flavours of the tests. In the case of the log-rank test, $W_{tj} = 1$ when n_{ij} is non-zero. Second, the Wilcoxon test is also a rank test and constructed in the same way as the log-rank test, except that for this test we set $W_{tj} = n_{ij}$ in $\mathbf{u}'$ and $\mathbf{V}_{il}$ functions (Cleves et al., 2004).

We employ a disaggregated trade dataset to identify relative trade advantages across CEBC-8 by main agro-food product groups by a degree of processing and by the benchmark and final agro-food products and their duration of survival rates over time to provide food policy implications. The empirical analysis is conducted

using detailed trade data from the Eurostat Comext by individual years in the period 1995–2007. The agro-food trade data sample consists of 557 items at five-digit level in the Standard International Trade Classification (SITC) system.

Empirical results

Levels and compositions in agro-food trade

The empirical results on the size and composition of trade by main agro-food product groups by the degree of processing are presented in Table 1 for five Central European countries (the Czech Republic, Hungary, Poland, Slovakia, and Slovenia) and three Balkan countries (Bulgaria, Croatia, and Romania). By the agro-food trade size, Poland, Hungary, and the Czech Republic are the most important among the analyzed CEBC-8. This finding is also a reflection of the size of agro-food sectors as being important for exports, and the country's population and income sizes as important for imports. Hungary switched from trade surplus to trade deficit in agro-food products with the EU-15 markets in 2006 and 2007, and similarly Bulgaria in 2007. Poland has recorded a pronounced shift from trade deficit to trade surplus since 2002. Romania experienced a temporary surplus in some years. On the other hand, the Czech Republic, Croatia, Slovakia, and Slovenia experienced deficit in agro-food trade with the EU-15 markets. The 2004 EU enlargement has encouraged the increases in real agro-food trade between the CEBC-8 and the EU-15 markets.

By the degree of processing, consumer-ready food dominates in agro-food export structures from Poland to the EU-15. Consumer-ready food and bulk raw commodities prevail in agro-food export structures from Bulgaria, Hungary, and the Czech Republic to the EU-15. For Slovakia and Slovenia, in the agro-food export structures the prevalence is in consumer-ready food and bulk raw commodities. For Croatia and Romania, the prevalence in agro-food export structures to the EU-15 is in bulk raw commodities and in consumer-ready food. In general, horticultural products account for less than 10% of agro-food exports from the CEBC-8 to the EU-15 markets with more recent increases. The importance of processed intermediates in agro-food export structures varies by the CEBC-8. Except for Slovenia, and to a lesser extent for Bulgaria, their importance has declined over time.

On the other hand, in the agro-food import structures to the CEBC-8 from the EU-15 markets, the prevalence is in consumer-ready foods and to a lesser extent in processed intermediates and horticultural products. Bulk raw commodities are much less important in CEBC-8 agro-food imports from the EU-15 markets than vice versa in the CEBC-8 agro-food exports to the EU-15 markets. Except for Romania and Bulgaria, the proportion of horticultural products in the CEBC-8 agro-food imports from the EU-15 markets is higher than vice versa in the CEBC-8 agro-food exports to the EU-15 markets.

Revealed comparative export advantage (RXA)

The CEBC-8 experienced revealed a comparative export advantage (RXA > 1) in the EU-15 markets (Table 2). The standard deviation suggests variability in the RXA index values by the CEBC-8 and over time. The number of products with RXA > 1 is less than the number of products with revealed comparative export disadvantage (RXA < 1), thus implying greater export specialization on more competitive and niche products. This result can be biased by the size of agro-food sectors and trade, where the EU-15 is much bigger by size than any individual CEBC-8. Differences across CEBC-8 are found also in the RXA index values by the analyzed agro-food product groups. Except for Romania and to a lesser extent for Slovakia, the RXA index values are the highest (and greater than one) for bulk raw commodities, implying comparative export advantages. For Romania, the highest RXA index value is found for processed intermediates. It is interesting to note that Bulgaria, Hungary, Poland, and Romania experienced RXA > 1 for each of the agro-food product groups, which does not hold for Croatia for horticulture, for the Czech Republic, Slovakia, and Slovenia for consumer-ready food and horticulture.

Import specialization index (RMA)

A relatively high dispersion is seen for the estimated values of the RMA index (Table 3). The mean values of the RMA > 1 suggest an import specialization disadvantage, which is concentrated on a smaller number of imported agro-food products, prevailing in importance over the imports of agro-food products with successful import specialization advantage (RMA < 1). The number of products without imports (RMA = 0) varies by the analyzed CEBC-8. The mean values of the RMA index are in general – except for Bulgarian and Romanian horticultural products – greater than one, thus indicating a lack in successful import specialization advantage that occurred during liberalization of the CEBC-8 agro-food imports to competition from the EU-15 markets.

Relative trade advantage (RTA)

A mean value of the RTA < 0 indicates that the CEBC-8 experienced a relative trade disadvantage in agro-food products in the EU-15 markets (Table 4). The results for the RTA indices indicate large variations, as seen from the maximum and minimum RTA index values and from the standard deviation in the RTA index value. In the processed intermediates and consumer-ready food, none of the analyzed CEBC-8 experienced a relative trade advantage in the EU-15 markets. These groups of products are mainly the result of primary and more sophisticated food processing, which requires both quality in food processing and developed marketing channels. For the bulk raw commodities, the RTA > 0 holds for Bulgaria, Croatia, Hungary, Romania, and Slovakia. The relative trade advantages for this group of products on the EU-15 markets are likely to be the result of advantages in natural factor endowments such as high quality agricultural land important for crop production. In the horticultural products, the relative trade advantages in the EU-15 markets are identified for Bulgaria, Hungary, and Romania. The relative trade advantages for horticultural products are likely to be determined not only by the agricultural natural endowments, and the tradition in horticultural production, but also by the relatively cheap labour that is used in horticultural production.

Duration of comparative advantage

We compare the duration of the RTA using both total agro-food trade as a benchmark and differentiated products. The Rauch (1999) product classification for differentiated products and the Kaplan–Meier survival function are employed to check for potential issues due to vertical specialization and to evaluate the duration of the RTA indices during the pre- and post-accession. The survival rates, which are higher for the differentiated products than for the benchmark total agro-food products, except for Croatia, confirm the fragmentation issue. Table 5 presents the survival rates for years 1 (1995), 10 (2004), and 13 (2007), and the similar survival rates for the benchmark and differentiated products to check to the effects of EU enlargements on the CEBCs' agro-food trade. First, we observe that a small part of the RTA > 0 fails after only a year, and the survival rates for the RTA indices are higher than 93% for all countries irrespective of specifications (benchmark or differentiated products). Second, an important finding is the

Table 1
Agro-food trade with the European Union (EU-15) in the years 1995–2007 (in 1995 Euro prices).

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Bulgaria													
Export (million Euro)	257.1	242.4	262.7	262.2	280.5	225.6	262.1	373.5	300.3	345.5	393.5	453.6	396.3
Bulk raw commodities (%)	25.8	20.0	21.3	20.2	32.0	25.2	29.1	50.6	35.0	34.0	36.1	43.7	25.4
Processed intermediates (%)	10.5	5.6	6.2	6.3	4.3	7.7	7.5	6.3	6.4	9.0	7.1	8.7	12.2
Consumer-ready food (%)	53.0	62.4	62.9	58.7	55.2	56.3	55.2	35.6	48.6	47.7	49.5	41.1	51.9
Horticulture (%)	10.7	12.0	9.6	14.8	8.5	10.8	8.2	7.6	10.0	9.3	7.3	6.5	10.5
Import (million Euro)	256.5	169.7	183.7	229.3	189.8	236.7	259.7	248.1	250.0	307.1	326.1	394.1	489.7
Bulk raw commodities (%)	3.1	7.0	10.4	3.5	3.8	3.5	2.4	2.6	3.8	3.8	2.6	4.0	6.9
Processed intermediates (%)	20.3	20.9	27.2	24.2	21.6	21.2	24.2	32.4	30.1	26.4	29.4	26.9	20.1
Consumer-ready food (%)	66.8	63.5	56.1	64.8	65.8	65.6	63.0	57.0	57.6	62.4	58.8	60.7	64.2
Horticulture (%)	9.9	8.6	6.3	7.5	8.8	9.7	10.4	7.9	8.5	7.4	9.2	8.4	8.8
Croatia													
Export (million Euro)	190.7	185.8	177.9	182.7	186.7	198.4	226.7	269.3	314.2	234.9	321.0	338.4	305.8
Bulk raw commodities (%)	59.4	58.7	62.7	68.5	69.6	69.1	59.6	56.8	46.5	52.7	42.5	44.6	54.3
Processed intermediates (%)	8.3	11.0	10.2	7.3	7.7	7.8	8.5	9.3	7.1	8.8	5.2	5.0	4.6
Consumer-ready food (%)	29.2	28.1	25.1	22.4	20.5	20.6	29.3	31.4	44.5	36.4	51.2	49.3	39.3
Horticulture (%)	3.1	2.2	2.0	1.8	2.2	2.5	2.6	2.5	1.9	2.1	1.1	1.0	1.9
Import (million Euro)	453.2	425.6	435.8	368.4	318.9	360.6	434.3	496.8	507.8	527.9	567.6	634.7	593.4
Bulk raw commodities (%)	5.2	5.7	7.3	6.1	6.0	6.6	8.5	8.2	5.1	5.6	5.1	4.9	7.0
Processed intermediates (%)	14.6	18.5	19.3	17.1	16.7	19.3	17.6	18.5	16.5	17.9	16.2	17.0	15.9
Consumer-ready food (%)	64.5	63.1	60.7	62.4	63.6	61.7	61.6	62.1	65.1	63.7	67.5	67.6	65.2
Horticulture (%)	15.7	12.8	12.7	14.4	13.7	12.5	12.3	11.1	13.3	12.9	11.1	10.5	11.9
Czech Republic													
Export (million Euro)	637.5	590.0	626.5	614.9	737.3	803.4	828.5	837.2	859.7	886.2	1240.0	1356.7	1711.5
Bulk raw commodities (%)	52.8	52.7	52.2	50.8	57.3	50.8	44.8	44.4	42.9	35.6	35.0	36.1	35.2
Processed intermediates (%)	17.4	16.4	17.7	18.5	13.5	14.4	16.9	15.8	15.6	14.3	12.2	12.6	10.3
Consumer-ready food (%)	24.1	26.2	25.6	27.1	25.8	31.3	36.1	37.3	38.4	45.6	47.1	45.2	43.5
Horticulture (%)	5.7	4.8	4.6	3.6	3.4	3.5	2.2	2.6	3.2	4.5	5.6	6.1	11.0
Import (million Euro)	873.9	937.8	949.5	968.4	964.3	1081.9	1190.2	1256.1	1292.4	1432.4	1826.0	2018.1	2448.8
Bulk raw commodities (%)	6.5	9.5	11.2	7.5	7.9	8.1	7.6	6.6	6.5	6.6	5.8	6.7	5.9
Processed intermediates (%)	25.1	22.8	24.4	26.2	23.3	26.0	26.5	27.7	27.1	26.4	21.9	21.5	19.1
Consumer-ready food (%)	49.1	48.5	44.9	47.7	50.2	48.7	49.5	48.9	49.1	49.6	55.2	53.0	55.5
Horticulture (%)	19.3	19.2	19.5	18.7	18.7	17.2	16.5	16.9	17.3	17.4	17.1	18.8	19.5
Hungary													
Export (million Euro)	1066.1	1119.1	1104.5	1127.7	1171.3	1239.5	1333.8	1418.4	1459.9	1471.9	1631.7	1738.9	1990.7
Bulk raw commodities (%)	23.1	20.6	19.9	24.3	25.2	25.7	22.6	30.6	26.4	28.3	30.7	31.4	38.6
Processed intermediates (%)	16.1	15.8	15.7	12.1	11.9	14.1	13.9	13.0	16.1	15.4	16.4	15.0	12.3
Consumer-ready food (%)	53.3	56.7	57.7	56.2	55.8	53.0	56.2	48.7	49.8	48.3	45.5	46.0	40.3
Horticulture (%)	7.5	6.9	6.7	7.4	7.1	7.3	7.3	7.7	7.7	8.1	7.5	7.6	8.8
Import (million Euro)	488.6	428.5	526.2	543.6	488.8	619.2	735.8	835.9	876.9	1155.2	1562.2	1766.4	2032.9
Bulk raw commodities (%)	8.9	10.0	9.3	10.6	11.4	11.0	11.3	9.5	9.4	8.5	6.6	7.6	10.0
Processed intermediates (%)	25.9	29.1	31.7	30.3	29.1	28.3	25.4	27.2	25.2	23.5	22.4	17.8	15.3
Consumer-ready food (%)	52.4	46.4	45.9	43.1	42.7	45.0	47.6	47.5	48.1	53.7	58.3	59.8	58.7
Horticulture (%)	12.9	14.5	13.1	16.0	16.8	15.7	15.7	15.8	17.4	14.3	12.6	14.8	16.0
Poland													
Export (million Euro)	1249.2	1143.1	1270.4	1333.7	1392.3	1538.2	1695.6	1722.4	2055.0	2490.1	3380.9	4240.3	5119.0
Bulk raw commodities (%)	22.1	16.0	15.8	16.4	16.1	16.0	12.6	13.3	12.4	10.7	10.4	9.2	8.9
Processed intermediates (%)	17.9	20.3	20.3	18.8	17.5	14.5	15.2	15.0	13.8	13.1	11.9	12.4	9.2
Consumer-ready food (%)	54.5	56.4	57.3	58.1	60.1	63.2	64.6	64.0	65.3	68.3	68.8	70.0	71.9
Horticulture (%)	5.5	7.2	6.6	6.7	6.3	6.3	7.6	7.8	8.5	7.8	8.9	8.3	10.0
Import (million Euro)	1357.2	1604.1	1671.2	1745.6	1534.9	1784.9	1897.3	1937.8	1747.3	2114.9	2919.2	3480.8	4358.2
Bulk raw commodities (%)	5.5	23.0	11.1	6.3	6.2	10.1	9.0	7.8	6.6	7.7	6.5	6.9	8.6
Processed intermediates (%)	33.2	29.0	35.4	37.2	32.1	32.1	31.7	33.7	32.4	28.6	24.2	21.5	17.3
Consumer-ready food (%)	45.0	34.0	38.0	38.8	41.9	37.5	36.5	37.2	39.1	45.8	52.2	53.6	55.3
Horticulture (%)	16.3	13.9	15.4	17.7	19.9	20.3	22.9	21.3	21.9	17.9	17.1	18.0	18.8
Romania													
Export (million Euro)	157.2	163.6	197.7	201.5	339.8	338.6	371.3	346.8	398.0	455.0	420.0	478.3	507.3
Bulk raw commodities (%)	21.9	22.1	24.5	39.0	57.5	48.9	39.3	45.6	45.0	49.8	53.0	58.2	37.0
Processed intermediates (%)	30.0	30.3	29.9	21.8	18.8	27.6	32.3	26.8	24.7	23.4	20.8	18.0	23.4
Consumer-ready food (%)	33.0	29.8	28.6	28.9	16.4	16.9	20.3	18.7	21.7	19.6	21.8	18.4	27.5
Horticulture (%)	15.2	17.8	17.0	10.4	7.2	6.6	8.0	8.8	8.6	7.3	4.4	5.4	12.1
Import (million Euro)	321.9	332.5	272.0	381.3	250.8	302.7	404.6	454.6	461.6	515.1	658.7	820.0	1075.8
Bulk raw commodities (%)	4.7	9.7	11.2	10.2	15.4	10.5	10.4	6.3	20.4	8.9	5.4	7.5	6.3
Processed intermediates (%)	21.5	20.8	22.9	22.0	22.4	24.4	20.0	27.5	23.2	21.6	19.2	18.9	14.0
Consumer-ready food (%)	69.3	64.9	58.0	60.3	52.0	54.1	60.0	58.1	45.9	60.0	66.5	63.4	66.7
Horticulture (%)	4.5	4.6	7.9	7.5	10.1	10.9	9.6	8.2	10.4	9.5	8.9	10.2	13.0

(*continued on next page*)

Table 1 (*continued*)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Slovakia													
Export (million Euro)	133.3	143.6	185.7	167.8	200.7	210.9	243.5	220.5	222.3	268.7	388.2	425.7	523.6
Bulk raw commodities (%)	56.4	60.3	57.1	59.7	69.1	65.1	62.6	58.7	57.5	44.2	40.6	41.2	32.9
Processed intermediates (%)	24.4	22.1	26.3	23.5	16.9	18.5	13.5	16.3	17.8	13.7	11.7	10.3	8.1
Consumer-ready food (%)	12.9	12.8	13.4	14.0	10.9	14.8	21.9	22.7	21.9	36.3	40.2	40.1	44.1
Horticulture (%)	6.3	4.7	3.2	2.8	3.1	1.6	2.0	2.3	2.9	5.8	7.6	8.4	14.9
Import (million Euro)	227.4	239.5	262.0	277.5	247.7	291.3	315.6	305.9	280.3	344.9	424.1	482.3	606.8
Bulk raw commodities (%)	7.0	11.2	10.1	7.1	8.4	13.0	12.1	6.8	6.4	6.1	4.9	6.4	7.6
Processed intermediates (%)	28.9	26.2	29.6	31.5	28.9	28.9	30.8	34.9	33.0	28.7	22.8	22.0	17.9
Consumer-ready food (%)	41.4	41.4	40.7	39.4	39.5	38.5	40.2	38.5	41.2	48.4	54.0	51.3	52.4
Horticulture (%)	22.7	21.3	19.6	22.1	23.2	19.6	16.9	19.8	19.4	16.8	18.3	20.2	22.1
Slovenia													
Export (million Euro)	134.8	127.9	134.4	145.1	149.7	154.0	138.5	143.9	143.8	175.4	262.3	324.7	396.7
Bulk raw commodities (%)	43.7	35.8	39.0	40.1	41.9	43.6	43.0	42.9	41.7	30.9	23.7	25.6	24.8
Processed intermediates (%)	15.4	23.4	20.7	18.7	19.4	22.7	22.7	20.0	13.6	9.7	9.8	20.1	20.8
Consumer-ready food (%)	35.5	36.1	35.7	37.6	35.7	29.6	32.2	34.6	41.6	39.1	50.6	43.9	40.2
Horticulture (%)	5.4	4.7	4.5	3.6	3.1	4.0	2.1	2.4	3.0	20.3	15.9	10.4	14.2
Import (million Euro)	433.0	421.2	437.6	442.3	450.3	465.3	454.4	447.8	417.5	475.6	572.9	607.4	773.5
Bulk raw commodities (%)	11.2	12.8	14.2	13.5	15.4	16.3	16.5	15.6	14.0	11.1	5.9	6.8	12.8
Processed intermediates (%)	16.3	12.8	15.3	15.0	13.2	13.7	15.4	16.6	14.9	12.6	11.5	10.8	9.1
Consumer-ready food (%)	58.3	59.1	56.0	55.8	56.8	55.7	52.8	52.2	52.2	60.4	66.1	64.9	60.2
Horticulture (%)	14.2	15.4	14.5	15.7	14.6	14.2	15.4	15.6	18.9	15.9	16.5	17.5	17.8

Note: the nominal Euro values are deflated by annual average harmonized indices of consumer prices (HICP 1995 = 100) for Euro area.
Source: own calculations based on Eurostat Comext trade dataset, and Eurostat and European Central Bank for HICP.

Table 2
Descriptive statistics for revealed comparative export advantage (RXA) index (average for the period 1995–2007).

	Bulgaria	Croatia	Czech Republic	Hungary	Poland	Romania	Slovakia	Slovenia
Maximum RXA value	10473.44	423.06	7503.074	4033.43	5339.88	1565.62	4047.019	292.19
Minimum RXA value	0	0	0	0	0	0	0	0
Standard deviation in RXA value	137.766	15.89	90.95	65.81	70.048	45.54	52.55	9.040
Median value	0	0	0.005	0.02	0.03	0	0	0
Mean RXA value	10.108	2.102	3.355	8.067	24.22	4.282	3.066	1.227
RXA < 1 (number of SITC items)	1657	1925	3268	2884	3533	1891	1963	2559
RXA = 0 (number of SITC items)	4303	4590	2933	2698	2164	4504	378	979
RXA > 1 (number of SITC items)	1281	26	1040	1659	1544	846	900	703
Mean RXA value								
Bulk raw commodities	26.065	5.832	7.187	23.70	6.81	4.59	5.81	2.69
Processed intermediates	7.921	1.140	6.588	7.41	5.262	8.62	5.91	1.59
Consumer-ready food	8.707	2.151	0.735	5.59	5.64	1.58	0.93	0.68
Horticulture	4.542	0.417	0.698	3.089	1.96	2.67	0.58	0.86

Source: own calculations based on Eurostat Comext dataset.

Table 3
Descriptive statistics for import specialization advantage (RMA) index (average for the period 1995–2007).

	Bulgaria	Croatia	Czech Republic	Hungary	Poland	Romania	Slovakia	Slovenia
Maximum RMA value	4927.05	1492.28	1734.25	544.48	1876.07	922.43	941.51	2793.25
Minimum RMA value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Standard deviation in RMA value	314.29	104.99	115.83	35.83	128.25	62.88	60.75	190.11
Median value	0.18	0.30	0.30	0.16	0.37	0.14	0.15	0.32
Mean RMA value	26.54	14.96	12.49	4.42	13.97	8.15	6.14	20.93
RMA < 1 (number of SITC items)	1857	1975	1962	1807	1814	1934	2026	2099
RMA = 0 (number of SITC items)	474	398	234	271	241	387	480	361
RMA > 1 (number of SITC items)	438	320	333	488	481	361	269	196
Mean RMA value								
Bulk raw commodities	1.07	2.07	12.50	1.65	13.99	1.18	5.84	6.15
Processed intermediates	11.12	16.92	8.09	3.71	10.36	8.20	3.13	21.36
Consumer-ready food	54.31	21.78	17.62	6.57	18.39	12.66	9.48	30.93
Horticulture	0.68	1.47	2.57	2.31	4.69	0.50	1.04	1.15

Source: own calculations based on Eurostat Comext dataset.

proportionally sharp decline in the survival rates for the RTA indices after the EU enlargement for all countries. The slope of hazard function had been smoothly downward sloping until 2003, and after then it becomes more inelastic. This implies that the CEBCs lost their agro-food relative trade advantages significantly after the EU enlargement. The duration of the RTA index for year 13 is

Table 4
Descriptive statistics for relative trade advantage (RTA) index (average for the period 1995–2007).

	Bulgaria	Croatia	Czech Republic	Hungary	Poland	Romania	Slovakia	Slovenia
Maximum RTA value	10473.44	423.05	7503.073	4033.43	5339.88	1565.62	4047.019	292.19
Minimum RTA value	−19511.45	−3457456	−28241	−67354.45	−58621.21	−166916.2	−76599.91	−1080407
Standard deviation in RTA value	437.45	40659.86	361.89	804.18	716.78	1965.16	903.08	12697.85
Median value	−0.011	−0.38	−0.13	−0.01	−0.13	−0.04	−0.016	−0.13
Mean RTA value	−15.919	−542.28	−11.78	−8.69	−18.89	−28.88	−12.58	−163.01
RTA < 0	3848	5018	4977	4148	4585	4444	4136	5022
RTA = 0	1720	1322	709	811	625	1465	1663	1050
RTA > 0	1673	901	1555	2282	2031	1332	1442	1169
Mean RTA value								
Bulk raw commodities	23.96	0.990	−2.62	20.88	−4.65	3.255	2.051	−2.21
Processed intermediates	−12.95	−88.24	−15.94	−26.59	−42.06	−75.88	−31.38	−485.33
Consumer-ready food	−31.44	−1082.97	−12.62	−5.577	−9.41	−10.73	−5.25	−15.53
Horticulture	3.64	−10.04	−4.50	0.05	−4.99	0.82	−3.40	−3.34

Source: own calculations based on Eurostat Comext dataset.

generally low, particularly for Croatia, as the Kaplan–Meier survival rates are less than 2%. The survival rates are the highest for Hungary and Poland, and for Bulgaria in differentiated products, indicating agro-food trade potentials in the EU-15 markets.

The duration of the RTA indices by the product groups by the degree of product processing differs between the benchmark (Table 6) and differentiated products (Table 7). The duration of the RTA indices is the highest for bulk raw commodities by the CEBC-8 for the benchmark and for differentiated goods. The highest survival rates by product groups considerably exceed the similar values of total agro-food trade, suggesting greater survival ability in relative trade advantages for some groups and niche agro-food products. In general, the Kaplan–Meier survival rates of the RTA indices for bulk raw commodities are consistently higher for the benchmark than for the differentiated products, and vice versa for processed intermediates, more sophisticated consumer-ready food, and horticultural products, confirming the fragmentation issues. Horticultural products are also more sensitive to weather and marketing conditions.

We also check the significance of the observed differences in survival rates across agro-food product groups using the log-rank and Wilcoxon non-parametric tests. For the RTA indices our results for the benchmark, using both tests, show that we can reject the hypothesis of equality of survival function across product groups for all the countries at 1% level of significance, except for Slovenia. However, estimations for the RTA indices for differentiated prod-

Table 5
Kaplan–Meier survival rates for RTA indices.

Country	Benchmark			Differentiated products		
	1 year	10 year	13 year	1 year	10 year	13 year
Bulgaria	0.9425	0.3312	0.0371	0.9512	0.3984	0.0607
Croatia	0.9340	0.2809	0.0130	0.9359	0.2873	0.0123
Czech Republic	0.9403	0.3241	0.0308	0.9475	0.3717	0.0496
Hungary	0.9496	0.3759	0.0531	0.9536	0.4210	0.0730
Poland	0.9441	0.3542	0.0561	0.9512	0.3989	0.0701
Romania	0.9380	0.3082	0.0235	0.9463	0.3549	0.0436
Slovakia	0.9381	0.3103	0.0370	0.9457	0.3375	0.0464
Slovenia	0.9358	0.2928	0.0270	0.9389	0.3096	0.0368

Source: own calculations based on Eurostat Comext dataset.

Table 6
Kaplan–Meier survival rates for RTA indices of benchmark (13 years).

Country	Bulk raw commodities	Processed intermediates	Consumer-ready food	Horticulture	Wilcoxon test	Log-rank test
Bulgaria	0.1220	0.0307	0.0301	0.0294	0.0000	0.0000
Croatia	0.0363	0.0102	0.0122	0.0058	0.0035	0.0001
Czech Republic	0.1190	0.0316	0.0187	0.0317	0.0000	0.0000
Hungary	0.1339	0.0503	0.0429	0.0482	0.0000	0.0000
Poland	0.1163	0.0327	0.0655	0.0453	0.0006	0.0000
Romania	0.0871	0.0255	0.0146	0.0173	0.0000	0.0000
Slovakia	0.1496	0.0286	0.0285	0.0312	0.0000	0.0000
Slovenia	0.0728	0.0218	0.0225	0.0265	0.0833	0.0017

Source: own calculations based on Eurostat Comext dataset.

Table 7
Kaplan–Meier survival rates for RTA indices of differentiated products (13 years).

Country	Bulk raw commodities	Processed intermediates	Consumer-ready food	Horticulture	Wilcoxon test	Log-rank test
Bulgaria	0.105	0.062	0.042	0.109	0.0586	0.0114
Croatia	0.026	0.018	0.005	0.009	0.4258	0.2915
Czech Republic	0.083	0.062	0.040	0.024	0.0002	0.0001
Hungary	0.056	0.100	0.058	0.087	0.0029	0.0024
Poland	0.105	0.060	0.064	0.082	0.2002	0.1633
Romania	0.077	0.048	0.035	0.030	0.1484	0.0902
Slovakia	0.115	0.029	0.043	0.054	0.2213	0.0599
Slovenia	0.084	0.038	0.026	0.035	0.1329	0.0369

Source: own calculations based on Eurostat Comext dataset.

ucts provide different results. Namely, we can accept the hypothesis of equality of survival function across product groups for the majority of countries, except for Bulgaria, the Czech Republic, and Hungary, at one percent level of significance regarding both tests.

Conclusions and policy recommendations

The paper offers empirical evidence on the agro-food trade competitiveness of Central European and Balkan countries during the pre- and post-accession periods to EU membership. Our findings suggest considerable differences both across agro-food product groups and across countries. Hungary and Bulgaria switched from trade surplus to trade deficit in agro-food products on the EU-15 markets. Poland has improved its agro-food trade balance from trade deficit to trade surplus with the EU-15 markets, whereas the results for Romania are less stable as they vary by individual years. The Czech Republic, Croatia, Slovakia, and Slovenia are net importers of agro-food products from the EU-15 markets. The EU enlargement has increased agro-food trade and particularly Poland has made substantial improvements as a result of trade openness with the EU-15 markets. We are aware of the weaknesses of trade based measures of competitiveness. Agro-food trade flows reflect the significance of barriers to trade during the pre-accession period. Trade based measures of competitiveness provide a realistic indicator of underlying competitiveness only in the absence of significant barriers to trade in the post-accession period, but are a limitation for the pre-accession period. However, we believe that our results are reliable enough to draw agro-food policy recommendations.

The export performances of the CEBC-8 on the EU-15 markets for the bulk of raw commodities are the best, and the revealed comparative export advantages are found also for processed intermediates. Mixed results in exports by countries are found for consumer-ready food (good performing countries are Bulgaria, Croatia, Hungary, Poland, and Romania) and for horticultural products (good performing countries are Bulgaria, Hungary, Poland, and Romania). These differences in the results can be explained by differences in natural factor endowments and agricultural structures in production of the bulk of raw commodities, climatic conditions, lower labour input costs for horticultural products, improvements in food processing and food supply marketing chains for consumer-ready food and for processed intermediates.

However, none of the analyzed CEBC-8 was found efficient in import specialization in agro-food products from the EU-15 markets. Bulgaria and Romania were only efficient in import specialization of horticultural products. This evidence suggests that during the CEBC adjustments to EU membership and after the accession, the agro-food import specialization and substitution strategy by the CEBC-8 for imports from the EU-15 markets has not been considered as a real option. The increasing import competition from the EU-15 markets as a result of trade liberalization and accession has played an important role in structural adjustments and restructurings in agro-food sectors and marketing chains, thus creating pressures for quality and competitiveness improvements, yet also contributing to product varieties on the CEBC markets for consumers.

The simultaneous export and import performances are reflected in relative trade advantage, which is not confirmed for the CEBC-8 agro-food trade on the EU-15 markets. What is most striking is that none of the CEBC-8 has experienced relative trade advantages in consumer-ready food and processed intermediates on the EU-15 markets. Horticultural products are found with relative trade advantages on the EU-15 markets for Bulgaria, Romania, and Hungary, and bulk raw commodities for Bulgaria, Hungary, Croatia, Romania, and Slovakia. These findings reflect a situation in which there are better trade performances for raw agricultural products than for consumer-ready foods. The former are associated with favourable natural agricultural factor endowments and competitive agricultural structures, whereas the latter are related with improvements in agro-food processing, marketing and supply chain management.

The duration analysis shows that the EU enlargement has a rather negative impact on trade advantages in all countries as a result of increased competitive pressures. The estimations confirm the highest agro-food trade sustainability on the EU-15 markets for Hungary and Poland, and for Bulgaria in differentiated products. The improvements in relative trade advantages in agro-food products for the CEBC-8 in the EU-15 markets are seen in a synergy with new approaches towards more competitive differentiated agro-food products as a result of improvements in food processing and agro-food chain marketing, investments in technology improvements and upgrading of product qualities. Long term sustainable agro-food sector development can only be assured when agro-food products are competitive in regional and global trade. As confirmed by import specialization, several agro-food products on the CEBC-8 local markets are facing increasing import competition introduced by regional and global food chains and different international retailing supermarkets. These developments imply challenges for the CEBC agro-food supply chain management and commercial agro-food trading.

Except for Croatia, the other analyzed CEBC are already EU members. Within the EU, agricultural and rural development policies provide an enabling environment and budgetary support to operate and conduct agro-food businesses in the Single European Market (SEM), whereas sustainable farm, food processing and agro-business development in the agro-food chain, and thus rural economy development, largely depends on the agro-food sector units' abilities to efficiently compete and sustain competitiveness in the borderless SEM and in global markets. For some CEBC, like Slovenia, rural development has to be driven by non-agricultural activities, particularly service activities, and by exploitation of certain niches for food products, which less depend on cost based advantages. To be competitive and sustain competitiveness is the major challenge for the CEBCs in the EU to efficiently compete with agro-food produce in the SEM, assuring conditions for sustainable development of agriculture and the rural country-side as an issue for future research.

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