Former Central European Free Trade Agreement countries' agri-food trade specialisation

Die Spezialisierung des Agrarhandels der ehemaligen Länder des Mitteleuropäischen Freihandelsabkommens (CEFTA)

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Abstract

The paper evaluates agri-food trade competitiveness and specialisation patterns of the former Central European Free Trade Agreement (CEFTA-7) countries compared with the European Union (EU-15) from 1995-2007. Agri-food trade specialisation stability and duration are investigated by main agri-food product groups according to the degree of product processing and dynamics in the demand growth exhibited by the EU-15 market. Except for Poland and Hungary, the former CEFTA-7 countries face a trade deficit in agri-food products with the EU-15 markets. The former CEFTA-7 agri-food exports to EU-15 markets are specialised towards higher-value, processed, consumer-ready food as a result of agri-food sector restructuring and integration to more competitive EU markets. The former CEFTA-7 agri-food export specialisation towards the EU-15 markets' most demanded products is also revealed. The results confirm that EU integration increases size of trade, stability, and the duration of former CEFTA-7 agri-food trade products on EU-15 markets.

Key words

competitiveness; trade specialisation; Central and Eastern Europe; European Union

Zusammenfassung

Dieser Beitrag beschäftigt sich mit der Wettbewerbsfähigkeit im Handel mit Agrar- und Ernährungsgütern sowie mit Spezialisierungsmustern der früher im Mitteleuropäischen Freihandelsabkommen (CEFTA-7) zusammengeschlossenen Länder im Vergleich zur Europäischen Union (EU-15) für den Zeitraum 1995-2007. Stabilität und Dauer von Handelsspezialisierungen werden anhand von Hauptproduktgruppen entsprechend dem Verarbeitungsgrad und der Dynamik des Nachfrageanstiegs auf dem EU-15-Markt untersucht. Mit Ausnahme von Polen und Ungarn sind die ehemaligen CEFTA-7-Länder mit einem Handelsdefizit an Agrarprodukten auf den EU-15-Märkten konfrontiert. Die Agrarexporte der ehemaligen CEFTA-7-Länder können als höherwertige, verarbeitete, verbrauchsfertige Nahrungsmittel bezeichnet werden. Dies ist sicherlich das Ergebnis der Umstrukturierung und Integration in die wettbewerbsfähigeren EU-Märkte. Außerdem wird aufgezeigt, welches die auf den EU-15-Märkten am meisten nachgefragten Produkte sind und wie sich die CEFTA-7-Länder auf diese Agrarexporte spezialisiert haben. Die Ergebnisse bestätigen, dass die EU-Integration den Handelsumfang und die Stabilität der Agrarprodukte der ehemaligen CEFTA-7-Länder auf den EU-15-Märkten erhöht.

Schlüsselwörter

Wettbewerbsfähigkeit; Handelsspezialisierung; Mittel- und Osteuropa; Europäische Union

1. Introduction

This paper analyses agri-food trade competitiveness and trade specialisation patterns for the former Central European Free Trade Agreement (CEFTA-7) countries before and after accession to the European Union (EU). The previous studies of agri-food trade competitiveness by EITEL-JÖRGE and HARTMANN (1999), BOJNEC (2001), FERTŐ and HUBBARD (2003), FERTŐ (2005), BOJNEC and FERTŐ (2007; 2010) employ a relative trade advantage index (VOLLRATH, 1991). Following BOJNEC and FERTŐ (2009), we investigate the former CEFTA-7 countries' agri-food trade structures, trade competitiveness, and trade specialisation patterns with the EU-15 by employing the LAFAY (1992) (LF) index, which was introduced to the transition literature by ZAGHINI (2005). We aim to identify the most specialised agri-food product groups, and evaluate the stability and dynamics of agri-food trade specialisation patterns for the former CEFTA-7 countries (Bulgaria, the Czech Republic, Hungary, Poland, Romania, Slovakia, and Slovenia), with the EU-15 being the agri-food export market. As LAFAY's (1992) index does not provide a benchmark country for comparing the results, Germany, as the former CEFTA-7's most significant agri-food market outlet, is used as the EU-15's internal benchmark country.

The paper contributes to the literature in two significant ways. First, it provides comparative analysis and evidence on agri-food trade structures, competitiveness performances, and trade specialisation patterns for the former CEFTA-7 countries, both before and after EU accession. The levels, evolution, and stability of agri-food trade competitiveness and trade specialisation patterns are investigated by main agri-food product groups, by the degree of product processing, and by the dynamics in demand growth of each year from 1995-2007. Second, the paper highlights the importance of the empirical results on agri-food trade structures and specialisation to derive policy implications for agri-food trade competitiveness and specialisation for the former CEFTA-7 countries, both before and after EU membership.

The paper is structured as follows. We first describe methodology and data used. We then present the empirical results and findings on the former CEFTA-7 agri-food trade developments with the EU-15; the calculated LF indices

and the most important agri-food trade structures; the regression analysis for the dynamics of the LF indices; and the estimated survival rates for the LF indices. The final section concludes.

2. Methodology and data

The empirical research on international trade specialisation often uses a wide array of trade indicators. The revealed comparative export advantage (RCA) index by BALASSA (1965) is particular popular. However, this index is subject to criticisms in empirical trade analysis, for example the asymmetric value problem and the problem with logarithmic transformation (see DE BENEDICTIS and TAMBERI, 2001). A further problem is the distortion introduced in the analysis, which may arise from the evolution of minority flows, the relative weight of the products, and from the macroeconomic situation such that cyclical factors confound the measurement of trade specialisation with the RCA index (e.g. ZAGHINI, 2005; FERTŐ and SOOS, 2008). LAFAY (1992) proposed solving some of these shortcomings through the construction of weighted indicators of contribution to the trade balance that, even if they contain interesting information, are ambiguous precisely in the measurement of trade specialisation. Because of the growing importance of intra-industry trade in agri-food trade, as well as macroeconomic fluctuation in the analysed period, the application of the Lafay index is becoming more popular (e.g. IAPADRE, 2001; LEMOINE and ÜNAL-KESENCI, 2004; YILMAZ, 2005; ALESSANDRINI et al., 2007). We apply the LAFAY (LF) (1992) index:

$$(1) \quad LF_j^i = \left(\frac{x_j^i - m_j^i}{x_j^i + m_j^i} - \frac{\sum_{j=1}^{N} x_j^i - m_j^i}{\sum_{j=1}^{N} x_j^i + m_j^i} \right) \frac{x_j^i + m_j^i}{\sum_{j=1}^{N} x_j^i + m_j^i},$$

where x_j^i and m_j^i are exports and imports of product j of former CEFTA country i, to and from the EU-15, respectively, and N is the total number of agri-food products. The LF-index measures the trade specialisation of former CEFTA country i in the production of product j, which is measured as the deviation of the product j normalised trade balance from the overall normalised agri-food trade balance. The normalisation of each product or sector is obtained by weighting each product's contribution regarding its respective importance in agri-food trade. Because the LF-index measures each product's contribution to the overall normalised agri-food trade balance, the sum of the LF-index is zero and thus the following relation holds: $\sum_{j=1}^{N} LF_j^i = 0$. If LF>0 holds for a certain product j, then a trade specialisation is revealed and the larger value indicates the higher degree of the product's trade specialisation. Similarly, negative values imply trade de-specialisation. Our focus is not on the full trade balance, but the LF-index is only calculated for a subgroup of agri-food trade.

Moreover, we investigate the stability of the LF-index's distribution from one period to another. Following DALUM et al. (1998) we use LF-index in regression analysis such that:

$$(2) \quad LF_{ij}^{t2} = \alpha_i + \beta_i LF_{ij}^{t1} + \varepsilon_{ij},$$

where the superscripts $t1$ and $t2$ describe the beginning and ending year, respectively. This implies that the results are sensitive to the choice of the beginning and ending years. We check the robustness of the results by using various beginning and ending years as alternatives (see also BOJNEC and FERTŐ, 2008). The dependent variable, the LF-index at time $t2$ for sector i in former CEFTA country j, is tested against the independent variable, which is the value of LF-index in year $t1$; α and β are standard linear regression parameters and ε is a residual term. If β>1, the existing specialisation of the former CEFTA country is strengthened. In this instance, a low level of specialisation in the initial period leads to less specialisation in the future. Such a movement can be called by β divergence. As a matter of fact, it is just the opposite impact when 0<β<1, which indicates de-specialisation. This means that commodity groups with low initial LF-indices grow over time, while product groups with a high initial LF-index decline. This case can be termed by β convergence. If β=1, then this suggests an unchanged trade specialisation pattern between periods $t1$ and $t2$. The special case exists where β<0, which indicates a change in the sign of the index. However, DALUM et al. (1998) point out that β>1 is not a necessary condition for growth in the overall trade specialisation pattern. Thus, following CANTWELL (1989), they argue that:

$$(3a) \quad \sigma_i^{2t2} / \sigma_i^{2t1} = \beta_i^2 / R_i^2,$$

and hence,

$$(3b) \quad \sigma_i^{t2} / \sigma_i^{t1} = |\beta_i| / |R_i|,$$

where R is the correlation coefficient from the regression and σ^2 is variance of the dependent variable. It follows that the trade specialisation pattern of a given distribution is unchanged when β=R. If β>R, the degree of specialisation has grown, which is termed σ divergence. However, if β<R, the degree of specialisation has fallen, which is termed σ convergence.

To investigate the probability of a country ceasing to market a product competitively in the EU-15, we use a duration analysis. The duration analysis of trade specialisation is estimated by the survival function $S(t)$, by using the nonparametric Kaplan-Meier product limit estimator. We assume that a sample contains n independent observations denoted $(ti; ci)$, where i = 1, 2,…, n, ti is the survival time, and ci is the censoring indicator variable C taking a value of 1 if failure occurs, and 0 otherwise of observation i. We also assume that there are m < n recorded times of failure. The rank-ordered survival times are denoted as t(1) < t(2) < … < t(m). Yet nj denotes the number of subjects at risk of failing at $t(j)$, and dj denotes the number of observed failures. The Kaplan-Meier estimator of the survival function is then:

$$(4) \quad \hat{S}(t) = \prod_{t(i)<t} \frac{n_j - d_j}{n_j},$$

with the convention that $\hat{S}(t) = 1$ if t < t(1). Given that many observations are censored, we note that the Kaplan-

Meier estimator is robust to censoring and use information from both censored and non-censored observations.

The empirical analysis focuses on the period between 1995 and 2007 using the Eurostat Comext trade dataset. The analysis contains seven former CEFTA countries. Agri-food trade is defined by the COMMISSION OF THE EUROPEAN UNION (1999). Our data sample consists of 575 items at the five-digit level of the Standard International Trade Classification (SITC) system. As is known from the literature on intra-industry trade, higher aggregation levels result in higher survival rates. The five-digit SITC level represents a medium aggregation level, which is commonly used in the literature.

Following CHEN et al. (2000) we classify agri-food trade into four commodity groups by the degree of processing: (1) bulk raw commodities, (2) processed intermediates, (3) consumer-ready food, and (4) horticulture. The purpose of this analysis is to evaluate the former CEFTA-7 trade structures, trade competitiveness performances, and trade specialisation patterns on the EU-15 markets. We expect that the former CEFTA agri-food sector restructurings, as well as trade liberalisation, EU membership and economic growth, are inducing a shift in agri-food exports and trade competitiveness specialisations from lower-valued bulk raw commodities towards higher-valued intermediate and consumer-ready processed food products. These achievements are compared with Germany, which is used as the benchmark. Moreover, following ZAGHINI (2005) and CRESPO and FONTOURA (2007) we classify agri-food trade into three groups of agri-food products depending on the demand growth dynamics in the EU-15 markets over the analysed period. If the export adjustments are efficient, we expect a higher share of agri-food exports and a positive mean value of the LF-index for agri-food trade specialisation in faster growth demand groups. We compare the results with Germany because it is the main trading partner for the former CEFTA-7 countries. We also present the empirical results of the LF-index for the five most important exported products, which are identified by their export share to evaluate the degree of the former

CEFTA-7 agri-food export concentration and trade specialisation on the EU-15 markets.

3. Results and findings

3.1 Agri-food trade developments

As shown by BOJNEC (1996) and the COMMISSION OF THE EUROPEAN UNION (1998), in the initial stage of transition prior to 1995, only Hungary and Bulgaria experienced agri-food trade surpluses domestically, as well as in trade with EU markets. Poland shifted from agri-food trade surplus to agri-food trade deficit. Romania, the Czech Republic, Slovakia, and Slovenia experienced agri-food trade deficits, which were largely related to trade with the EU-15 markets. Since 1995, the analysed former CEFTA-7 countries, and Germany, have experienced diverging patterns in agri-food trade developments with the EU-15 markets (table 1). The Czech Republic, Slovakia, Slovenia and Germany experienced agri-food trade deficits in the EU-15 markets. Bulgaria turned from agri-food trade surplus to trade deficit. Annual variations and more recent net agri-food imports from the EU-15 are seen for Romania. Hungary maintains an agri-food trade surplus, while a positive shift from net agri-food trade importer to net agri-food trade exports to the EU-15 markets is seen for Poland. These heterogeneous developments are reflected in the results of the LF-index.

Figure 1. **β/R Ratio with varying lags by countries, 1995-2007**
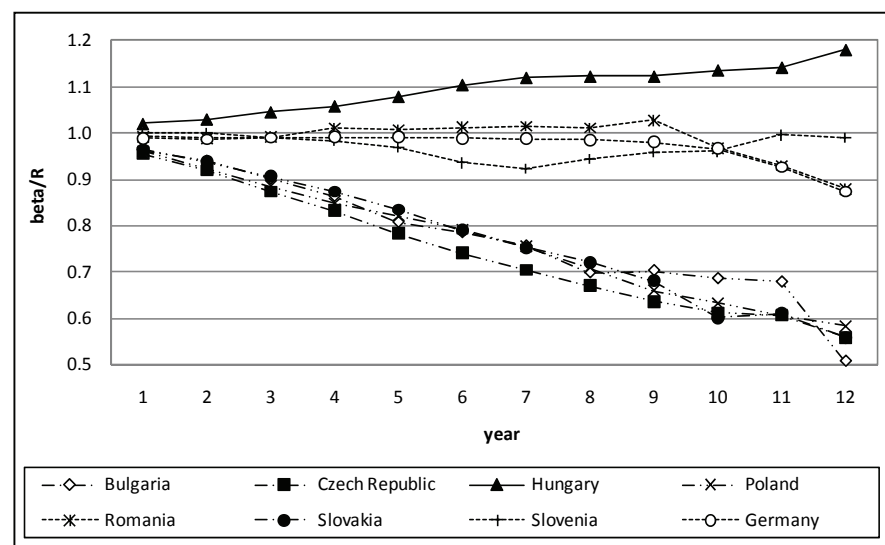
Source: authors' calculations

Table 1. **Net agri-food trade (exports – imports) for former CEFTA-7 countries and Germany with the European Union (EU-15) from 1995-2007 (in million Euros, in constant 1995 prices)**

	1995	1997	1999	2001	2003	2005	2007
Bulgaria	0.6	79	90.7	2.5	50.3	67.4	-93.4
Czech Republic	-236.4	-323	-227.1	-361.7	-432.7	-586	-737.3
Hungary	577.5	597.5	710.6	670	702	338.2	377.8
Poland	-108.1	-400.8	-142.6	-201.7	307.7	461.7	760.8
Romania	-164.7	-74.3	89.1	-33.3	-63.6	-238.6	-568.4
Slovakia	-94.2	-76.2	-47	-72.1	-58.1	-36	-83.2
Slovenia	-298.2	-303.2	-300.5	-316	-273.7	-310.6	-376.9
Germany	-12 976.8	-13 210	-11 638.1	-9 938.3	-8 800.8	-6 300.9	-4 987.1

Note: The nominal Euro values are deflated by annual average harmonised indices of consumer prices (HICP 1995=100) for the Euro area.

Source: own calculations based on Eurostat Comext trade dataset and Eurostat for HICP

These observations imply a lack of competitiveness of the former CEFTA agri-food sectors in the EU-15 markets, which have not been overcome during the transition process, economic liberalisation, restructuring, or EU integration. The most positive examples are Poland and Hungary, which have made considerable progress in agri-food trade performances in the EU-15 markets.

3.2 Lafay index and trade specialisation pattern

We conducted the analyses of relative competitiveness using the LF–index, which is normalised to the former CEFTA-7 total agri-food trade as the benchmark of comparison instead of total traded merchandise. This normalisation procedure is due to interpretation: The mean value of the calculated LF-index as the sum of the values for the analysed agri-food products per definition equals zero. The LF-index value by agri-food products can be positive, meaning trade specialisation, or negative, meaning trade de-specialisation, or it can equal zero, meaning a break-even point between trade specialisation and trade de-specialisation.

The empirical results of the LF-index estimation show the range of variation between trade de-specialised products with negative minimum values and trade specialised products with positive maximum values varies between former CEFTA-7 countries, but much less so for Germany (table 2). Between 1995 and 2007, the range of variation, except for Hungary in 2007, declined, which was caused by the reduced range of variation in trade specialisation. The decline in standard deviation is particularly caused by the decline in the LF-index maximum value, indicating a deterioration in the former CEFTA-7 specialisation pattern.

We have also analysed the importance of the five most important products[1] in total agri-food exports to the EU-15 markets, which increased for Hungary and Romania, but declined for Bulgaria, the Czech Republic, Poland, Slovakia, and Slovenia. For Germany, it is rather stable at a relatively lower level than the former CEFTA-7 countries. The reason is the greater number of important exported products as a result of more diversified and developed agri-food sectors. Except for Poland and to a lesser extent Bulgaria, more than one-quarter of agri-food exports to EU-15 markets is concentrated on the five most important products. As expected, the former CEFTA-7 comparison with Germany clearly shows that the former CEFTA-7 agri-food export concentration on EU-15 markets is much more concentrated on the few top products than for Germany, which is exporting a wider range of agri-food products as a result

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[1] The following products are frequently among the top-5 products in the former CEFTA-7 countries: for Bulgaria, these are tobacco; poultry cuts and offal, wool tops and other combed wool; other wheat, meat of sheep; for the Czech Republic, these are wood of coniferous species; cigarettes containing tobacco; milk and cream; for Hungary, these are other wheat; sunflower seeds; and poultry cuts and other offal; for Poland, these are meat of bovine animals; cigarettes containing tobacco; and poultry cuts and other offal; for Romania, these are wood of non-coniferous species; cigarettes containing tobacco; and other than pure-bred breeding animals; for Slovakia, these are wood of coniferous species; butter and other fats and oils derived from milk; beet sugar; and sunflower seeds; and for Slovenia, these are vegetable residues of soya beans; milk and cream; wood of non-coniferous species; and woods in the rough or roughly squared.

Table 2. **Summary statistics for the LF-index, 1995-2007**

	1995	1997	1999	2001	2003	2005	2007
Bulgaria							
Maximum	10.76	12.83	11.79	7.60	4.32	4.53	2.26
Minimum	-4.17	-6.29	-3.77	-3.87	-3.77	-6.00	-3.02
Standard dev.	0.67	0.71	0.72	0.58	0.49	0.50	0.34
Range	14.93	19.12	15.56	11.47	8.10	10.53	5.28
Czech Republic							
Maximum	12.53	11.50	11.10	8.23	7.18	4.77	4.14
Minimum	-2.83	-2.64	-2.82	-3.54	-3.36	-2.50	-2.17
Standard dev.	0.69	0.65	0.65	0.53	0.51	0.40	0.39
Range	15.36	14.13	13.93	11.77	10.55	7.28	6.31
Hungary							
Maximum	3.32	2.51	2.25	3.15	3.05	4.40	8.24
Minimum	-4.20	-2.22	-2.32	-2.02	-3.06	-2.37	-1.82
Standard dev.	0.38	0.32	0.31	0.32	0.34	0.36	0.44
Range	7.52	4.73	4.57	5.17	6.11	6.77	10.07
Poland							
Maximum	4.85	4.15	2.72	3.38	3.25	1.91	2.12
Minimum	-3.75	-2.50	-3.07	-5.33	-3.62	-2.78	-2.53
Standard dev.	0.48	0.44	0.42	0.43	0.38	0.31	0.28
Range	8.60	6.66	5.79	8.70	6.86	4.69	4.65
Romania							
Maximum	4.20	5.00	8.61	5.67	6.23	5.54	4.95
Minimum	-5.49	-5.83	-4.21	-3.35	-5.41	-6.66	-2.88
Standard dev.	0.52	0.56	0.65	0.57	0.63	0.58	0.46
Range	9.69	10.83	12.81	9.02	11.64	12.20	7.83
Slovakia							
Maximum	8.33	7.88	8.40	6.26	6.84	5.07	3.60
Minimum	-3.13	-5.02	-4.47	-4.51	-3.85	-2.67	-1.68
Standard dev.	0.61	0.61	0.65	0.59	0.55	0.43	0.34
Range	11.46	12.90	12.87	10.77	10.69	7.74	5.28
Slovenia							
Maximum	7.10	6.85	8.34	8.67	8.15	3.68	5.23
Minimum	-3.40	-2.81	-4.60	-1.90	-1.84	-2.90	-2.86
Standard dev.	0.43	0.44	0.50	0.50	0.45	0.39	0.43
Range	10.50	9.66	12.94	10.57	10.00	6.57	8.09
Germany							
Maximum	1.42	1.65	1.54	2.19	2.27	2.94	1.87
Minimum	-1.79	-1.52	-1.62	-1.68	-1.53	-1.36	-1.24
Standard dev.	0.21	0.2	0.19	0.2	0.19	0.21	0.18
Range	3.22	3.17	3.15	3.87	3.79	4.3	3.11

Source: own calculations based on Eurostat Comext dataset

of more developed food processing and international agri-food marketing.

The single LF-index values show decline for the five most important exported agri-food products in the former CEFTA-7 and Germany, except for an increase in Hungary, Romania and Slovenia. The development of the LF-indices over time and their differences across countries imply changes in the former CEFTA-7's total size of agri-food exports and in its structures. This is consistent with changing specialisation patterns that are caused by restructuring, as well as more competitive market structures.

The cumulative LF-index values for the four agri-food commodity groups[2] reveal trade specialisation patterns towards bulk raw commodities that are deteriorating, except for Hungary and Romania (table 3). For the other three pro-

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[2] These are (1) bulk raw commodities, (2) processed intermediates, (3) consumer-ready food, and (4) horticulture.

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Table 3.	Cumulative LF-index by product groups, 1995-2007						
	1995	1997	1999	2001	2003	2005	2007
				Bulgaria			
Bulk raw commodities	11.35	5.31	13.57	13.35	15.46	16.60	9.16
Processed intermediates	-4.87	-10.18	-8.31	-8.33	-11.71	-11.02	-3.92
Consumer-ready food	-12.65	-0.39	-9.37	-9.77	-8.09	-8.09	-7.92
Horticulture	6.16	5.26	4.10	4.75	4.34	2.51	2.68
				Czech Republic			
Bulk raw commodities	22.60	19.64	24.30	18.03	17.44	14.06	14.20
Processed intermediates	-3.78	-3.23	-4.81	-4.65	-5.55	-4.65	-4.29
Consumer-ready food	-15.95	-12.28	-14.75	-8.65	-7.22	-5.89	-8.09
Horticulture	-2.87	-4.13	-4.74	-4.73	-4.67	-3.52	-1.82
				Hungary			
Bulk raw commodities	6.14	4.57	5.63	5.02	7.66	11.86	14.14
Processed intermediates	-4.23	-6.89	-6.99	-5.11	-4.08	-2.98	-1.50
Consumer-ready food	-2.94	2.87	1.92	0.27	-2.59	-8.95	-12.10
Horticulture	1.03	-0.54	-0.55	-0.18	-1.00	0.07	-0.54
				Poland			
Bulk raw commodities	8.27	2.30	4.92	1.84	2.90	1.90	0.17
Processed intermediates	-7.62	-7.42	-7.25	-8.23	-9.28	-6.08	-4.02
Consumer-ready food	-2.02	4.24	1.91	4.96	5.34	4.67	4.20
Horticulture	1.38	0.88	0.42	1.43	1.04	-0.50	-0.35
				Romania			
Bulk raw commodities	7.57	6.48	20.56	14.46	12.20	22.63	13.33
Processed intermediates	3.75	3.41	-1.75	6.14	0.74	0.74	4.09
Consumer-ready food	-16.89	-14.63	-19.34	-23.58	-14.40	-23.03	-18.48
Horticulture	5.58	4.74	0.53	2.98	1.46	-0.34	1.06
				Slovakia			
Bulk raw commodities	23.01	22.84	30.04	24.84	25.21	17.80	12.57
Processed intermediates	-2.08	-1.63	-5.95	-8.52	-7.53	-5.53	-4.84
Consumer-ready food	-19.20	-18.24	-19.23	-12.18	-12.86	-9.19	-7.32
Horticulture	-1.72	-2.98	-4.86	-4.14	-4.82	-3.08	-0.41
				Slovenia			
Bulk raw commodities	11.75	8.91	9.93	9.51	10.56	7.69	5.36
Processed intermediates	-0.33	1.95	2.30	2.63	-0.49	-0.75	5.23
Consumer-ready food	-11.10	-9.41	-9.79	-9.24	-6.99	-6.20	-10.12
Horticulture	-0.32	-1.44	-2.44	-2.91	-3.08	-0.74	-0.48
				Germany			
Bulk raw commodities	1.84	1.20	1.26	1.46	0.64	1.27	1.48
Processed intermediates	4.02	3.70	2.62	1.86	1.05	-0.12	-1.01
Consumer-ready food	0.46	1.25	2.54	2.90	4.68	4.77	4.99
Horticulture	-6.31	-6.16	-6.43	-6.22	-6.36	-5.91	-5.45
Source: own calculations based on Eurostat Comext dataset							

duct groups, the former CEFTA-7 results are mixed, though there is a prevalence on trade de-specialisation on the EU-15 markets in processed intermediates (except, to a lesser extent, for Romania and Slovenia), consumer-ready food (except for Poland and in the past for Hungary), and in horticultural products (except for Bulgaria, and to a lesser extent for Romania, and in the past for Hungary and Poland).

Table 4 presents structural changes in trade specialisation by agri-food product groups by the degree of product processing in 1995 and 2007. Consumer-ready food has the highest share of product groups with LF>0, and further increases for Poland (even more than for Germany). Consumer-ready food has also become the single most important product group with LF>0 for Bulgaria, Hungary, Slovakia, Slovenia and the Czech Republic. Only for Romania is the share of processed intermediates higher than for consumer-ready food. The former CEFTA-7 countries have experienced deteriorating trade specialisation for horticultural products. For bulk raw commodities and processed intermediates, the results are mixed between countries. These developments imply the declining importance of agriculture and greater opportunities for trade in higher value-added food processing products.

The former CEFTA-7 countries' agri-food exports are shifting towards the most dynamic growth products demanded by the EU-15. Table 5 presents the former CEFTA-7 agri-food export structures and a similar comparison with Germany along the three dynamic demand growth groups by EU-15 markets: (i) demand growth rate equal to or less than 5%, (ii) demand growth rate between 5 and 10 %, and (iii) demand growth rate greater than 10%. Germany has further strengthened its agri-food export specialisation towards the most dynamic demand growth group. A similar pattern in development from the least-dynamic and medium-dynamic demand growth groups towards the most-dynamic demand growth group is also found for the Czech Republic, Hungary, Poland, Romania, and Slovakia. Except for Romania, and to a lesser extent for Slovakia, the share of the most dynamic demand growth group is greater than 60%. Bulgaria and Slovenia represent a separate group with a shift from the least-dynamic demand growth group towards the medium-dynamic and particularly towards the most-dynamic demand growth group.

Table 6 presents the cumulative LF-index for the three dynamic demand growth groups in the EU-15 market. The results for the former CEFTA-7 countries are mixed. For Bulgaria, the results confirm a deteriorating trade specialisation for the least dynamic demand growth group, but a shift from trade de-specialisation to trade specialisation patterns for the medium-growth demand group. For the fastest-growing demand group the de-specialisation pattern has remained. The Czech Republic experiences a shift from trade de-specialisation in the least and middle dynamic demand growth groups to trade specialisation pattern in the fastest growing demand group. Hungary experiences deteriorating trade specialisation for the least dynamic demand growth group, a shift from trade specialisation to trade de-specialisation for the medium-growth demand group, and vice-versa for the most dynamic demand growth group with trade specialisation patterns. The shift from trade specialisation to trade de-specialisation for the least and medium-

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Table 4.   **The share (in percentage) of product groups with LF>0, 1995 and 2007**

	Bulgaria	Czech Republic	Hungary	Poland	Romania	Slovakia	Slovenia	Germany
	Share of product groups with LF>0							
	1995							
Bulk raw commodities	22.6	23.3	17.6	13.6	17.4	21.3	17.4	10.6
Processed intermediates	29.9	41.7	32.7	26.4	33.0	39.8	32.1	40.8
Consumer-ready food	26.3	26.7	34.6	45.0	32.1	27.8	38.5	38.9
Horticulture	23.4	11.7	17.6	16.4	19.3	13.9	11.9	10.6
	2007							
Bulk raw commodities	18.2	22.8	21.3	12.3	25.0	24.6	19.6	12.2
Processed intermediates	28.7	35.0	32.3	25.1	36.0	31.4	32.4	31.4
Consumer-ready food	39.9	35.0	36.2	53.8	32.0	38.1	36.3	49.0
Horticulture	14.0	9.8	12.6	10.5	10.0	8.5	11.8	9.0

Source: own calculations based on Eurostat Comext dataset

demand growth groups, and vice-versa for the shift from trade de-specialisation to trade specialisation for the fastest growing demand group is clearly confirmed for Poland. The results for Romania indicate a trade specialisation pattern for the least dynamic demand growth group, a shift from trade specialisation to trade de-specialisation for the medium-demand growth group, and a slight improvement in trade de-specialisation patterns for the fastest growing demand group. Slovakia experiences deteriorating trade specialisation for the least dynamic demand growth group, trade de-specialisation for the medium-growth demand group, and a shift from trade de-specialisation to trade spe-

cialisation for the most dynamic demand growth group. For Slovenia, the results indicate significant deterioration in trade specialisation for the least dynamic demand growth group, a shift from trade de-specialisation to trade specialisation for the middle dynamic demand growth group, and improvements in trade de-specialisation for the fastest dynamic demand growth group. Germany experiences trade de-specialisation for the least and medium dynamic demand growth groups, and trade specialisation for the fastest growing demand group. With a time lag, some similarities are seen for the Czech Republic, Hungary, Poland, and Slovakia. Overall, one can state that trade is specialising towards

Table 5.   **Export shares by demand growth groups (in percentage) from 1995-2007**

Growth rate	1995	1997	1999	2001	2003	2005	2007
	Bulgaria						
≤5%	47.35	32.40	40.84	36.48	39.32	36.34	24.33
5.01% to ≤10%	16.38	21.71	16.16	21.09	21.43	19.81	29.86
>10.01%	36.28	45.88	43.00	42.43	39.24	43.85	45.80
	Czech Republic						
≤5%	49.82	47.81	43.34	38.80	35.42	23.39	17.80
5.01% to ≤10%	33.41	29.48	29.60	27.48	35.67	21.46	19.56
>10.01%	16.77	22.70	27.07	33.73	28.92	55.15	62.63
	Hungary						
≤5%	43.35	38.59	35.61	34.34	34.57	25.41	22.25
5.01% to ≤10%	28.61	26.37	25.32	25.23	27.44	22.50	17.29
>10.01%	28.05	35.05	39.07	40.43	37.99	52.10	60.46
	Poland						
≤5%	40.24	37.90	34.12	28.89	24.22	14.09	11.60
5.01% to ≤10%	38.78	38.45	38.46	38.74	36.35	26.16	21.27
>10.01%	20.98	23.66	27.42	32.37	39.43	59.75	67.13
	Romania						
≤5%	47.2	47.7	60.1	59.1	60.1	49.0	34.0
5.01% to ≤10%	27.1	27.5	22.0	17.9	19.1	15.2	16.1
>10.01%	25.7	24.8	17.9	23.0	20.9	35.8	49.8
	Slovakia						
≤5%	63.78	55.21	61.84	56.18	57.68	31.88	26.05
5.01% to ≤10%	21.95	23.43	19.56	14.51	14.53	20.94	16.28
>10.01%	14.27	21.36	18.60	29.31	27.79	47.18	57.67
	Slovenia						
≤5%	61.5	56.8	57.6	60.7	54.3	30.8	21.7
5.01% to ≤10%	10.2	10.4	7.4	7.2	8.9	14.9	26.5
>10.01%	28.3	32.7	35	32.1	36.8	54.4	51.8
	Germany						
≤5%	20.5	20.8	19.0	17.8	17.1	16.6	17.2
5.01% to ≤10%	19.6	18.3	18.5	16.9	18.3	17.8	17.9
>10.01%	59.8	60.9	62.5	65.3	64.6	65.6	64.9

Source: own calculations based on Eurostat Comext dataset

Table 6.   **Cumulative LF-index by demand growth groups, 1995-2007**

Growth rate	1995	1997	1999	2001	2003	2005	2007
	Bulgaria						
≤5%	10.03	0.75	6.61	7.25	9.89	9.33	2.20
5.01% to ≤10%	-5.17	-2.13	-5.92	-4.50	-5.19	-5.85	1.45
>10.01%	-4.85	1.38	-0.69	-2.76	-4.70	-3.48	-3.65
	Czech Republic						
≤5%	12.77	12.37	11.96	9.57	8.26	0.88	-1.52
5.01% to ≤10%	0.00	-2.59	-3.40	-3.78	-0.08	-3.53	-3.72
>10.01%	-12.77	-9.78	-8.56	-5.79	-8.19	2.65	5.23
	Hungary						
≤5%	5.44	3.83	3.66	5.73	5.77	3.52	0.23
5.01% to ≤10%	3.14	0.11	-1.50	-2.22	-0.17	-1.25	-2.40
>10.01%	-8.58	-3.94	-2.15	-3.51	-5.61	-2.26	2.17
	Poland						
≤5%	9.70	8.59	8.24	4.84	2.01	-3.52	-4.45
5.01% to ≤10%	3.39	2.39	-0.32	-2.34	-2.46	-3.90	-2.82
>10.01%	-13.09	-10.98	-7.92	-2.50	0.45	7.42	7.27
	Romania						
≤5%	11.98	10.92	15.17	18.76	18.34	15.84	8.00
5.01% to ≤10%	4.38	3.56	-1.71	-4.61	-2.32	-3.34	-4.92
>10.01%	-16.36	-14.48	-13.46	-14.15	-16.02	-12.50	-3.08
	Slovakia						
≤5%	16.81	13.42	17.55	15.97	15.06	5.39	1.81
5.01% to ≤10%	-5.71	-5.25	-8.00	-9.05	-9.25	-2.68	-4.91
>10.01%	-11.10	-8.17	-9.55	-6.92	-5.81	-2.72	3.11
	Slovenia						
≤5%	15.56	13.33	13.60	13.50	12.17	6.42	-0.86
5.01% to ≤10%	-5.27	-4.98	-6.10	-6.49	-7.67	-3.42	2.07
>10.01%	-10.29	-8.35	-7.50	-7.01	-4.50	-2.99	-1.21
	Germany						
≤5%	-0.65	0.46	-0.72	-0.64	-0.86	-0.78	-0.42
5.01% to ≤10%	-3.89	-4.23	-4.24	-4.7	-4.92	-5.04	-4.95
>10.01%	4.53	3.76	4.96	5.33	5.78	5.82	5.38

Source: own calculations based on Eurostat Comext dataset

those commodity groups that have a high demand growth. Considering this, Poland has made the most substantial positive developments in agri-food competitiveness in the EU-15 markets.

3.3 Distribution dynamics of the Lafay index

We estimate equation (2) between the starting and ending periods. The regressions for the dynamics of the LF-index distribution are presented for total agri-food trade and by product groups (table 7). The regression coefficients β are significantly larger than zero, indicating that the hypothesis of opposite direction change in trade specialisation pattern in these cases can be rejected. The estimations suggest that β specialisation is dominant in the former CEFTA-7 countries and Germany. The outlier, with a not statistically significant β value, is found for processed intermediates for Slovenia, consumer-ready food for Romania, and bulk raw commodities for Germany.

The β/R values suggest σ divergence for some cases, where estimations imply β specialisation, such as: for Hungary's total agri-food trade; for bulk raw commodities for Hungary and to a lesser extent for Romania; for processed intermediates for Germany; for consumer-ready food for Slovakia and Slovenia; and for horticultural products for the Czech

Republic and Slovakia. The decline in the specialisation pattern due to proportional changes in sectors towards the average is outweighed by changes in the proportional position between sectors (DALUM et al., 1998). The β/R ratios greater/smaller from unity suggest a more significant convergence/divergence in the agri-food trade pattern over the time. The ß/R ratios less, but closer to unity imply a more stable agri-food trade specialisation pattern. The ß/R ratios less than unity imply a less stable agri-food trade specialisation pattern that tends to converge.

Figure 1 reveals that the β/R values with different time lags may change over a longer time frame: except for Slovenia, the β/R ratios move to further from unity, suggesting a more significant convergence/divergence in the agri-food trade specialisation pattern over time. More specifically, we could identify three developmental paths: increasing the β/R ratio for Hungary; more stable β/R ratios for Germany, Romania, and Slovenia; and decreasing the β/R ratios for Bulgaria, the Czech Republic, Poland, and Slovakia.

3.4 Survival analysis for the Lafay index

We are interested in the duration of survival for agri-food trade specialisation. The survival rates for the LF>0 are presented for total agri-food trade by the former CEFTA-7

Table 7. Changes in LF-index by countries and product groups, between 1995 and 2007

	Bulgaria	Czech Republic	Hungary	Poland	Romania	Slovakia	Slovenia	Germany
Agri-food total								
ß	0.215	0.370	0.487	0.264	0.325	0.256	0.289	0.592
R^2	0.181	0.439	0.171	0.206	0.137	0.211	0.085	0.46
β/R	0.506	0.558	1.177	0.582	0.879	0.558	0.990	0.873
N	557	557	557	557	557	557	557	557
Sig. of F (H0: β=0)	0	0	0.000	0.000	0.000	0.000	0.000	0.000
Sig. of F (H0: β=1)	0	0	0.000	0.000	0.000	0.000	0.000	0.000
Bulk raw commodities								
ß	0.156	0.351	0.750	0.132	0.803	0.229	0.230	0.182*
R^2	0.085	0.721	0.079	0.298	0.553	0.464	0.134	0.153
β/R	0.536	0.414	2.667	0.242	1.080	0.336	0.626	0.465
N	65	65	65	65	65	65	65	65
Sig. of F (H0: β=0)	0.0187	0	0.0232	0.000	0.000	0.000	0.0027	0.153
Sig. of F (H0: β=1)	0	0	0.4425	0.000	0.0344	0.000	0.000	0
Processed intermediates								
ß	0.132	0.561	0.388	0.190	0.603	0.339	-0.052*	0.461
R^2	0.092	0.445	0.373	0.285	0.484	0.586	0.001	0.206
β/R	0.434	0.841	0.636	0.356	0.867	0.443	-1.848	1.016
N	178	178	178	178	178	178	178	178
Sig. of F (H0: β=0)	0	0.552	0.000	0.000	0.000	0.000	0.7016	0.000
Sig. of F (H0: β=1)	0	0.822	0.000	0.000	0.000	0.000	0.000	0.000
Consumer-ready food								
ß	0.212	0.350	0.419	0.359	0.058*	0.152	0.515	0.581
R^2	0.196	0.135	0.528	0.219	0.005	0.019	0.160	0.467
β/R	0.479	0.952	0.577	0.767	0.812	1.118	1.289	0.850
N	247	247	247	247	247	247	247	247
Sig. of F (H0: β=0)	0.000	0.004	0.000	0.000	0.262	0.032	0.000	0.000
Sig. of F (H0: β=1)	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000
Horticulture								
ß	0.720	0.348	0.674	0.470	0.424	0.343	0.332	0.808
R^2	0.640	0.076	0.614	0.444	0.268	0.048	0.145	0.893
β/R	0.900	1.259	0.860	0.705	0.819	1.566	0.873	0.855
N	67	67	67	67	67	67	67	67
Sig. of F (H0: β=0)	0.000	0.024	0.000	0.000	0.000	0.072	0.0015	0.000
Sig. of F (H0: β=1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: All β estimations are significant at the 10% level if not signed otherwise. * not significant

Source: own calculations based on Eurostat Comext dataset

countries and for Germany as the benchmark comparison. In addition, we present the survival rates by agri-food product groups, by the degree of product processing, and by the demand growth groups using the Kaplan-Meier survival rates with a 13-year time lag (table 8). Among the former CEFTA-7 countries, the highest survival rates for agri-food trade specialisation on the EU-15 markets are found for Poland, but less than for Germany, and the lowest are found for Romania and Slovenia. The duration of trade specialisation differs by agri-food product groups and demand growth groups. For bulk raw commodities, Slovakia experiences the highest, and Slovenia the lowest survival rates for trade specialisation. Hungary experiences the highest, and Slovenia the lowest survival rates for trade specialisation in processed intermediates. Poland experiences the highest, and Romania the lowest survival rate for trade specialisation in consumer-ready food. Bulgaria experiences the highest, and Slovakia the lowest survival rates in horticultural products. Bulgaria and Poland experience the highest, and Slovakia and Slovenia the lowest survival rates in trade specialisation by the least dynamic demand growth group. For the middle dynamic demand growth group, Poland experiences the highest, and Slovakia the lowest survival rates in trade specialisation. Finally, Poland experiences the highest, and Slovenia the lowest survival rates in trade by the fastest growing demand group at the EU-15 markets. In all cases the survival rates for the former CEFTA-7 countries are lower than for Germany. These results imply that Germany, an EU member for much longer than the other countries in the analysis, has significantly higher survival rates in agri-food trade specialisation patterns. These results imply that the history of agri-food trade relations pertaining to EU membership does explain the stability of agri-food trade. This can be related to tradition, information, and developed trust. Agri-food trade flows for the new EU members are more dynamic and more volatile. This can be explained by changes in the enterprise structure which demanded that the enterprises establish long-term relations with older EU members.

4. Findings and implications

Agri-food trade competitiveness and specialisation patterns of the former CEFTA-7 countries and the EU-15 markets were analysed, with German trade patterns serving as a basis for comparison. The former CEFTA-7 countries, now the new EU member states, experience some differences and also some similarities in trade development and specialisation patterns. The developments in the former CEFTA-7 agri-food trade structures, specialisation patterns, and the duration and stability of the agri-food trade patterns suggest that we can classify the former CEFTA-7 countries into three groups of countries regarding their success in the EU market integration process. First, the most successful group consists of the founding CEFTA-4 member countries (the Czech Republic, Hungary, Poland, and Slovakia). These countries have adjusted well to the EU-15 markets in the sense that they concentrate their trade towards those product groups with the fastest dynamic demand. In all aspects of the analysis, particularly Poland and Hungary were found to perform best. Second is Slovenia, which is found as the best performing country in comparison with the countries of the former Yugoslavia and in comparison with Albania (BOJNEC and FERTŐ, 2010), but one of the worst performing countries in comparison with the other former CEFTA-7 countries. Slovenian agriculture is constrained by less favourable agricultural natural factor endowments and fragmented agricultural structures, which has not been overcome by privatisation, restructuring, and competitiveness improvements in the food processing sector, nor in

Table 8. **Estimated Kaplan-Meier survival function for LF index > 0**

Year	Bulgaria	Czech Republic	Hungary	Poland	Romania	Slovakia	Slovenia	Germany
1996	0.8819	0.8786	0.8881	0.8857	0.8762	0.8747	0.8745	0.9294
1997	0.8197	0.8165	0.8282	0.8256	0.8113	0.8081	0.8087	0.8917
1998	0.7550	0.7520	0.7665	0.7641	0.7443	0.7405	0.742	0.8531
1999	0.6868	0.6851	0.7035	0.7028	0.6742	0.6717	0.6739	0.8122
2000	0.6180	0.6173	0.6370	0.6373	0.6035	0.6016	0.6043	0.7685
2001	0.5480	0.5472	0.5715	0.5702	0.5325	0.5302	0.5319	0.7194
2002	0.4753	0.4748	0.5002	0.5004	0.4570	0.4567	0.457	0.6639
2003	0.3997	0.3998	0.4250	0.4271	0.3815	0.3801	0.3803	0.6024
2004	0.3222	0.3230	0.3458	0.3517	0.3041	0.3039	0.3028	0.5283
2005	0.2387	0.2389	0.2624	0.2715	0.2231	0.2257	0.2206	0.4410
2006	0.1446	0.1480	0.1663	0.1782	0.1336	0.1386	0.1315	0.3306
2007	0.0374	0.0335	0.0388	0.0557	0.0247	0.0301	0.0241	0.1537
Kaplan-Meier survival function for LF>0 (13 years) by product groups								
Bulk raw commodities	0.0972	0.1047	0.1041	0.0686	0.0770	0.1130	0.0529	0.1581
Processed intermediates	0.0305	0.0375	0.0385	0.0345	0.0283	0.0287	0.0241	0.1654
Consumer-ready food	0.0281	0.0223	0.0272	0.0726	0.0145	0.0222	0.0189	0.1642
Horticulture	0.0603	0.0237	0.0415	0.0511	0.0223	0.0180	0.0215	0.0905
logrank test	0.000	0.000	0.000	0.000	0.000	0.000	0.1093	0.000
Wilcoxon	0.000	0.000	0.000	0.000	0.000	0.000	0.4994	0.000
Kaplan-Meier survival function for LF>0 (13 years) by growth groups								
≤5%	0.0460	0.0282	0.0383	0.0460	0.0287	0.0214	0.0213	0.1445
5.01% to ≤10%	0.0377	0.0253	0.0404	0.0486	0.0268	0.0223	0.0265	0.1191
>10.01%	0.0312	0.0427	0.0383	0.0683	0.0207	0.0416	0.025	0.1844
logrank test	0.000	0.2590	0.2083	0.2992	0.000	0.3278	0.0339	0.000
Wilcoxon	0.000	0.0818	0.1308	0.0028	0.000	0.0599	0.0154	0.0024

Source: own calculations based on Eurostat Comext dataset

international agri-food marketing. Therefore, the findings for Slovenia are less profound than for other former CEFTA countries. Third, Bulgaria and Romania exhibit differences by agri-food products groups over time. The reason for these greater instabilities in agri-food trade integration with the EU-15 markets are instabilities in domestic agricultural production, with delays in the restructuring of the food processing sectors to comply with higher quality requirements and food standards required in the EU-15.

The fact that the former CEFTA-7 countries have specialised their agri-food export specialisation largely towards consumer-ready food and food groups with growing demands in the EU-15 markets has led to export growth after EU accession. These agri-food trade specialisation patterns are further confirmed by the duration and stability of agri-food export growth, which is important for the sustainable development of the agri-food sectors in the former CEFTA-7 countries after having joined the enlarged Single European Market.

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