Competitiveness of Hungarian agri-food products after EU Accession

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Summary

The paper investigates effects of Hungarian EU accession on agri-food trade by combining competitiveness and trade theory literature. After an overview of theoretical points, the paper empirically tests the method of common market shares (CMS) on Hungarian agri-food trade. From an analyses of trade flows during the period 2000-2007, the paper concludes that the share of exports to the EU15 remained almost constant through the years analysed - though import share significantly increased. Detailed results by country and product group highlighted main trading partners and traded products. It turns out that accession to the European Union resulted in a slight decrease in export concentration by country and product group and a significant increase in import concentration by country. This finding was strengthened using analyses of correlation and Herfindahl-Hirschmann indices. Calculations made using a CMS model on the competitiveness of Hungarian agri-food products show that the competitiveness of Hungarian agri-food products changed for the better in EU15 countries from the average of the period 2000-2003 to the average of the period 2004-2007, mainly due to growth in market size.

Classification (JEL) code: Q17

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1. INTRODUCTION

Development of the concept of competitiveness is inseparable from the development of international trade theory. These two sets of theory basically attempt to answer the question "when and under which conditions it is worth for two entities (mainly countries) to trade with each other?" The means of trade changes over time, however, so totally different factors have determined which country trades with which, and on what terms throughout history.

With the unfolding of the industrial revolution and international work specialization, products created in almost every country became traded internationally, even though some countries primarily had an export focus while others largely became importers. Adam Smith's (1723-1790) interpretation of this phenomenon was that countries produce a product in which they have an absolute advantage and will exchange it for products of which they do not possess such advantage.

Smith's theory was developed further by David Ricardo (1772-1823) who pointed out as far back as 1817 that international trade between nations is not based on absolute but relative advantage. According to the economist, if the *laissez faire* principle prevails, each country will produce the product in which it has a comparative advantage, the basis of which advantage is a difference in technology. Ricardo's model was developed further by Heckscher [1919] and Ohlin [1933] who saw the source of comparative advantage not as technology but as resource-endowment. According to their model, a country exports those products which production inputs it is relatively well endowed with, and can intensively use. Capital-rich countries thereby export capital-intensive products while labour-rich countries export labour-intensive products. This relationship assumes, however, that resource-endowment determines resource prices, though it is well known that this coherence is not always apparent in real life

(e.g. when the state intervenes – such as through supporting strong wage increases – in the labour market, which can create advantages for other, well labour-endowed countries).

Comentario [S1]: Yes?

These defects in theory were pointed out by Leontief [1954], whose research on the US labour market discovered that US trade structure contradicts the theories of Heckscher [1919] and Ohlin [1933]: the US economy is capital-intensive while exports are labour-intensive. Leontief expressed the capital demand of sectors by using the gross dollar value of investment needed to produce one unit, while labour demand was expressed as the annual number of employed people.

As the industrial revolution brought the theory of comparative advantage to life in the 18th century, competitiveness literature emerged thanks to globalization in the second part of the 20th century. The first classical user of the notion of competitiveness was Michael E. Porter who defined 5 forces of competitiveness in his now-classic book, published in 1980 (Porter [1980]). Porter published another book in 1990 (Porter [1990]) on how to analyze competitiveness between nations, in which he developed the notion of competitive advantage alongside comparative advantage. Salovaara and Vaahtera [1990] analysed similar factors in increasing competitiveness (production cost, market share, profit and financing), while Salvatore [2002] identified eight factors as sources of competitive advantage.

In the 1990's, however, analysis of competitive advantage focused just on macro and micro levels and hardly any attention was paid to the meso-level (Lengyel [2000]). At the same time, widespread globalization has made more and more people realize that the geographical location of economic activities plays a determining role in shaping competitiveness, as competitive advantages are usually connected to a smaller region or city.

A decisive representative of this stream of thought was Paul Krugman, according to whom space economics is similar to an economy with two sectors, having both mobile and immobile activities in space. The distribution of mobile activities is affected by two

contradictory economic processes: the centripetal and centrifugal forces of space. For Krugman, regions are just abstractions; dynamically changing geographic intersections are the focus of his thoughts. In contrast, for Porter [1990], a given line of the spatial extension of business is the region, the business environment of which is determined by four factors (Porter [1990]): 1. factor conditions; 2. demand conditions; 3. related and supporting industries, and; 4. firm strategy, structure and rivalry. Besides the four factors mentioned above, Porter [1998] later identified two other factors: government and chance.

One proponent of the most recent views on competitiveness is Thirwall [1979], according to whom a country's competitiveness may be equivalent to an ability to grow the economy in a manner which does not lead to an increase in external debt.

As for Boda-Pataki [1995], competitiveness means export-competitiveness, the view that Salovaara-Vaahtera [1990] takes. As for Lengyel [2000], the three most important competitive factors are GDP, number of people employed and population. In other words, the author argues that a high level of competitiveness can be reached through achieving a high level of income and employment. Losonc [2003] stresses that most important components of competitiveness are labour productivity, labour cost, exchange rate and internal prices, while Salvatore [2002] writes that competitiveness is the ability of a nation to create a higher level of welfare than its competitors.

After having reviewed common theories on competitiveness and trade, the paper now analyses agri-food trade patterns between Hungary and EU15 during the years 2000-2007, focusing on changes after EU accession.

2. AGRI-FOOD TRADE WITH EU15 MEMBERS

Market share of EU15 in Hungarian agri-food trade partly changed after the accession (Table 1). While share of exports to EU15 remained almost constant through the years analysed, import share significantly increased, meaning that Hungary imported more agricultural products from EU15 member states after 2004 than before. Therefore, the agri-food trade balance decreased in the period analysed. The share of exports to EU15 countries was highest in 2004, while those of imports reached their peak in 2005. As to the structure of Hungarian agri-food trade, it is clear that every second USD comes into or leaves the EU15 in connection with national agri-food trade. It follows that the EU15 group represents an important trading group for Hungary.

Table 1

Share of Hungarian agri-food trade with EU15 in total Hungarian agri-food trade, percentage (2000-2007)

Denomination	**2000**	**2001**	**2002**	**2003**
Export	45.41	47.51	48.46	49.66
Import	43.43	45.70	47.89	49.17
Balance	46.98	48.76	48.95	50.16
Denomination	**2004**	**2005**	**2006**	**2007**
Export	53.52	51.44	50.35	51.08
Import	61.60	64.22	62.04	61.99
Balance	39.68	24.16	24.46	33.98

Source: Author's calculation based on UN [2009]

Comentario [S2]: ?

As to trade with EU15 member states, Hungarian agri-food export was quite concentrated in the period analysed (Table 2). Hungary's most important agri-food export markets were Germany, Italy and Austria, taking a total share of 67% and 62% of national exports respectively – indicating a high but decreasing quantity of national agri-food exports. A significant decrease can be seen in exports to Germany from the average of 2000-2003 to the average of 2004-2007, while export to Greece increased by more than 5%, according to UN [2009] data. Hungarian agricultural products do not appear in Luxemburg at all and rarely appear on the markets of Denmark, Finland, and Ireland and Portugal (less than combined 1% market share in 2004-2007).

Comentario [S3]: Yes?

Table 2

Hungary's agri-food export to EU15 by country (%)

Denomination	**2000-2003**	**2004-2007**
Austria	13.36	14.22
Belgium	3.93	2.95
Denmark	0.53	0.95
Finland	0.74	0.62
France	7.78	7.05
Germany	38.36	27.81
Greece	1.31	6.53
Ireland	0.11	0.13
Italy	15.34	19.87
Luxemburg	0.00	0.00
Netherlands	5.52	7.38
Portugal	0.14	0.26
Spain	6.64	3.99
Sweden	1.97	1.84
United Kingdom	4.26	6.41
Total	100.00	100.00

Source: Author's calculation based on UN [2009]

The picture is slightly different when analyzing agri-food imports from the EU15 (Table 2). Four countries (Germany, Netherlands, Austria, Italy) comprised 65% and 77% of total agri-food trade value respectively, thus import concentration is high and significantly increasing. Hungary had minimal agri-food imports from Finland, Ireland, Luxemburg, Portugal and Sweden (less than 1% combined market share in 2004-2007). From the average of 2000-2003 to the average of 2004-2007, Germany's import share in national agri-food import increased, while Denmark's market share decreased the most. Comparing Table 2 with Table 3, it turns out that Hungary imports more, and exports less, from/to its biggest trading partner (Germany), pushing its trade structure in an unfavourable direction.

Comentario [S4]: Yes?

Table 3

Hungary's agri-food import from EU15 by country (%)

Denomination	**2000-2003**	**2004-2007**
Austria	7.87	10.66
Belgium	5.59	4.50
Denmark	6.04	2.42
Finland	0.08	0.05
France	8.89	6.85
Germany	26.34	36.63
Greece	4.57	1.61
Ireland	1.20	0.63
Italy	12.64	9.64
Luxemburg	0.00	0.05
Netherlands	18.24	20.01
Portugal	0.06	0.32
Spain	7.69	6.07
Sweden	0.78	0.54
United Kingdom	3.29	3.08
Total	100.00	100.00

Source: Author's calculation based on UN [2009]

Analyzing agri-food trade with EU15 by product group reveals the same concentrated picture as by country (Table 4 and 5). Hungary exported mainly three product groups to EU15 markets in the period analysed: meat and meat preparations (01), cereals and cereal preparations (04) and vegetables and fruit (05) (Table 4). The share of these three product groups was 77% and 73% of Hungarian agri-food exports to the EU15 respectively, showing a slight decrease from a significant percentage of total exports. It is also observable from Table 4 that shares of meat exports decreased by more than 10% from the average of 2000-2003 to the average of 2004-2007, proportionately increasing the share of cereals.

Table 4

Hungary's agri-food export to EU15 by product group (%)

Denomination - export	**2000-2003**	**2004-2007**
00: Live animals	6.09	5.32
01: Meat, meat preparations	39.30	27.12
02: Dairy products, birds eggs	2.13	3.95
03: Fish, crustaceans, molluscs	0.39	0.16
04: Cereals, cereal preparations	11.24	26.85
05: Vegetables and fruit	26.40	18.84
06: Sugar, sugar preparations, honey	4.03	5.43
07: Coffee, tea, cocoa, spices	2.51	2.14
08: Animal feed stuff	6.94	8.34
09: Misc. edible products	0.97	1.85
Total	100.00	100.00

Source: Author's calculation based on UN [2009]

Comentario [S5]: I think 'molluscs' should be 'shellfish' – please check

As for national agri-food imports, amounts are much lower than those of exports. Notable Hungarian agri-food imports from EU15 during the 8 years analysed were meat (01), vegetables and fruit (05), coffee, tea, cocoa, spices (07), animal feed stuff (08) and other edible products (09). (Table 5). The combined share of these 5 products from the group of 10 was 79% and 75%, respectively, showing a slight decrease. Import share changed just slightly from the average of 2000-2003 to the average of 2004-2007, unlike in the case for exports.

Table 5

Hungary's agri-food import from EU15 by product group (%)

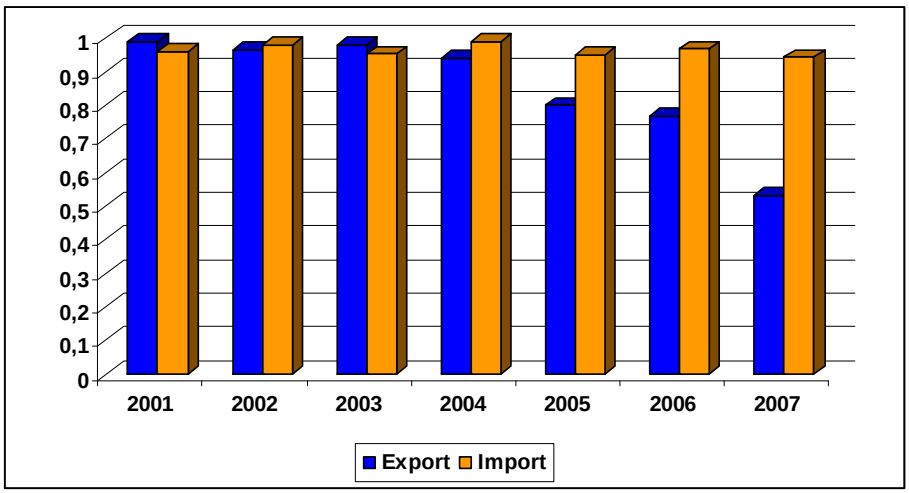
Denomination	**2000-2003**	**2004-2007**
00: Live animals	1.90	3.59
01: Meat, meat preparations	14.02	14.92
02: Dairy products, birds eggs	7.30	9.58
03: Fish, crustaceans, molluscs	1.48	1.58
04: Cereals, cereal preparations	7.96	7.90
05: Vegetables and fruit	21.43	20.90
06: Sugar, sugar preparations, honey	2.40	2.25
07: Coffee, tea, cocoa, spices	10.77	11.61
08: Animal feed stuff	17.26	16.19
09: Misc. edible products	15.49	11.46
Total	100.00	100.00

Source: Author's calculation based on UN [2009]

Summarizing the results above, it can be concluded that accession to the European Union resulted in a slight decrease in export concentration by country and product group and a significant increase in import concentration by country. These tendencies can also be seen on Figure 1., showing correlation between each year's product structure, selecting 2000 as the base year. Analysis of such this figure shows that agri-food exports changed significantly (decreased) after 2004, while imports remained static. In other words, agri-food import structure by product group remained stable, while exports became more unstable over the period analysed.

Figure 1

Structure of Hungarian agri-food trade with EU15, based on correlation between 2000 and the actual year



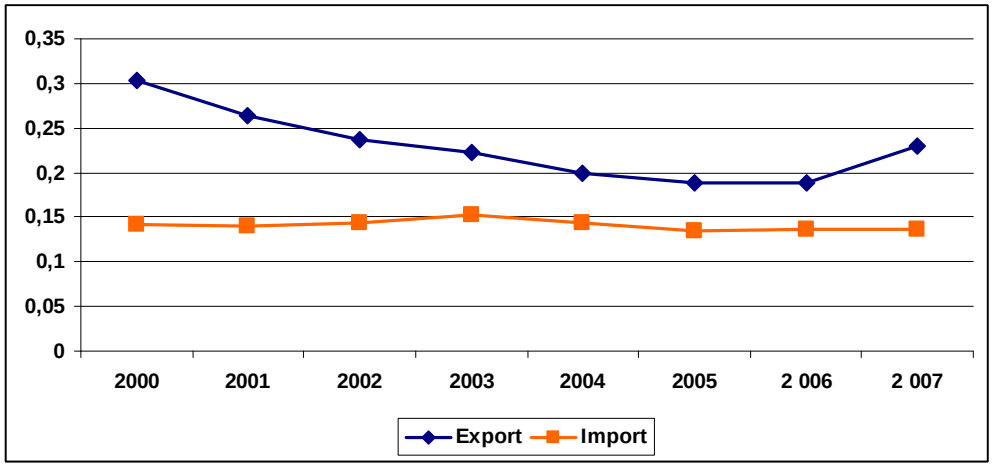
Source: Author's calculation based on UN [2009]

High quantities of national agri-food exports and imports can also be tested using Herfindahl-Hirschmann indices. Results of such an analysis reveals significantly decreasing export quantities (with the exception of the year 2007) with a relatively stable import concentration (Figure 2). Quantities of imports, in other words, changed less than those of

exports. It can also be seen that the highest export concentration was in 2000 and the lowest in 2006, but quantities of exports were still above those of imports in all years analysed.

Figure 2

Herfindahl-Hirschmann indices of Hungarian agri-food trade with EU15, 2000-2007



Source: Author's calculation based on UN [2009]

After delineating the main tendencies of the national agri-food trade with EU15, I now analyze competitiveness through the constant market share method.

3. THEORY AND MEASUREMENT OF CONSTANT MARKET SHARES

Theories of trade mention constant market share (CMS) method as being prominent in measuring competitiveness (CMS is a method which analyses causes of changes in exports). The CMS model – which was re-popularized at the end of the 20th century – was first used by Tyszinski in 1951 for trade in industrial products, while the works of Rigaux and Sprott analysed changes in trade patterns of agricultural products (Fertő [2004]). The model was

used by Dyrsdale-Lu (1996) to examine the export performance of Australia between 1984 and 1994 and Brownie-Dalziel (1993) made similar analyses of New-Zealand for the period of 1970-1984 (Ahmadi-Esfahani [2006]).

The method investigates trade trends and laws in order to determine those factors affecting a country's export-performance (Ahmadi-Esfahani [2006]). In the original model, price and non-price factors obviously affect competitiveness; nevertheless, export-competitiveness can be examined without taking them into account. The basic presumption underlying the CMS model is that a country's export share in a given market remains constant at the same level of competitiveness (Ahmadi-Esfahani [1995]). It follows that any changes in a country's exports can be traced back to changes in composition of competitors and competitiveness.

3.1. The basic model

The basic model determines a country's share in the reference market as follows:

(1) $S = q/Q$

where S is the country's share in the reference market, q is the export to the reference market and Q are the overall exports of a country. Transforming the formula by visualizing time (Δ), product type ($i = 1,\ldots,I$) and focus market ($j = 1,\ldots,J$) changes in variables we generate the following equation:

(2) $\Delta q_{ij} = S_{ij}\Delta Q_{ij} + Q_{ij}\Delta S_{ij}$

The traditional CMS-model explains changes in export through two effects: scale-effect ($S\Delta Q$) and competitive effect ($Q\Delta S$), so the first part of the right hand side of the second formula explains presumed changes in export or scale-effect, while the second part explains the difference between actual and expected change or competitive-effect (Fertő [2003]).

The second formula, however, is only true over the short term. If the CMS-model is adopted for use with discrete intervals, the equation can be written in several ways, depending on the initial and final moments. Latest adaptations of CMS-model use the formula below:

$$(3)\ \Delta q_{ij} = \underbrace{S^0_{ij}\Delta Q_{ij}}_{\text{scale-effect}} + \underbrace{Q^0_{ij}\Delta S_{ij}}_{\text{competitive-effect}} + \underbrace{\Delta Q_{ij}\Delta S_{ij}}_{\text{second-order effect}}$$

Scale effect, therefore, analyses the average change in export supposing that individual market shares are permanent. Similarly, competitive-effect shows the average change in exports supposing that imports are fixed, while second-order effect refers to the relationship between export growth and market share growth.

3.2. Extensions of the basic model

In traditional economic models, the profit of a competition-winner is equal to the losses of other players. The basic model thus assumes that one party's profit is another party's loss in the competition of exporter countries for given reference markets. In the case of more players it is not so easy to tell who takes away market share from whom; different extensions of the model deal with this latter question (Fertő [2004]).

The second level analysis of the model decomposes scale- and competitive-effects further in order to answer the question of whether they have changed because of export market growth or reference market growth. The following table shows the possibilities of second level decomposition.

Table 6: Second-level decomposition of the CMS-model

	Denomination	Formula
Scale-effect	Scale-aggregate growth effect (SAGE)	$\Delta Q=\sum_{ij}\Delta Q_{ij}/\sum_{ij}\Delta Q^{0}_{ij}$
	Scale-market effect (SME)	$\sum_{ij}(\Delta Q_{ij}-\Delta Q)$
Competitive-effect	Competitive aggregate growth effect (CAGE)	$\Delta S=\sum_{ij}\Delta S_{ij}/\sum_{ij}\Delta S^{0}_{ij}$
	Competitive market effect (CME)	$\sum_{ij}(\Delta S_{ij}-\Delta S)$

Source: Author's composition, based on Ahmadi-Esfahani [2006]

The scale-aggregate growth effect supposes that scale-effects are uniform across markets, while scale-market effect analyses the average impacts of different scale effects across markets. In the same way, competitive aggregate growth effect assumes that competitive-effects are uniform across markets, while competitive market effect analyses the average impacts of different competitive effects across markets. 'Market' effects thus examine whether a country's export-structure has something to do with export growth: for instance, a positive 'market' effect suggests that a given country has been targeting the 'right' markets.

Third level decomposition of the CMS-model goes even further and analyses competitiveness more deeply in order to answer the question of whether competitiveness changes because of changes in products, target markets or, by accident, a combination of the two. Possibilities for third level decomposition are shown in the table below.

Table 7: Third level decomposition of the CMS-model

	Denomination	Formula
Scale market effect	Scale regional effect (SRE)	$\sum_{ij}(\Delta Q_{ij}-\Delta Q_i)$
	Scale product effect (SPE)	$\sum_{ij}(\Delta Q_{ij}-\Delta Q_j)$
	Scale interaction effect (SIE)	$\sum_{ij}(\Delta Q_{ij}-\Delta Q)- \sum_{ij}(\Delta Q_{ij}-\Delta Q_i)- \sum_{ij}(\Delta Q_{ij}-\Delta Q_j)$
Competitive market effect	Competitive regional effect (CRE)	$\sum_{ij}(\Delta S_{ij}-\Delta S_i)$
	Competitive product effect (CPE)	$\sum_{ij}(\Delta S_{ij}-\Delta S_j)$
	Competitive interaction effect (CIE)	$\sum_{ij}(\Delta S_{ij}-\Delta S)- \sum_{ij}(\Delta S_{ij}-\Delta S_i)- \sum_{ij}(\Delta S_{ij}-\Delta S_j)$

Source: Author's composition based on Ahmadi-Esfahani [2006]

Scale regional effect assumes that scale market effect differs across regions alone, independently from product-effects, while scale product effect analyses just the opposite: how scale market affects change if product market changes are taken into consideration independently from market change of regions. In other words, 'product effects' will be positive where the export-structure favours those markets in which market growth is above average (scale product effect) or in which growth in market share is above average (competitive product effect). 'Interaction effects' in turn examine what kind of relationship exists between markets of products and regions; that is, whether regional and product effects reinforce or offset each other. Third level competitive effects illustrate exactly the same factors but they decompose competitive-effects instead of scale-effects.

CMS-model thus analyzes in some depth the export competitiveness of a country but as with all scientific methods, it has limitations. Literature describes base year sensitivity as the first limitation (Richardson [1971]. It is clear, namely, that results of given year's

comparisons are largely dependent on the situation of the world and local economy and on *ad hoc* trade relations. Therefore, Jepma [1986] has suggested the average of several years as a basis for comparison, while other literature identifies base year weighting as the solution to the problem. The former method appeared more reliable during empirical testing (Ahmadi-Esfahani [2006], Fertő [2004]).

The second limitation of the CMS-model is the level of aggregation. It is a pressing challenge to identify which countries should form trading blocs, or to what extent is it worth decomposing a product. Literature suggests the answer to this problem is to use aggregation algorithms where further disaggregation only marginally increases product (regional) effects. It is demonstrable, however, that such an algorithm is not an optimal solution - it is not certain whether there always exists a relationship between scale effects and the level of aggregation (Houston [1967]). Another solution may be the use of cluster analysis (Pudney [1981]) but this method – requiring several further calculations – entrusts the researcher with identifying meaningful clusters. On the whole, literature generally entrusts the selection of reference market and product disaggregation to the researcher, which in most cases is done according to preset standards (Ahmadi-Esfahani [2006]).

Another limitation of the method may be selection of the proper currency. It is clear that changes in exchange rates can strengthen/weaken a country's relative competitiveness (Oldersma-Van Bergeijk [1993]). This problem is easily solvable, however, if the US dollar – the world currency most widely used in trade - is used to value products (Ahmadi-Esfahani [2006]).

3.3. Competitiveness of agri-food products by constant market shares

The CMS-model presented above was utilised to analyze the competitiveness of Hungarian agri-food exports. Target markets called into analysis are EU15; the study covers the years 2000-2007. Four year averages were chosen as reference points due to the base year sensitivity of the method (2000-2003, 2004-2007). This method of base year selection is also good for analysing the effects on trade of the accession to the European Union. In my calculations I used UN trade data in SITC3 format, two digit decomposition, and two digit rounding at three levels of analyses. Results are given by country and also by product.

3.3.1. First level analysis by country

Aggregated results for the CMS-model, first level analysis at a country-group level are shown in Table 8.

Table 8: Results of the first level analysis at a country-group level for agri-food products using the CMS-model

Target market (EU15)	**2004-2007**	
	USD	**%**
Scale effect	609 614 248	64.46
Competitive-effect	212 032 232	22.42
Second-order effect	124 049 764	13.12
Total profit	945 696 244	100.00

Source: Author's calculations based on UN [2009]

The growth in Hungarian agri-food exports to the EU15 was around 946 million USD from the average of the period 2000-2003 to the average of 2004-2007 (Table 8.). This change is due to three effects, according to basic CMS model analysis. First, to a scale effect, accounting for 610 million USD, equivalent to 65% of total profits. Second, to a competitive effect, equivalent to 212 million USD, equivalent to 22% of export value growth. Finally, to a second-order effect which accounted for 124 million USD (13% of export change). Significant changes in national agri-food exports in the period analysed were clearly due to positive scale effects; that is, to the fact that the EU15 countries increased imports. In parallel, Hungary's competitiveness in terms of agri-food products has significantly improved compared to other exporters in the EU15 markets from the average of 2000-2003 to the average of 2004-2007.

Table 9 shows results detailed by EU15 member states. One can observe that Hungary continuously increased its agri-food product market share concerning the main markets of EU15 from the average of 2000-2003 to the average of 2004-2007 (from 0.65% to 0.78%); an increase of share in 9 countries, according to detailed data. The highest market share was in Austria when taking the 2004-2007 average, while the lowest was in Luxemburg. Moreover, Table 9 also shows that Hungary increased its competitiveness in the agri-food markets of 10 countries (except for Belgium, Finland, Germany, Spain and Sweden) where competitive effects were positive from the base period to the average of 2004-2007. According to the results of first level analysis, export performance growth for the 10 member states was less due to growth in competitiveness and more due to increase in market size.

Table 9: Results of first level analysis with the CMS-model to agri-food products for the EU15 member states, by country

Denomination	Market share*, %		Effects, USD		
	2000-2003	2004-2007	Scale-effect	Competitive-effect	Second-order effect
Austria	3.64	4.19	105 988 421	21 241 130	16 178 201
Belgium	0.30	0.28	22 967 226	-3 363 655	-1 885 320
Denmark	0.12	0.25	3 425 838	6 083 789	3 752 624
Finland	0.48	0.47	4 802 895	-135 206	-84 439
France	0.37	0.43	40 988 652	11 976 744	6 054 104
Germany	1.32	1.18	219 046 045	-42 659 471	-23 377 832
Greece	0.43	2.34	10 105 042	61 001 140	45 064 817
Ireland	0.04	0.05	803 325	298 575	201 600
Italy	0.87	1.41	82 806 753	100 344 743	51 982 754
Luxemburg	0.00	0.00	1 226	37 212	22 812
Netherlands	0.40	0.63	35 258 207	33 466 330	20 510 213
Portugal	0.04	0.08	743 629	1 947 294	980 077
Spain	0.53	0.36	47 791 068	-22 318 571	-15 419 498
Sweden	0.49	0.48	16 389 138	-160 364	-128 274
United Kingdom	0.19	0.34	26 758 892	35 077 393	21 130 965
Total	0.65	0.78	609 614 248	212 032 232	124 049 764

* Share of Hungary's cereal exports of EU15 cereal imports

Source: Author's calculations based on UN [2009]

3.3.2. First level analysis by product

Product level analyses reveal which products were competitive in EU15 markets. Hungary was able to increase its market share in the case of seven product groups out of ten in the markets of EU15 from the periods 2000-2003 to 2004-2007 (Table 10). The highest growth in market share was found in case of cereals (04), while the biggest decrease was observable with fish (03). Analysis of different effects signifies that Hungary developed its

competitiveness in the cases of seven product groups in EU15 markets and deteriorated in three cases. The most competitive product group from the base period to 2004-2007 was cereals (04), while the least competitive was meat (01). For each product group, market size increased (positive scale effect), showing that EU15 markets imported more of all agri-food products from the period 2000-2003 to 2004-2007.

Table 10: Results of first level analysis using the CMS-model to cereals for EU15 member states, by product

Denomination	Market share*, %		Effects, USD		
	2000-2003	2004-2007	Scale-effect	Competitive-effect	Second-order effect
00: Live animals	1.54	1.64	35 769 503	4 123 067	2 325 092
01: Meat, meat preparations	1.92	1.53	268 679 511	-84 044 264	-55 138 969
02: Dairy products, birds eggs	0.12	0.28	12 065 603	28 730 124	15 624 302
03: Fish, crustaceans, mollusc	0.02	0.01	2 161 355	-1 957 509	-1 035 241
04: Cereals, cereal preparations	0.75	2.08	74 813 552	208 573 608	133 260 723
05: Vegetables and fruit	0.66	0.58	155 037 179	-35 567 880	-20 043 233
06: Sugar, sugar preparations, honey	0.69	1.13	23 633 533	27 030 340	15 226 919
07: Coffee, tea, cocoa	0.19	0.20	14 962 235	875 177	500 500
08: Animal feed stuff	0.66	1.06	30 858 625	43 872 204	18 727 568
09: Misc. edible products	0.12	0.23	9 039 514	9 296 023	8 297 085
Total	0.65	0.78	609 614 248	212 032 232	124 049 764

* Share of Hungary's agri-food exports of EU15 cereal imports

Source: Author's calculations based on UN [2009]

3.3.3. Second and third level analysis

Results of second and third level analyses by scale and competitive effect are shown in Table 11.

Table 11: Results of second and third level analyses of the CMS-model by scale and competitive effect for the period 2004-2007 (%)

Denomination	**Scale-effect**	**Scale-effect**		**Scale market effect (SME)**		
		SAGE	**SME**	**SRE**	**SPE**	**SIE**
EU15	64.46	58.50	5.96	4.38	-4.82	6.40
Denomination	**Competitive-effect**	**Competitive-effect**		**Competitive market effect (CME)**		
		CAGE	**CME**	**CRE**	**CPE**	**CIE**
EU15	22.42	20.35	2.07	6.30	10.21	-14.44

Source: Author's calculations based on UN [2009]

The agri-food market size of the EU15 grew from the period 2000-2003 to 2004-2007 by 64.46% (Table 11). This is for two reasons: the change of scale-aggregate growth effect and scale market effect. Scale aggregate growth effect refers to the extent to which EU15's agri-food imports changed from the period 2000-2003 to 2004-2007 (an increase of 58.50%). Scale market effect, moreover, shows to what extent Hungary's agri-food exports were able to keep pace with these changes; that is, to what extent national cereal export structure facilitated adoption to rapidly-changing markets. Based on these facts, it can be concluded that Hungary's agri-food export position on EU15 markets was favourable; national agri-food exports grew at a rate that the market increase justified. As scale aggregate growth effect and the increase of scale market effect were positive, the EU15 market increased for Hungary as a whole after accession to the EU.

Furthermore, it is clear from competitive effects that Hungary was able to increase competitiveness in EU15 agri-food markets over the period analysed. Competitive aggregate growth effect (CAGE) shows how Hungary's agri-food market share has increased by 20.35% in EU15 markets from the average of 2000-2003 to the average of 2004-2007. This growth was supported by the fact that Hungarian export structure matched the import needs of EU15; that is, in most cases Hungary exported higher quantities to ascendant markets and vice versa. In other words, Hungary gained huge market share in important markets and a small market share of insignificant markets. On the whole, national competitiveness improved against EU15 markets, as competitive effect was positive.

Third level decomposition further analyses drivers. As Table 11 shows us, Hungary's agri-food exports did not respond to changes in market sizes in the EU15; that is, did not transport the theoretically-determined ideal quantity to proper markets. It follows that Hungary could not position its products and quantities on the ideal markets. Scale interaction effects, moreover, show that the latter two effects strengthened each other. According to second and third level analyses of scale effect, it can be thus concluded that Hungarian cereal export structure did not favour EU15 markets with products which showed above average market growth (Hungary thus exported 'incorrect' products to 'correct' markets).

4. CONCLUSIONS

This paper analysed agri-food trade between Hungary and EU by combining competitiveness and trade theory literature. It analysed agri-food trade flows between 2000-2007 and revealed that the share of exports to the EU15 remained almost constant through the years analysed while import share significantly increased, meaning that Hungary imported more agricultural products from EU15 member states after 2004 than before. Detailed results by country and product group indicated main trading partners and traded products. In summary, it turns out that accession to the European Union resulted in a slight decrease in export quantity by country and product group and a significant increase in import quantity by county. This notion was strengthened using analyses of correlation and Herfindahl-Hirschmann indices. Calculations made using a CMS model on the competitiveness of Hungarian agri-food products show that the competitiveness of the Hungarian agri-food products changed for the better in EU15 countries from the average of the period 2000-2003 to the average of the period 2004-2007, mainly because of growth in market size. According to a second level analysis using the same method, Hungarian export structure matched the import needs of EU15; that is, in most cases Hungary exported higher quantities to ascendant markets and vice versa. In other words, Hungary gained huge market share in important markets and a small market share of insignificant markets. According to third level analysis, however, Hungary's agri-food export did not respond to changes in market size of the EU15; that is, did not transport the theoretically-determined ideal quantity to proper markets. It follows that Hungary could not position its products and quantities on the ideal markets. On the whole, it can be concluded that Hungary was able to benefit from the EU accession and increase its competitiveness on EU15 markets.

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