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THE DYNAMICS OF OUR AGRICULTURAL FOREIGN TRADE RELATIONSHIPS WITH THE COUNTRIES OF THE EUROPEAN UNION

THESES OF DOCTORAL (Ph. D.) DISSERTATION

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1. INTRODUCTION

1.1. Preliminaries of the study

As for an economic professional working in a particular area of food industry it seemed obvious even during my undergraduate studies to show extra interest to the study of the international position of the Hungarian agri-food industry.

This interest was further cultivated during the first 12 years of my carrier in Vörös Október Cooperative where I had experience in crop production and trade. Beyond these having brought up in the country I always had a subjective, emotional leaning towards agriculture with a love and respect of the land and the people working it.

It is due to these factors that I have been paying attention to processes in the agri-food industry for a long time. With this background it only seemed natural to pick up the topic I studied for my graduation thesis and further develop in my doctoral thesis.

It appeared to be an exciting task to rethink and develop the subject, and to conduct a detailed analysis and comparison of the results, achievements and potentials of the era right before the EU accession and the time period since the accession. The outcome of these studies have been published and presented in print and national and international conferences.

1.2. The relevance and importance of the subject

After the accession to the European Union the Hungarian food industry (especially the agricultural section of it) found itself in a difficult situation. One of the factors causing difficulty was the fact that other Central Eastern European (CEE) countries had the same problem: as a result of the economical transition the agricultural sector suffered significant loss of positions, the earlier – politically governed- markets collapsed and domestic food sectors found themselves in a crisis. Export had to be redirected to western markets with higher standards, where only high quality, specialty product could compete.

This „market-shift" was influenced by different conditions of the world economy in the 1990s and the first few years of the new millennium. Some of the most important factors for the agri-food industry in the 90s were:

- the end of the Council of Mutual Economic Assistance (CMEA),
- the transformation crisis of the CEE countries,
- the split up of the Soviet Union and Yugoslavia,
- the split of Czechoslovakia.

After the accession these influences toned down, since by this time most of the privatization process was over which increased the significance of other international factors.

Due to the new conditions the share of the sector in the overall export was dropping drastically from the beginning of the decade, amounting to only 5.5% by 2009. On the other hand, another reason for the decreasing export share was the dynamic growth of other sectors' export. The import share of the sector was dropped likewise, only amounting to 3.2% of the total import. This phenomenon of the decrease of export/import share of the agri-food industry matched the world trends and the EU trends as well.

Foreign trade of food items and agricultural products is a key factor for Hungary, because the agri-food industry is the only sector of the country capable of keeping up a positive trade balance on the long run.

The agreement on the liberalization of the agriculture effective from July 2000 and further expanded in 2001 and 2002 was a significant step forward in the liberalization of commerce between Hungary and the EU as well as in the preparation of the accession of the country. Besides

pulling down duties, the transformation of managing quotas (enforcing the principle of succession), inclusion of new articles in the preferential list, and combining quotas providing various allowance levels for the same article may also be considered as further concessions.

The ecological (natural and climatic) attributes of Hungary as they relate to agricultural production are prominent in Europe. 70% of the area of the country (in various capacities) is appropriate for intensive production, while 18% is forested. Production capacities are far from being exploited, and environmental strain is below the European average. So there is no theoretical obstacle to produce more and better quality. In recent years domestic food consumption has been decreasing steadily, but we still have not been able to maximize the newly opened export potentials due to lack of sufficient product base.

The extension of the EU in May 2004 and January 2007 has opened a new, historic dimension of a joint future for the newly accessed countries. Today almost 500 million people of 27 countries form a common political and economical union. The EU membership has been a challenge and at the same time it has created -sometimes unrealistically- optimistic expectations in our society.

Forasmuch the years elapsed since the accession have not produced an overall improvement of the agribusiness, moreover the situation has only become more difficult due to the worldwide economic recession, each study is profitable trying to analyse processes in the past in order to help make our future better.

1.3. Purpose and hypothesis of the study

My purpose is to demonstrate the conditions prevalent in the agricultural policy and agricultural trade of the EU as well as in the Agri Chapter of WTO.

In the analysis I have ventured to determine positives and negatives primarily from a Hungarian point of view, to analyze the mainstream processes of our agricultural trade relationships, to compare the changing of trends of our commercial relationships with EU countries/groups of countries and to examine the most important markets and competitiveness of the Hungarian agri-products, and the conditions and possibilities of the Hungarian agri-trade.

I consider it important to present the future perspective of the role and status of Hungarian agri-food products.

My main purpose is to discover the product groups that showed signs of competitiveness in the trade between Hungary and (other) EU countries between 1995-2009.

From May 2004 Hungary has to prove competitiveness on the uniform European market, where only products with significant market advantage will prevail.

I also aim to seek answers to the following questions:

1. How did the competitiveness of Hungarian agri-food products change in recent years?
2. In relation to which groups of countries Hungarian agri-food products show competitive advantage or disadvantage, that is where to export and where not to?

In setting my purposes I considered the verification or refutation of the following hypotheses:

H-1: Hungarian agri-food products are competitive in the trade with the EU-2 (Romania and Bulgaria joined the EU 1st Jan. 2007.) while they aren't competitive in the trade with the EU-9 (countries that joined the EU 1st May 2004.).

H-2: There have been fewer changes in the structure of intra-industry trade for the EU-15 group than for the EU-9 group.

There have been fewer changes in the structure of the intra-industry trade between the Mediterranean group (Cyprus, Malta) and the EU-25, than in the one between CEE (Czech, Poland, Hungary, Slovakia, Slovenia) and the EU-22 group.

H-3: Hungarian agri-food products have a stronger comparative advantage on the market of the Mediterranean countries (Cyprus and Malta) than that of the CEE (Czech, Poland, Hungary, Slovakia, Slovenia).

H-4: In the BCG-matrix analysis more products are going to land in the "dead dog" category for the EU-9 country group (2009/2004 – export change, %) than for the EU-26, furthermore the groups formed by clustering will largely be identical or at least will show significant resemblance to the BCG-matrix grouping.

H-5: Our anticipated trade turnover in the coming years (2010-2012) in relation to some country groups and product categories will be as follows:

In case of the **EU-26 export of food grade meat and offal** in 2012 **will not reach the level it did in 2009**, while the **import value** a will grow dynamically and **will exceed it**. As a result the contribution of the product category to the active balance of the sector will decrease even more.

The **export of grains will grow significantly,** the **import value** though, **will not reach the** record **level of 2008.** This way the positive effect of the product category it has on the active trade balance will further increase.

In case of the **EU-9 export and import values of oilseeds and oil rich fruits is going to decrease** compared to 2009.

2. MATERIAL AND METHOD

Since the main stream of my research is the examination of the dynamics of our foreign trade relationships with the EU countries, I have used publications of Hungarian and international professionals, articles from economic and trade magazines and periodicals and domestic and international statistical data during my work.

In my analysis the agri-(foreign)trade data used was the I-IV. product classes and 01-24 product groups of the Harmonized System (HS) and the Combined Nomenclature (CN), hence all data from all examined countries were completely comparable with the Hungarian data.

Reflecting the changes in agri-trade in numbers I have used the data retrieved from the databases of EUROSTAT, AKI, KSH and BUNDESBANK. Collecting relevant data was hindered by he fact that EUROSTAT only has data from newly accessed countries form 1999, so I had to acquire the missing data for these countries and years from KSH.

The fact that KSH published its data in USD, EUROSTAT in EURO and prior to 1998 in ECU presented a further problem. I converted these figures using conversion tables found on the following website: www.bundesbank.de/statistik/statistik_zeitreihen.php?func=row&tr=wj5636

My study encompasses 9 and 15 years. To calculate ratios and balances I have used 1995 and 2001 as the base year, despite the fact that agricultural production levels were on the bottom in the early 90s. Choosing the base year was also determined by the lack of sufficient data from earlier years. The last year of my study is 2009. This way I have been able to use the latest data giving the most complete picture of the processes.

In drawing deeper conclusions I used trade and share indices (Balassa, Vollrath, /RTA/ and Grubel – Lloyd-index /GL/, and constant market share /CMS/). The reason for choosing these indices was the fact that all of them use the same formula as the starting point, use the same type of data as their source data, which are sufficient for the calculation of the simple Balassa index.

For clustering calculations I used the SPSS 15.0. statistical software. I used exponential, linear and logistic function analysis to prepare prognosis on the export of products, I completed the joining in the PASW Statistics 18. software suite and drew the charts using Microsoft Excel.

3. RESULTS

3.1. CMS-constant market share analysis

The constant market share analysis is used to identify three components of the export performance: effect of market size, effect of market composition and effect of competition.

The constant market share analysis is based on the presupposition that the export share of the base period is sustained in the subsequent time period in the case of the given product group. With the help of the presupposition it is possible to determine three structural components of the market share. For the purposes of my analysis I chose the 2001-2003 average of the Hungarian agri-food export to the EU countries that joined 1st May 2004 (EU-9) and 1st January 2007 (EU-2) as the baseline, which was then compared to the average of 2007-2009. I used the correlations below to determine the components of the export performance:

$$(q^1 - q^0) = S^0 (Q^1 - Q^0) + \sum (S_i^0 - S^0) \times Q_i^1 + (q^1 - \sum S_i^0 Q_i^1),$$

where q denotes the value of agri-food export to the EU-9 or EU-2, S is the share of Hungary from the total agri-food import of EU-9 or EU-2, S_i is the share of Hungary from the total agri-food import of EU-9 or EU-2 for *i* product group, Q is the total agri-food export to EU-9 or EU-2, Q_i is the total agri-food export to EU-9 or EU-2 for *i* product group. The equation shows that the fluctuation of Hungarian agri-food export to EU-9 or EU-2 ($q^1 - q^0$) between the dates above can be separated into three components which are shown on the right side of the equation.

The effect of market size shows the changes in the total agri-food import of the EU-9 or EU-2 in the above mentioned time period. If this grows/shrinks then under constant market share (S^0) Hungary's export to the EU-9 or EU-2 will grow/shrink, and its value is reflected by the expression $S^0 (Q^1 - Q^0)$. The effect of market size may result from the shift in EU demand, which shift among others may be attributed to changes in consumer taste, increase of income or the change of willingness to import.

The effect of market composition refers to the fact that different product groups (member countries) have different share from the Hungarian agri-food export into the EU-9 or EU-2 compared to Hungary's share in the total EU-9 or EU-2 agri-food import. During the base period ($S_i^0 - S^0$) Hungary's agri-food export is going to grow if it is concentrated to the product group (countries) (Q_i^1) that grow faster/slower than in the entire EU-9 or EU-2. The effect of market composition may be explained with the combination of changes in the export supply and the import demand.

The effect of competition may be calculated by subtracting the export level that would have been resulting had the export share of the base period been unchanged for all product groups (countries) ($\sum S_i^0 Q_i^1$), from the actually realized Hungarian export in the subsequent period (q^1). The competition effect may be explained as the consequence of the change in supply, like reduction of costs, increased profitability of production, technological improvement, or government policy. [FERTŐ, 2000]

I have completed the constant market share analysis (CMS) for both EU-9 and EU-2, all product groups (HS-24), and all country groups.

Table 1. shows Hungary's agri-food export to the **EU-9 by product groups** in the two periods**.** Hungary's share from the import of the EU export dropped to 104,52% from 105,6%. The export growth was more than EUR 532,45 million during the examined period. This surplus is divided into three portions according to the constant market share analysis method, which are displayed in the bottom section of Table 1.

The effect of market size based on the data available was EUR 745.70 million (140% of the total surplus), the effect of the market composition was EUR 102,0 million (19% of the total surplus) and the effect of competition was EUR -314,78 million (-59% of the total surplus).

According to the CMS analysis the largest amount of increase in Hungary's export was primarily due to the effect of market size. In other words the main source of the increase of the Hungarian agri-food export was the 285,3 % increase in the import of the EU-9 countries.

The effect of the market composition was EUR 102,0 million, while the ***effect of competition*** was EUR -314,78 million. Market share n the case of 8 product categories (dairy, milled products, vegetable sap and extracts, animal fat and vegetable oil, sugar and candies, various edible preparations, food industry by-products and tobacco and derivatives) increased. At the same time the market composition effect for the same products was in the negative range.

So there was not even one product category where market share grew, and at the same time the market composition effect was positive. The negative market composition effect may explain the concentration of Hungary's agri-food export on products where the growth of the demand in the EU-9 was below average. [FERTŐ, 2000]

Table 1.: Constant Market Share Analysis by product groups in EU-9 countries (accessed 1. May. 2004) (million EUR)

Product groups	All EU import 2001-2003	Hungarian export to EU-9 annual mean 2001-2003	Hungarian share (%) S_i^0	All EU mean import 2007-2009 Q_i^1	Hungarian export to the EU-9 annual mean 2007-2009	Hungarian share (%)	$(s_i^0 - s^0)Q_i^1$	$s_i^0 Q_i^1$
	(1)	(2)	(3)=(2)/(1)	(4)	(5)	(6)=(5)/(4)	(7)	(8)
Live animals	95,974	5,133	0,0535	316,285	11,737	0,0371	-1	17
Edible meat offal, chitterlings	370,415	41,503	0,1120	2 205,154	73,251	0,0332	125	247
Fish, shellfish, molluscs, crustaceans and other aquatic invertebrates	149,992	1,230	0,0082	739,495	1,389	0,0019	-35	6
Dairy products, eggs, natural honey, other edible animal products	288,962	4,204	0,0145	1 277,875	28,958	0,0227	-52	19
Other edible animal products	60,451	1,400	0,0232	195,423	1,829	0,0094	-6	5
Live trees and other plants, bulbs, tubers, roots, other flowers and decorative leaves	215,525	3,298	0,0153	479,899	3,671	0,0076	-19	7
Edible vegetables, roots, tubers	411,441	23,322	0,0567	1 148,675	29,168	0,0254	1	65
Edible fruits, nuts, citrus and melon peels	638,787	20,377	0,0319	1 883,681	26,053	0,0138	-45	60
Coffee, tea, mate tea, spices	159,070	7,006	0,0440	534,505	20,206	0,0378	-6	24
Grains	232,440	67,785	0,2916	785,790	183,765	0,2339	186	229
Milled products, malt, starch, inulin, gluten	165,405	4,717	0,0285	333,867	16,563	0,0496	-9	10
Oil seeds, oily fruits, various seeds and fruits, industrial plants, herbs, straw, fodder	163,156	10,595	0,0649	381,355	19,071	0,0500	4	25
Shellac, gums, resin and other vegetable saps and extracts	46,952	0,128	0,0027	94,565	0,522	0,0055	-5	0
Plant raw material for spinning, other vegetable material	2,046	0,135	0,0661	4,559	0,292	0,0641	0	0
Animal fat and vegetable oil, derivatives of these, processed cooking oils and vegetable wax	472,809	12,203	0,0258	940,641	38,067	0,0405	-28	24
Products from meat, fish, shellfish, molluscs, and other aquatic invertebrates	158,737	14,405	0,0907	581,995	19,465	0,0334	20	53
Sugar and candies	270,410	8,148	0,0301	725,843	61,568	0,0848	-18	22
Cocoa and derivatives	375,681	14,232	0,0379	914,564	30,604	0,0335	-16	35
Confectioners' products and other products using grains, flour, starch, or milk	439,735	13,199	0,0300	1 154,177	18,480	0,0160	-29	35
Processed products using vegetables, fruits, nuts, and other plant parts	315,985	51,396	0,1627	891,859	76,006	0,0852	96	145
Various edible products	682,320	27,382	0,0401	1 494,453	97,471	0,0652	-23	60
Beverages, spirits and vinegar	522,808	29,146	0,0557	1 736,930	85,747	0,0494	0	97
Food processing by-products and discards, manufactured fodder	774,432	38,771	0,0501	1 165,761	67,164	0,0576	-6	58
Tobacco and derivatives	230,657	2,655	0,0115	682,303	23,774	0,0348	-30	8
Total	7 244,192	402,372	0,0560	20 669,655	934,820	0,0452	102	1 250

Source: Own calculations based on EUROSTAT (2010) data

	Q^0	q^0	S^0	Q^1	q1
Constant Market Share Analysis (EUR, %)					
Market size effect	745,70	140%			
Market composition effect	102,00	19%			
Competition effect	-314,78	-59%			
Total profit (surplus)	532,45	100%			

(Abbreviations of HS and CN categories have been used in the table.)

I also examined the Hungarian agri-food export to the **EU-9** according to the distribution to export countries, which figures are organized in Table 2. The components of the growth of Hungary's agri-food export had a few differences in relation to the product group data. The effect of market size was EUR 745,7 million (140%), which is identical to that of he product group data. The effect of competition was EUR -211,26 million (-40%). The larger difference between the two groupings of data can be detected here (103,52). The effect of market composition was EUR -2 million when considering the countries. This figure shows a EUR 100 million difference.

The main conclusion of the constant market share analysis by countries would be, that the increase in the Hungarian export was ***largely due to the effect of market size***. Both the market composition effect and the competition effect were negative, but in this case the competitive effect was more significant. Market share was only increased in case of 3 out of the 9 countries: Slovakia, Cyprus and Malta. These countries took almost 15% of the Hungarian export in the second half of the period concerned. The market composition effect was negative except in the case of two countries: (Slovenia and Slovakia). There was only one country (Slovakia) where market share grew and the market composition effect was positive at the same time.

From the table it is obvious that the market size effect exceeds both the negative market composition and the negative competition effects.

Table 2.: Constant Market Share Analysis by countries in EU-9 and EU-2 countries

(million EUR)

Country	All EU import 2001-2003	Hungarian export to EU-9 annual mean 2001-2003	Hungarian share (%) S_i^0	All EU mean import 2007-2009 Q_i^1	Hungarian export to the EU-9 annual mean 2007-2009	Hungarian share (%)	$(s_i^0 - s^0)Q_i^1$	$s_i^0 Q_i^1$
	(1)	(2)	(3)=(2)/(1)	(4)	(5)	(6)=(5)/(4)	(7)	(8)
Czech	1 678,21	89,197	0,0531	4 635,66	190,103	0,041	-11,11	246,385
Poland	2 339,92	118,054	0,0505	7 411,86	224,893	0,0303	-37,74	373,944
Slovakia	809,664	55,46	0,0685	2 604,86	295,346	0,1134	33,74	178,427
Slovenia	544,664	91,073	0,1672	1 249,10	135,38	0,1084	139,48	208,861
Estonia	464,204	14,365	0,0309	848,597	12,415	0,0146	-20,87	26,26
Latvia	453,709	11,105	0,0245	1 196,74	19,805	0,0165	-37,18	29,292
Lithuania	434,489	19,317	0,0445	1 664,89	34,521	0,0207	-18,45	74,019
Cyprus	269,384	3,449	0,0128	649,508	17,249	0,0266	-27,76	8,316
Malta	249,959	0,352	0,0014	408,439	5,108	0,0125	-22,11	0,575
EU-9 countries total	**7 244,209**	**402,372**	**0,0555**	**20 669,655**	**934,82**	**0,045**	**-2,00**	**1 146,079**
Bulgaria	261,968	21,477	0,0820	1 216,769	79,425	0,0653	-137,54	99,755
Romania	795,115	184,681	0,2323	2 996,559	635,356	0,2120	111,60	696,009
EU-2 countries total	**1 057,083**	**206,158**	**0,195**	**4 213,328**	**714,781**	**0,17**	**-25,94**	**795,764**
	Q^0	q^0	S^0	Q^1	q^1			

Source: Own calculations based on EUROSTAT [2010]

Constant Market Share Analysis (EUR, %)

	EU-2		EU-9	
Market size effect	615,55	121%	745,7	140%
Market composition effect	-25,94	-5%	-2,00	0%
Competition effect	-80,98	-16%	-211,26	-40%
Total profit (surplus)	508,62	100%	532,45	100%

Table 3. shows Hungary's agri-food export to the **EU-2 by product groups** in the two periods**.** Hungary's share from the import of the EU-2 import dropped to 16.96% from 19.5%. The export growth was more than EUR 508,62 million during the examined period. This surplus is divided into three portions according to the constant market share analysis method, which are displayed in the bottom section of Table 3.

The effect of market size based on the data available was EUR 615.55 million (121% of the total surplus), the effect of the market composition was EUR -111.0 million (-22% of the total surplus) and the effect of competition was EUR 3.63 million (1% of the total surplus).

According to the CMS analysis the largest amount of ***increase in Hungary's export was primarily due to the effect of market size***. In other words the main source of the increase of the Hungarian agri-food export was the 346.72% increase in the import of the EU-2 countries.

The effect of the market composition was EUR -111.0 million, while the ***effect of competition*** was EUR 3.63 million. Market share increased in the case of 15 product categories. At the same time the market composition effect for the same products was in the negative range except for two products (grains where it was positive and plant raw material and other vegetable products where it was 0).

The negative market composition effect may explain the concentration of Hungary's agri-food export on products where the growth of the demand in the EU-2 was below average. The growth of the export of agri-food products was due to the positive competition effect

I also examined the Hungarian agri-food export to the **EU-2** according to the distribution to export countries, which figures are organized in Table 2. The components of the growth of Hungary's agri-food export had two differences compared to the product group data. The effect of market size was EUR 615.55 million (121%). The effect of competition was EUR – 80.98 million (-16%), which showed a EUR -77.35 million difference to the product category break-down. The effect of market composition was EUR -25.94 million (-5%).

The main conclusion of the constant market share analysis by countries would be, that **the increase in the Hungarian export both to EU-9 and EU-2 countries was largely due to the effect of market size**.

The market composition effect was negative for the EU-2 in both data break-down. In the EU-9 the market composition effect was negative when looking at the countries, but positive when looking at the products. EU-2 and EU-9 market share was increased in case of 15 products and 2 respectively. There was only one product (grains) where market share grew and the market composition effect was positive at the same time.

It is obvious from the table that in the product group break-down for EU-9 the market size effect exceeds the negative market composition effect, while for EU-2 the positive market size effect exceeds the negative market composition effect.

Table 3.: Constant Market Share Analysis by product groups in EU-2 countries (accessed 1.Jan. 2007) (million EUR)

Product groups	All EU import 2001-2003	Hungarian export to EU-2 annual mean 2001-2003	Hungarian share (%) S_i^0	All EU mean import 2007-2009 Q_i^1	Hungarian export to the EU-2 annual mean 2007-2009	Hungarian share (%)	$(s_i^0 - s^0)Q_i^1$	$s_i^0 Q_i^1$
	1	2	(3)=(2)/(1)	(4)	(5)	(6)=(5)/(4)	(7)	(8)
Live animals	46,461	32,325	0,6958	121,427	35,303	0,2907	61	84
Edible meat offal, chitterlings	180,252	20,374	0,1130	847,931	112,660	0,1329	-70	96
Fish, shellfish, molluscs, crustaceans and other aquatic invertebrates	19,442	0,137	0,0070	82,603	1,808	0,0219	-16	1
Dairy products, eggs, natural honey, other edible animal products	38,614	5,254	0,1361	272,778	39,147	0,1435	-16	37
Other edible animal products	5,709	0,734	0,1286	30,671	1,258	0,0410	-2	4
Live trees and other plants, bulbs, tubers, roots, other flowers and decorative leaves	12,379	1,851	0,1495	84,034	10,120	0,1204	-4	13
Edible vegetables, roots, tubers	22,020	2,417	0,1098	105,300	7,767	0,0738	-9	12
Edible fruits, nuts, citrus and melon peels	36,191	0,405	0,0112	161,601	8,374	0,0518	-30	2
Coffee, tea, mate tea, spices	26,680	7,168	0,2687	101,039	2,828	0,0280	7	27
Grains	100,431	52,215	0,5199	271,853	161,486	0,5940	88	141
Milled products, malt, starch, inulin, gluten	42,274	19,885	0,4704	119,494	39,562	0,3311	33	56
Oil seeds, oily fruits, various seeds and fruits, industrial plants, herbs, straw, fodder	18,070	1,944	0,1076	133,681	16,431	0,1229	-12	14
Shellac, gums, resin and other vegetable saps and extracts	5,671	0,020	0,0036	18,293	0,073	0,0040	-4	0
Plant raw material for spinning, other vegetable material	0,273	0,114	0,4197	1,203	0,546	0,4535	0	1
Animal fat and vegetable oil, derivatives of these, processed cooking oils and vegetable wax	58,896	3,398	0,0577	182,880	39,162	0,2141	-25	11
Products from meat, fish, shellfish, molluscs, and other aquatic invertebrates	14,751	2,418	0,1639	63,402	11,869	0,1872	-2	10
Sugar and candies	27,332	2,408	0,0881	153,382	31,103	0,2028	-16	14
Cocoa and derivatives	40,255	1,703	0,0423	150,554	10,016	0,0665	-23	6
Confectioners' products and other products using grains, flour, starch, or milk	48,114	5,875	0,1221	205,493	27,669	0,1346	-15	25
Processed products using vegetables, fruits, nuts, and other plant parts	43,807	9,070	0,2070	194,316	28,855	0,1485	2	40
Various edible products	94,294	6,930	0,0735	290,417	35,184	0,1211	-35	21
Beverages, spirits and vinegar	38,767	2,482	0,0640	241,112	25,743	0,1068	-32	15
Food processing by-products and discards, manufactured fodder	64,330	25,562	0,3974	193,501	67,383	0,3482	39	77
Tobacco and derivatives	72,071	1,470	0,0204	186,363	0,435	0,0023	-33	4
Total	1 057,083	206,158	0,1950	4 213,328	714,782	0,1696	-111	711

Source: Own calculations based on EUROSTAT (2010) data

	Q^0	q^0	S^0	Q^1	q^1
Constant Market Share Analysis (EUR, %)					
Market size effect	615,55	121%			
Market composition effect	-111,00	-22%			
Competition effect	3,63	1%			
Total profit (surplus)	508,62	100%			

In conclusion it can be stated that the position of Hungarian agri-food products improved from the average of 2001-2003 to that of 2007-2009 for both EU-9 and EU-2 markets as well. For the EU-9 there is a contradiction though, because the EUR 532.45 million gain was matched with significant loss in the area of competitiveness.

The CMS analysis showed that the main source of the growth of agri-food product export to both **EU-9 and EU-2** was the market size effect in product groups as well as countries. Export performance was largely influenced by the negative competition effect in both groups of countries. In case of the EU-2 the negative market composition effect was strong in the country break-down and also significant in the product group break-down.

The first part of my H-1 hypothesis – "**Hungarian agri-food products are competitive in the trade with the EU-2 (Romania and Bulgaria joined the EU 1st Jan. 2007.) while they aren't competitive in the trade with the EU-9 (countries that joined the EU 1st May 2004)**." – could not be confirmed, because our competition position is in the negative range in relation to both groups. Nevertheless there are a few countries (Slovakia, Cyprus, Malta), and 8 product categories in the EU-9 and 15 in the EU-2 where we have competitive advantage..

3.2. Measuring intra-industry trade with the use of Grubel-Lloyd-index

3.2.1. Intra-industry trade in the agri-food trade between Hungary and the EU

My analysis is aimed at the trade between Hungary and the EU-26, Hungary and the EU-15, Hungary and the EU-9 and Hungary and the EU-2 countries. I have also performed calculations in relation to the trade relationships of the following groups: EU-10 and EU-17, CEE and EU-22, Baltic countries and EU-24, Mediterranean countries and EU-25, EU-2 and EU-24, for product categories in the 2001-2009 period, with special attention to 2001, 2004 and 2009. In this thesis I only present those connected to my hypothesis. The data used for this research came from the database of EUROSTAT.

According to **Fertő** (2003) intra-industry trade is when identical goods are traded for each other. One explanation to the existence of intra-industry trade is, that statistical data is too much aggregated. Another explanation can be that customers like variety, a bounty of brands. Looking at it from the production point of view: development of sectors can be of different speed, which leads to differences in costs for the same product in different countries.

The classic Grubel – Lloyd-index (GL-index) is used to measure intra-industry trade (IIT).

Table 4. shows a few attributes of the intra-industry trade between Hungary and the EU for agri-food products.

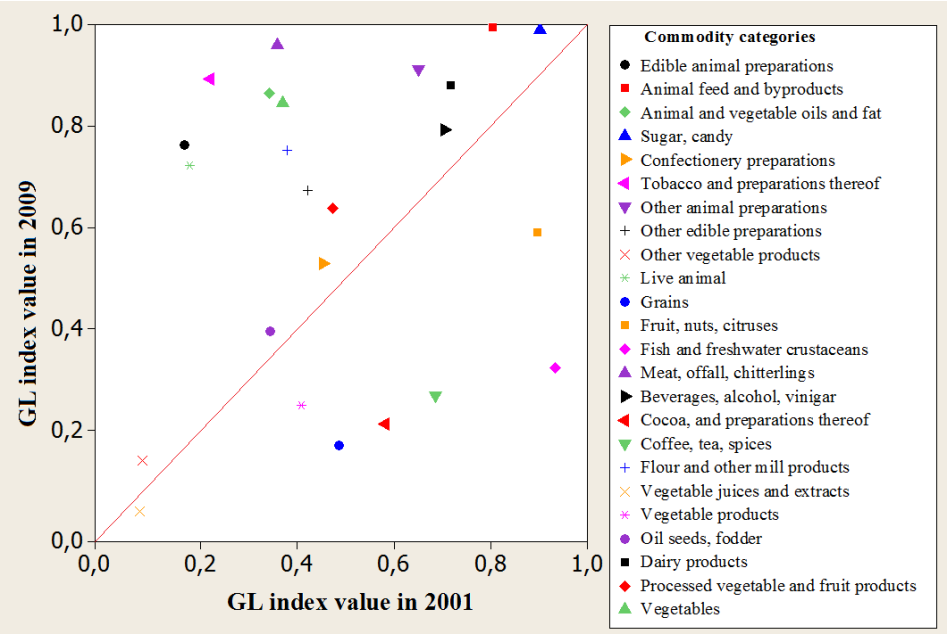
Table 4. Grubel – Lloyd-indices in the Hungary-EU and EU-EU agri-food industry trade in 2001, 2004 and 2009

Product categories of the Harmonized System (HS) and the Combined Nomenclature (CN)	HUN/ EU-15/ 2001	HUN/ EU-15/ 2004	HUN/ EU-15/ 2009	HUN/ EU-9/ 2001	HUN/ EU-9/ 2004	HUN/ EU-9/ 2009	KKE/ EU-22/ 2001	KKE/ EU-22/ 2004	KKE/ EU-22/ 2009	Med./ EU-25/ 2001	Med./ EU-25/ 2004	Med. / EU-25/ 2009
Live animals	0,18	0,64	0,72	0,34	0,53	0,56	0,39	0,49	0,96	0,37	0,69	0,08
Edible meat offal, chitterlings	0,36	0,49	0,96	0,61	0,61	0,59	0,50	0,78	0,92	0,21	0,22	0,43
Fish, shellfish, molluscs, crustaceans and other aquatic invertebrates	0,93	0,50	0,32	0,55	0,19	0,36	0,77	0,88	0,95	0,44	0,36	0,22
Dairy products, eggs, natural honey, other edible animal products	0,72	0,87	0,88	0,22	0,13	0,22	0,64	0,55	0,76	0,33	0,38	0,73
Other edible animal products	0,65	0,80	0,91	0,18	0,14	0,77	0,82	1,00	0,88	0,88	0,11	0,87
Live trees and other plants, bulbs, tubers, roots, other flowers and decorative leaves	0,41	0,28	0,25	0,18	0,15	0,86	0,43	0,41	0,37	0,01	0,01	0,00
Edible vegetables, roots, tubers	0,37	0,67	0,85	0,96	0,55	0,79	0,88	0,96	0,89	0,55	0,68	0,53
Edible fruits, nuts, citrus and melon peels	0,90	0,79	0,59	0,49	0,43	0,97	0,76	0,69	0,54	0,89	0,83	0,72
Coffee, tea, mate tea, spices	0,69	1,00	0,27	0,90	0,42	0,99	0,88	0,53	0,64	0,17	0,13	0,15
Grains	0,49	0,33	0,17	0,56	0,72	0,37	0,79	0,77	0,29	0,00	0,00	0,01
Milled products, malt, starch, inulin, gluten	0,38	0,96	0,75	0,92	0,69	0,98	0,90	0,92	0,86	0,01	0,05	0,02
Oil seeds, oily fruits, various seeds and fruits, industrial plants, herbs, straw, fodder	0,34	0,30	0,40	0,63	0,60	0,82	0,53	0,61	0,54	0,26		0,30
Shellac, gums, resin and other vegetable saps and extracts	0,07	0,05	0,04	0,11	0,03	0,42	0,23	0,41	0,43	0,01	0,00	0,00
Plant raw material for spinning, other vegetable material	0,08	0,12	0,14	0,48	0,52	0,39	0,28	0,49	0,68	0,69	0,95	0,00
Animal fat and vegetable oil, derivatives of these, processed cooking oils and vegetable wax	0,34	0,66	0,87	0,44	0,61	0,80	0,21	0,31	0,72	0,04	0,12	0,02
Products from meat, fish, shellfish, molluscs, and other aquatic invertebrates	0,17	0,41	0,76	0,68	0,99	0,51	0,50	0,61	0,73	0,01	0,03	0,00
Sugar and candies	0,90	0,60	0,99	0,71	0,82	0,99	0,88	0,56	0,98	0,05	0,21	0,02
Cocoa and derivatives	0,58	0,50	0,21	0,51	0,54	0,66	0,74	0,73	0,81	0,08	0,01	0,00
Confectioners' products and other products using grains, flour, starch, or milk	0,45	0,36	0,53	0,51	0,32	0,47	0,61	0,73	0,86	0,02	0,04	0,05
Processed products using vegetables, fruits, nuts, and other plant parts	0,47	0,57	0,64	0,68	0,97	0,56	0,61	0,73	0,91	0,36	0,33	0,22
Various edible products	0,42	0,38	0,67	0,65	0,73	1,00	0,45	0,64	0,90	0,17	0,17	0,09
Beverages, spirits and vinegar	0,70	0,86	0,79	0,98	0,57	1,00	0,95	0,77	0,73	0,27	0,22	0,11
Food processing by-products and discards, manufactured fodder	0,80	0,93	1,00	0,64	0,53	0,67	0,46	0,59	0,88	0,06	0,04	0,04
Tobacco and derivatives	0,22	0,55	0,89	0,49	0,40	0,37	0,98	0,45	0,56	0,04	0,49	0,14

Source: Author's calculations based on EUROSTAT [2010] data

In the trade between Hungary and the EU-15 there was continuous growth in the GL-index for 12 products (Live animals, Edible meat offal, chitterlings, Dairy products, Other edible animal products, Edible vegetables, Oil seeds, Plant raw material, Animal fat and vegetable oil, Products from meat, fish, etc., Processed products using vegetables, fruits, Food processing by-products and discards, manufactured fodder, Tobacco and derivatives)

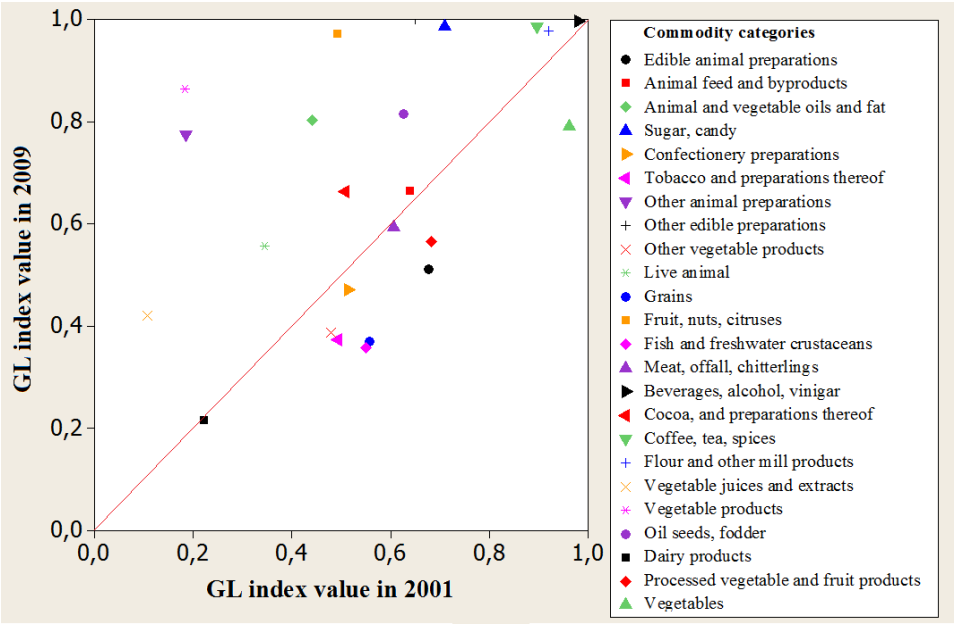
In case of six product categories (Fish, shellfish, molluscs, crustaceans and other aquatic invertebrates, Live trees and other plants, Edible fruits and nuts, Shellac, gums, resin and other vegetable saps and extracts, Cocoa and derivatives) a steady decline is obvious through 2001, 2004, and 2009. Figure 1. shows this trend.



Source: Author's chart based on EUROSTAT [2010] data

Figure 1 : Hungary/EU-15 GL-index diagram

It is clear from Figure 2. that the GL-indices steadily grew from 2001 to 2004 and then to 2009 in the trade between Hungary and the EU-9 for the following products: live animals, animal and vegetable fat and oils, sugar and candy, cocoa and derivatives, other edible products, and beverages, sprits and vinegar. In case of the latter two the index value was 1 in 2009, which means that for these products the intra-industry trade is a perfect one. For this group of countries the GL-index values fluctuated for most products, and in case of two (fish and other aquatic animals, tobacco and derivatives) we see a steady decline.



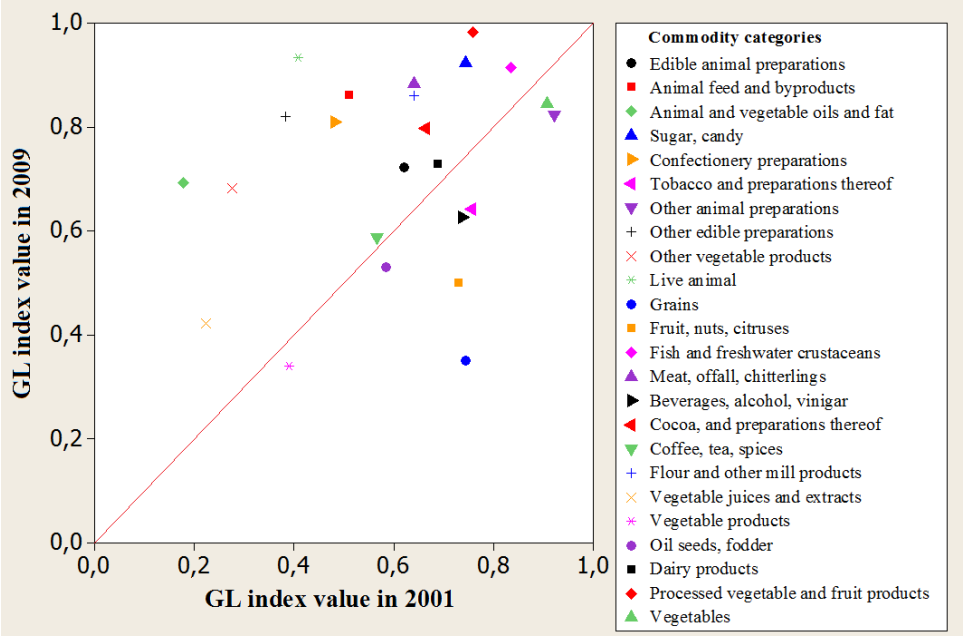
Source: Author's calculations based on EUROSTAT [2010] data

Figure 2 : Hungary/EU-9 GL-index diagram

Out of the point values of the GL-indices the dairy product is located on the diagonal, the meat and offal right next to the diagonal which indicates that for these products there was no change in the structure of the intra-industry trade. The most significant change occurred in case of the Plants and other animal products, since these are farthest from the diagonal. (Figure 2.)

3.2.2. Intra-industry trade between various groups of EU countries in the agri-food industry

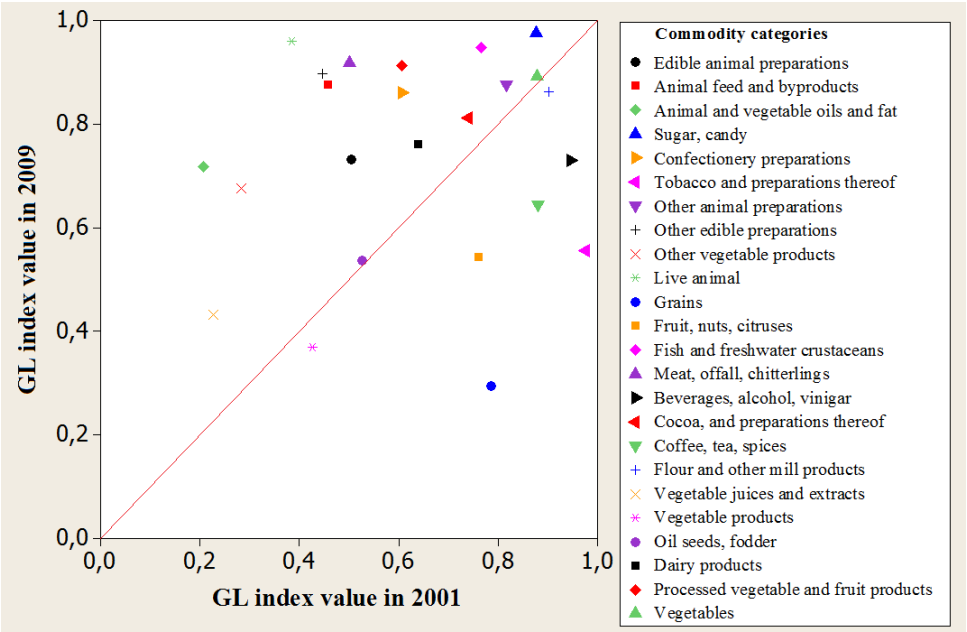
The index values are the highest in the trade relationships between the EU-10 and EU-17 (Figure 3), and between the Central-Eastern European countries (CEE) and the EU-22 (Figure 4). In the trade between the EU-10 and EU-17 12 product groups, and in the one between the Central-Eastern European countries (CEE) and the EU-22 11 product groups show a steadily growing (between 0.42 and 0.98) value in 2009.



Source: Author's calculations based on EUROSTAT [2010] data

Figure 3: EU-10/EU-17 GL-index diagram

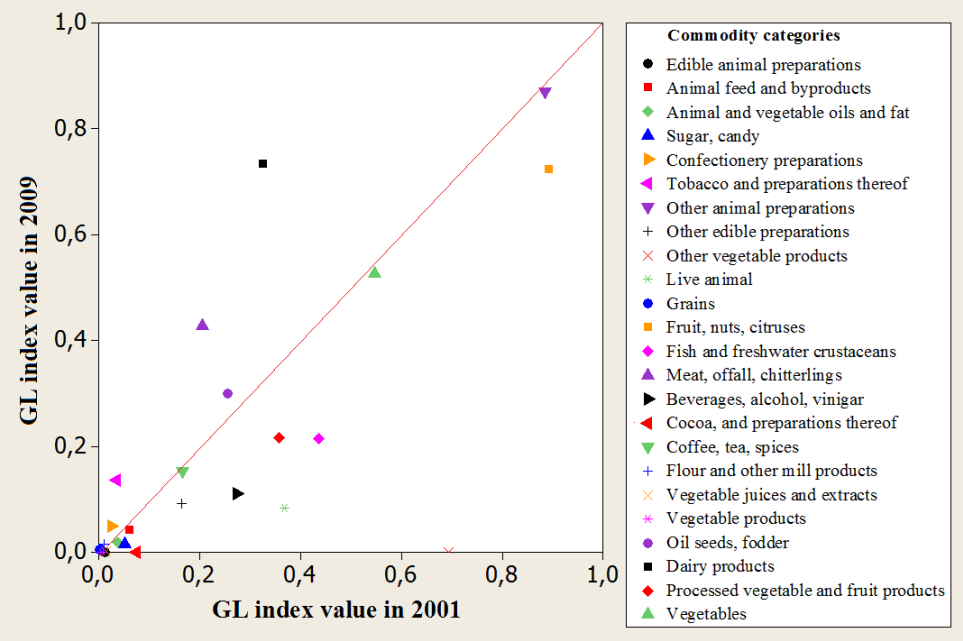
In the CEE group there was one product group (Other animal products) with a GL-index value of 1, which reflects a perfect intra-industry trade scenario. (Figure 4)



Source: Author's calculations based on EUROSTAT [2010] data

Figure 4: Central-Eastern European countries/EU-22 GL-index diagram

The GL-indices of the trade between the Mediterranean and the EU-25 countries (Figure 5) demonstrated steady growth in case of five products and steady decline in the case of the same number. The highest value of index was calculated from the trade of fruit, nuts and citrus. These figures decreased between 2001 and 2009. The export value grew between 2011 and 2004 and then decreased between 2004 and 2009. For the Mediteranean/EU-25 countries relations the value of the GL-index was 0 for 1 product (milled products), which shows no trade between the industries.



Source: Author's calculations based on EUROSTAT [2010] data

Figure 5 : Mediterranean countries/EU-25 GL-index diagram

In conclusion it can be stated that the first part of my hypothesis H-2 which says: **"There have been fewer changes in the structure of intra-industry trade for the EU-15 group than for the EU-9 group."** did not prove to be true, because there were fewer changes to the product structure in the EU-9.

The second half of hypothesis H-2 **"There have been fewer changes in the structure of the intra-industry trade between the Mediterranean group (Cyprus, Malta) and the EU-25, than in the one between CEE (Czech, Poland, Hungary, Slovakia, Slovenia) and the EU-22 group."** proved to be true because in the Mediterranean countries the change was insignificant which is not true for CEE/EU-22 trade relationships, as changes there were remarkable.

3.3. Theory of Competitiveness and Comparative Advantages, methods and measurement techniques

In this section of my dissertation I studied the dynamics of the structure of Hungarian agri-trade between 2011-2009 (specifically for 2001, 2004, 2009 and periods of 2001-2003, 2004-2006, and 2007-2009) on five reference markets. I used the **Balassa index** to measure the specialization of trade. According to Balassa the comparative advantage is realized in the form of high share of the export market, while comparative disadvantage is realized in the form of low shares of the export market.

One of the most popular complex indicators is the method of the **Revealed Comparative Advantages** (RCA). One of the most important critiques of RCA is that it only considers the export, and omits the import. A further deficiency is that it does not indicate the importance of the

export of the examined country on the world market. At the same time it is popular because it is simple, does not require a lot of data, and can be handled with ease. The RCA and the change of export structure over time may show the areas that have potential for improvement in competitiveness, so which areas to concentrate on. [ELEKES-PÁLOVICSNÉ, 2001]

The Balassa-index is often criticized for the omission of the effects of different economic policies (agricultural policy), and for the asymmetric values. Trade structures are distorted by various government interventions, policies and restrictions, while the asymmetry of the B-index means that if a country has comparative advantage for a product, the value may range from one to infinite, while in case of comparative disadvantage the value can only range between 0 and 1. This may lead to over evaluation of the weight of a particular industry. [FERTŐ, 2003]

A partial solution to this problem is the ranking of the B-index, which was proposed by Hinloopen-van Marrewijk [2001]:

Category A: $0 < B \leq 1$
Category B: $1 < B \leq 2$
Category C: $2 < B \leq 4$
Category D: $4 < B$

Category A contains the products without comparative advantage. Category B has weak, C has moderate and D has strong comparative advantage. This categorization can be easily interpreted.

3.3.1. Revealed Comparative Advantages to the various groups of countries in the EU

I have calculated the B-index for five different reference groups, which are as follows:

The EU-15; countries accessed on 1st May 2004 (without Hungary), and on 1st July 2007 (EU-2). In case of the EU-15 I considered the countries accessed before 1st May 2004. I used data from the EUROSTAT database.

In this thesis I only deal with the two country groups which are connected to my hypothesis. (CEE and Mediterranean)

A.)

Table 5. and Figure 6. show the revealed comparative advantages and disadvantages of Hungarian agri-food products in the **CEE countries accessed 1st May 2004**, for the years 2001, 2004 and 2009, and the periods 2001-2003, 2004-2006 and 2007-2009.

For the following products Hungary **did not have comparative advantage** in neither year or period:

Fish and aquatic animals, Dairy products, Other vegetable and animal products, Vegetables, Fruits, nuts and citruses, Vegetable juices and extracts, Cocoa and derivatives, Confectioner's products, and Tobacco and derivatives.

Weak comparative advantage:
Milled products, Vegetable and fruit products, Fodder and by-products from 2004 to 2009, Meat, offal from 2001 to 2006, Oilseeds and fodder from 2001 to 2009, Live animals from 2007 to 2009.

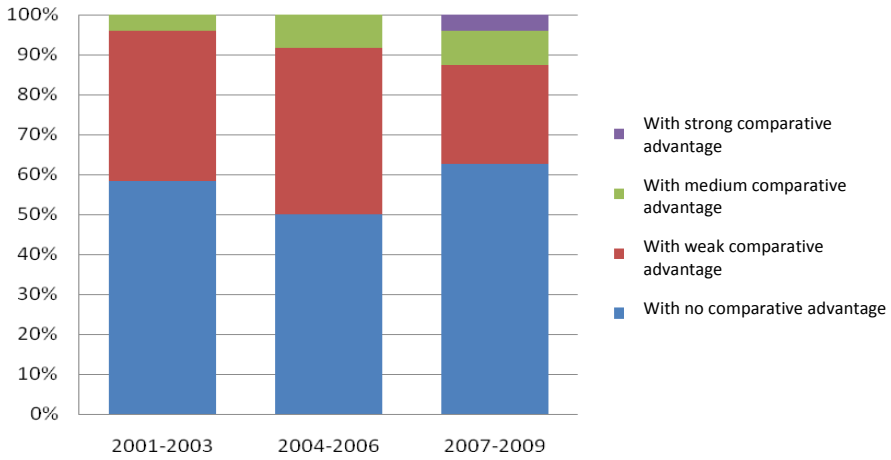
Moderate comparative advantage:
Grains from 2001 to 2006, Other vegetable products from 2005 to 2009.

Strong comparative advantage: only one product category manifested it, Grains from 2007 to 2009.

Table 5: B-index ranking for CEE countries accessed 1st May 2004

	2001		2001-2003		2004		2004-2006		2009		2007-2009	
	pc	%	pc	%	pc	%	pc	%	pc	%	pc	%
Category A: 0 < B ≤ 1 no comparative advantage	15	63	14	58	13	54	12	50	14	58	15	63
Category B: 1 < B ≤ 2 weak comparative advantage	8	33	9	38	9	38	10	42	9	38	6	25
Category C: 2 < B ≤ 4 moderate comparative advantage	1	4	1	4	2	8	2	8	1	4	2	8
Category D: 4 < B strong comparative advantage	0	0	0	0	0	0	0	0	0	0	1	4

Source: Author's calculations based on EUROSTAT [2010] data



Source: Author's calculations based on EUROSTAT [2010] data

Figure 6: Graphic presentation of B-index ranking for CEE countries accessed 1st May 2004.

B.)

Table 6 and Figure 7 show the revealed comparative advantages and disadvantages of Hungarian agri-food products in the **Mediterranean countries accessed 1st May 2004**, for the years 2001, 2004 and 2009, and the periods 2001-2003, 2004-2006 and 2007-2009.

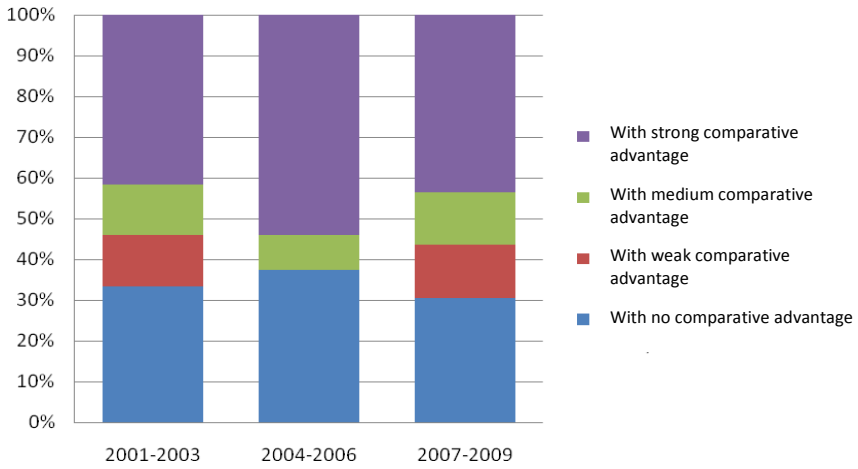
The product categories having the ***strongest revealed comparative advantage*** for Hungary over these countries are the following: Live animal, Vegetable products, Grains, Milled products, Oilseeds and fodder, Other vegetable products, Animal food products, Fodder and by-products.

There is a ***moderate advantage*** in case of Coffee, tea and spices, and there is ***no comparative advantage*** in case of Fish and aquatic animals, Dairy products, Vegetables, Fruit, nuts and citruses, Tobacco and derivatives.

Table 6: B-index ranking for Mediterranean countries accessed 1st May 2004.

	2001		2001-2003		2004		2004-2006		2009		2007-2009	
	pc	%	pc	%	pc	%	pc	%	pc	%	pc	%
Category A: 0 < B ≤ 1 no comparative advantage	6	25	8	33	9	39	9	38	5	22	7	30
Category B: 1 < B ≤ 2 weak comparative advantage	3	13	3	13	1	4	0	0	4	17	3	13
Category C: 2 < B ≤ 4 moderate comparative advantage	5	21	3	13	2	9	2	8	3	13	3	13
Category D: 4 < B strong comparative advantage	10	42	10	42	11	48	13	54	11	48	10	43

Source: Author's calculations based on EUROSTAT [2010] data



Source: Author's calculations based on EUROSTAT [2010] data

Figure 7: Graphic presentation of B-index ranking for Mediterranean countries accessed 1st May 2004

The number of product groups with revealed comparative advantage shows a declining tendency in all reference groups, except for the Mediterranean countries. In spite of the significant changes in Hungarian agriculture the distribution of the B-indices proved to be fairly stable.

The Hungarian agri-trade ***manifests a trend of decreasing specialization in all reference groups***. In other words Hungary has lost its comparative advantages in numerous product categories regardless of the reference market. The results attest for a significant drop in the specialization of the agri-food export. The stability of the B-index is less constant on the level of the product groups.

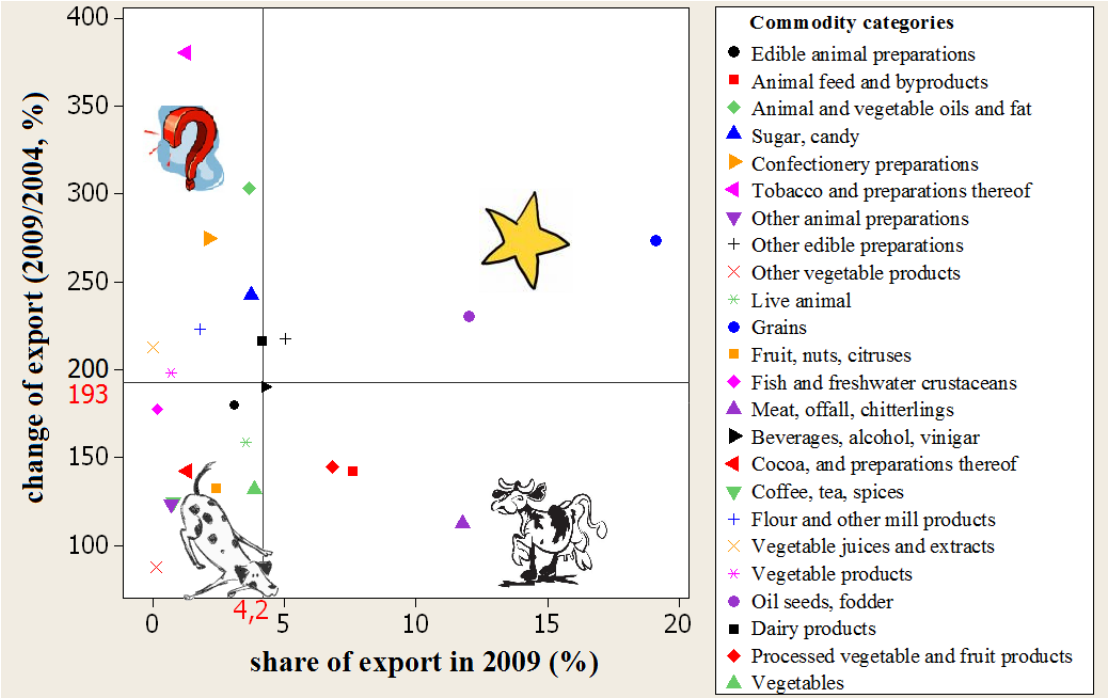
In conclusion: It was in the 2004-2006 period when Hungary had the strongest comparative advantage over the Mediterranean countries, which was close to 50%. In this time period there was no product in trade that had a weak comparative advantage. The number of products with strong comparative advantage was more than 10, and the ratio of these was over 40% both in 2001-2003, and 2007-2009. At the same time CEE countries only had one product category (Grains) that enjoyed strong comparative advantage. Unfortunately the number of product categories we do not have comparative advantage in has been growing.

All in all we may say that my hypothesis (H-3) that says: "***Hungarian agri-food products have a stronger comparative advantage on the market of the Mediterranean countries (Cyprus and Malta) than that of the CEE (Czech, Poland, Hungary, Slovakia, Slovenia)***" was proven, as in average we had 10 products with comparative advantage on the market of the Mediterranean countries, while on the CEE market we did not have any in the 2001-2006 period, and only had one in 2007-2009.

3.4. BCG matrix

One of the most popular and most wide spread method of portfolio analysis in recent years is the BCG matrix – which is a market growth/relative market share matrix elaborated by the Boston Consulting Group. This is a two dimensional matrix with market share on the horizontal and the pace of market expansion on the vertical axis. [SZITÁNÉ, 2006]

Our export to the EU-26 in 2009on the base of 2004 shows the picture below (Figure 8):



Source: Author's calculations based on EUROSTAT [2010] data

Figure 8: BCG matrix of the EU-26

Compared to the base period (2004) out of the more important products in Commodity class II. emerges the Grains category as a "star" product with 12,7-19,1% of market share and 273,5% of growth, and drawing attention to the extreme price fluctuation.

Earlier stability of the Oilseed and fodder category in Commodity class II. disappeared. It had below average performance in 1998, 1999 and 2001, despite this fact with its 9,4-12% share and 230,4% of growth it belongs in the "star" category.

Other edible products category takes the third place which belongs in commodity class IV. according to the Harmonized system and the combined nomenclature.

Dairy products, an important category of the animal husbandry industry is located on the borderline between the "star" products and the "question marks" and draws attention not by the market share of 3,5-4,1%, but by the declining market tendencies.

Within the important product categories it is the Meat and offal that emerges with 11,8-18,9% of market share and 112,8% of growth as a "milking cow" product. The set-back in the turnover from

meat products can almost entirely be attributed to the currency change rate changes between EURO and USD.

Among the "milking cow" products belonging to the food processing industry one of the most important product group is the Vegetable and fruit products with a market share of 6,8-8,5% and a growth of 144,8%. Although the there had been a drop in the export of this product, it shows signs of a steady climbing up since 2001.

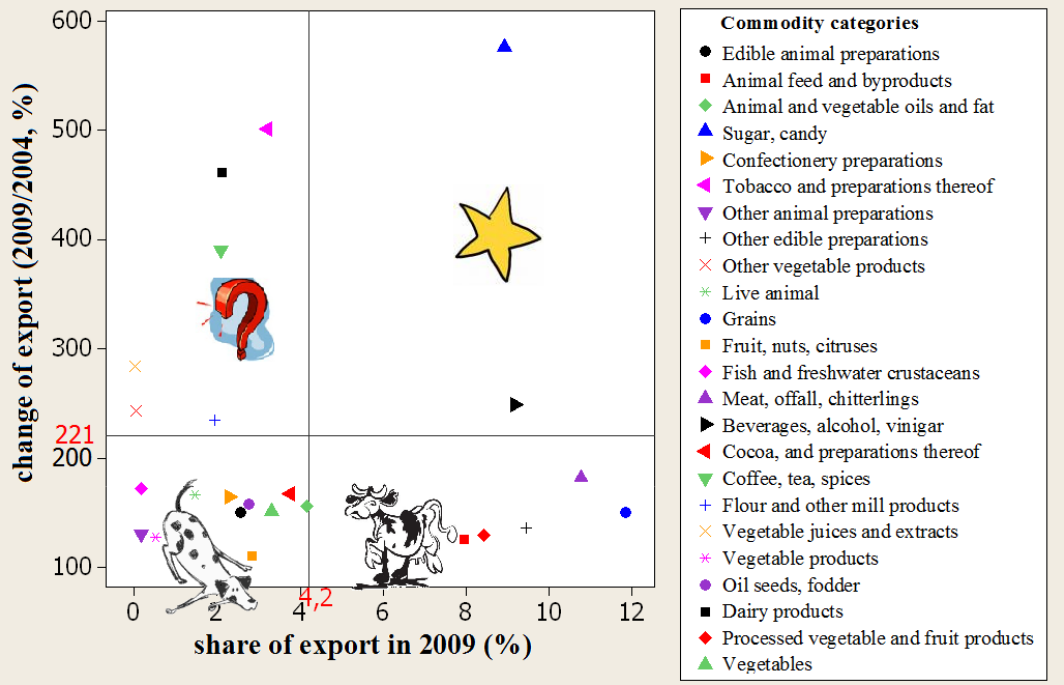
Animal and vegetable fat and oil took second place in the "question mark" section, which deserves attention with its market share of 2,2-3,6% and growth of 303,3%. But in 2000-202 revenue from selling this product showed a declining proportion due to changes in customer behaviour, but in 2004-2009 it began growing again.

Tobacco and derivatives emerges from it category the "question mark" with the most significant growth in the early 90s. The increase stalled after reaching the peak in 1997 and its export revenues began dropping in the early years of the new millennium.

Sugar and Candy from Commodity class IV. is in middle field with its market share of 2,8-3,7% and growth of 242,2% compared to the base period (2004).

If we draw the BCG matrix from data other than our export to the entire EU, we will get different results.

The BCG matrix of our export to the EU-9 (Figure 9) shows a distinct shift compared to the EU-26 figures:



Source: Author's calculations based on EUROSTAT [2010] data

Figure 9: BCG matrix for the EU-9 countries accessed 1st May 2004

Products like Oilseed and fodder belonging in the "star" category for the EU-26, end up in the "dead dog" field for the export to the EU-9 with a declining share of 3,1-2,8% and 157,9% of growth. From the "star" category Grains shift over to the "milking cow" range with a share of 13,7-11,8% and a growth of 150,5 %. The number of "dead dog" products increased since Vegetable products and Confectioner's products slid down here from the "question mark" field.

In conclusion: From the BCG matrices you may see that in the Hungarian agri-food export to the EU-26 only 10-15% of the product groups belong in the "star" category, while almost 40% is a "de

dog". Examining other groups of course will give other results. The analysis highlights the structural problems of the sector and serves as a good lesson for decision makers in the policy.

Over all it can be stated that the first part of my H-4 hypothesis **"… more products are going to land in the "dead dog" category for the EU-9 country group (2009/2004 – export change, %) than for the EU-26, …"** was validated by the data.

3.5. Export ranking of agricultural and food industry products of Hungary (HS-24) by cluster analysis in the EU-9 countries

Testing the second half on my H-4 hypothesis stating that for the EU-9 country group (2009/2004 – export change, %) the groups formed by clustering will largely be identical or at least will show significant resemblance to the BCG-matrix grouping was done using the PASW Statistics 18 software package.

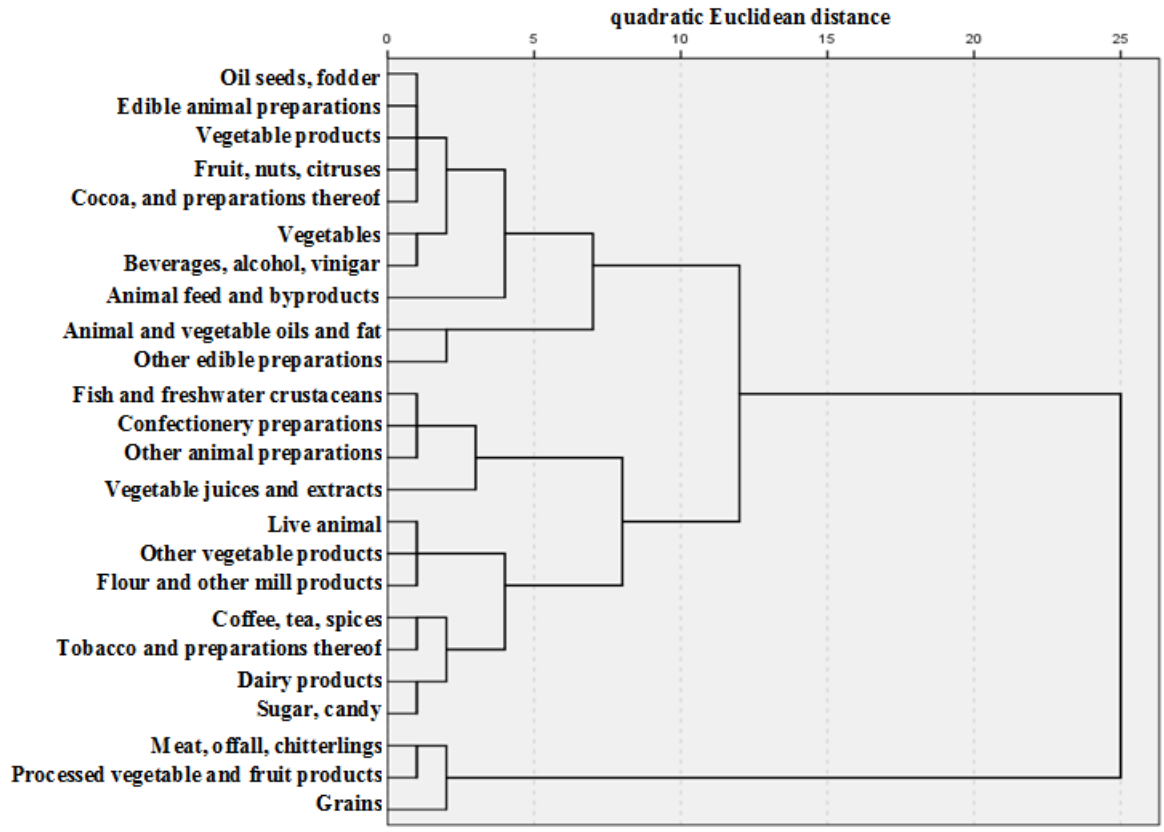
I did the grouping by hierarchical cluster analysis using **Ward's algorithms** and the non hierarchical method of **K-means**.

The dendrogram resulting from the cluster analysis illustrates the process of grouping product categories based on their similarities. Here we have to look for the larger leap in distance. This method calculates the distance between objects in a multi dimensional space, and as a result it pulls product groups together. From one step to the next objects farther and farther away from each other will be grouped together. Unless we stop the process all objects end up in one group (cluster).

In the cluster analysis I grouped the products (HS-24) by their similarities. I carried out the analysis for the EU-9 countries, for years 1995, 1999, 2001, 2004, 2009, and proportional changes for 1999/1995, 2001/1999, 2004/2001, 2009/2004. I used 1995. because for calculating most indicators in the dissertation this was the starting point, and also because I did not have sufficient data for earlier years. I have chosen 1999 and 2001 to get a picture from the period before the accession, 2004 the year of accession and 2009 for the most recent data. This way I was able to provide the most comprehensive picture.

3.5.1. Grouping of the agri-food export products (HS-24) of Hungary and the EU-9 using Ward's method.

Ward's clustering algorithm: it pulls together clusters where the increase of internal variance is the smallest. The method minimizes the increase of variance pulling the groups together. I stopped the process where the square Euclidian distance used as the basis for pulling groups together equalled 5, because beyond that there s a larger leap in distance. As a result I ended up with five clusters. The dendrogram resulting from the cluster analysis illustrates the process of grouping product categories based on their similarities. (Figure 10)



Source: Author's calculations based on EUROSTAT [2010] data

Figure 10: Dendrogram prepared using indicators of Hungarian agri-trade export to the EU-9 countries between 1995-2009

Based on the dendrogram (*the dendrogram of growing variance was done with Ward's method)* Cluster I has 8 products: Vegetable products, Vegetables, Fruits, nuts and citrus, Oilseed and fodder, Animal food products, Cocoa and derivatives, Beverages, spirits and vinegar, Fodder and by-products.

Cluster II has the following 2 products: Animal and vegetable fat and oils, Other edible products. Cluster III has the following 4 products: Fish and other aquatic animals, Other animal products, Vegetable juices and extracts, Conditioner's products. Cluster IV has 7 products as follows: Live animals, Dairy products, Coffee, tea and spices, Milled products, Other vegetable products, Sugar and candy, Tobacco and derivatives. Finally, Cluster V has 3 product categories: meat and offal, grains, Vegetable and fruit products.

Some product categories (Fish and other aquatic animals, Other animal products, Conditioner's products) in Cluster III resulting from Ward's method were in the "dead dog" category according to the BCG matrix, while the fourth (Vegetable juices and extracts) was ranked in the "question mark". Products in Cluster II. (Animal and vegetable fat and oils, Other edible products) belonged in the "milking cow" category. Sugar and candy of Cluster IV. proved to fall in the "star" group according to the BCG matrix, and Dairy products, Coffee, tea and spices, Milled products, Other vegetable products, Tobacco and derivatives all were in the "question mark" group. Elements of Cluster V. (meat and offal, grains, Vegetable and fruit products) were all "milking cows", while the 8 products of Cluster I were split between three different categories (one "star", one "milking cow" and six "dead dogs").

3.5.2. Grouping of the agri-food export products (HS-24) of Hungary and the EU-9 using the K-means method

The K-means algorithm ranks every element to the cluster that has its centre closest to the given element. In this process I created four clusters.

Table 7: Standardized mean values of cluster indicators for K-means method in the agri-food export to EU-9 countries

	Group			
	1	2	3	4
Ratio in Hungarian export into the EU-9 in 1995, %	-0,18	2,21	-0,68	-0,27
Ratio in Hungarian export into the EU-9 in 1999, %	0,21	2,13	-0,73	-0,50
Change of Hungarian export into the EU-9 from 1995 to 1999, %	-0,04	-0,59	1,70	-0,47
Ratio in Hungarian export into the EU-9 in 2001, %	0,33	2,09	-0,66	-0,59
Change of Hungarian export into the EU-9 from 1999 to 2001, %	0,84	0,47	-0,49	-0,53
Ratio in Hungarian export into the EU-9 in 2004, %	0,52	1,77	-0,80	-0,57
Change of Hungarian export into the EU-9 from 2001 to 2004, %	0,24	-0,30	-1,06	0,35
Ratio in Hungarian export into the EU-9 in 2009, %	0,38	1,65	-0,94	-0,39
Change of Hungarian export into the EU-9 from 2004 to 2009, %	-0,51	-0,52	-0,26	0,62

Source: Author's calculations based on EUROSTAT [2010] data

Table 7 above shows the mean values of the indices by the determined clusters. In case of these clusters the table contains the mean ratios of Hungarian products in the export and the mean values of the share changes.

Table 8 shows the number of product groups in each cluster. The names of each product group with the respective clusters is listed in Table 9.

Table 8: Number of product groups ranked in clusters

		No. of product groups for clusters
Closer	1	7
	2	3
	3	4
	4	10
Total:		24

Source: Author's calculations based on EUROSTAT [2010] data

Table 9: Products in the individual clusters

			Product group
Group membership	1	1	Vegetables
		2	Fruits, nuts and citruses
		3	Animal food products
		4	Cocoa, and derivatives
		5	Other edible products
		6	Beverages, spirits, vinegar
		7	Animal fodder, by-products
	2	1	Meat, offal and chitterlings
		2	Grains
		3	Vegetable and fruit products
	3	1	Fish, freshwater animals
		2	Other animal products
		3	Vegetable juices and extracts
		4	Conditioner's products
	4	1	Live animals
		2	Dairy products, other animal food
		3	Vegetable products
		4	Coffee, tea, spices
		5	Milled products
		6	Oil seeds, fodder
		7	Other vegetable products
		8	Animal and vegetable oils and fat
		9	Sugar, candy
		10	Tobacco and preparations thereof

Source: Author's calculations based on EUROSTAT [2010] data

In Cluster II (according to the Ward method) Animal and vegetable fat and oil is a "star" product while Fruits, nuts and citruses are "question mark" products in the BCG matrix. In Cluster III Tobacco, and Dairy are "dead dogs", while Fish and aquatic animals is a "question mark".

In Cluster IV each product (Fodder, Grains, Meat and offal, Milled products) is in the "milking cow" group according to the BCG matrix, just like Live animals in Cluster V. Out of the 14 products in Cluster I. we find one among "milking cows" and one among "question marks", while twelve in the "dead dog" group. The ranking of Ward's method and that of the K-means technique do not match, but show some resemblance.

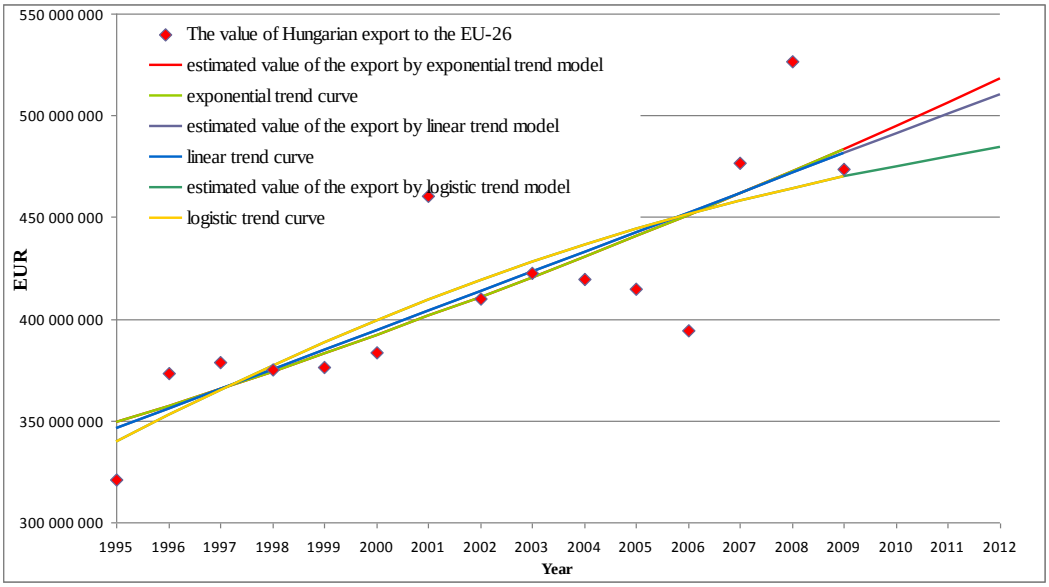
3.6. Export and import prognosis of product groups HS-02, HS-10 and HS-12 for the 2010-2012 period in relation to the EU-26 and EU-9 country groups

3.6.1. The development of export and import of Hungarian agri-food products in the next 3 years with the EU-26

The purpose of my research was to be able to give a prognosis concerning the dynamics of export and import of certain products (Meat and offal, Dairy products, Grains, Milled products, Oilseeds and -fruits) in the next 3 years in the relations with EU-26 and EU-9 countries. In my calculations I used the export and import data available from 1995-2009.

For the prognoses based on timelines I used the type of function out of the tested ones (***linear, exponential and power law***) which resulted in the best fit according to the relative residual error (Vse), and the coefficient of determination (R^2). In this work I only included the products and country groups relevant to my hypotheses.

The export of meat offal and chitterlings (HS-02) is going to increase in the next few years, but it won't reach the saturation (maximum) level of 2008, but it will most likely exceed the 2009 export level by EUR 36.68 million (7,7%). Both the exponential and the linear function results in a higher value than the logistic function. (Figure 11) I have to add that the Meat and offal category has the second-third largest turnover out of the 24 product groups.

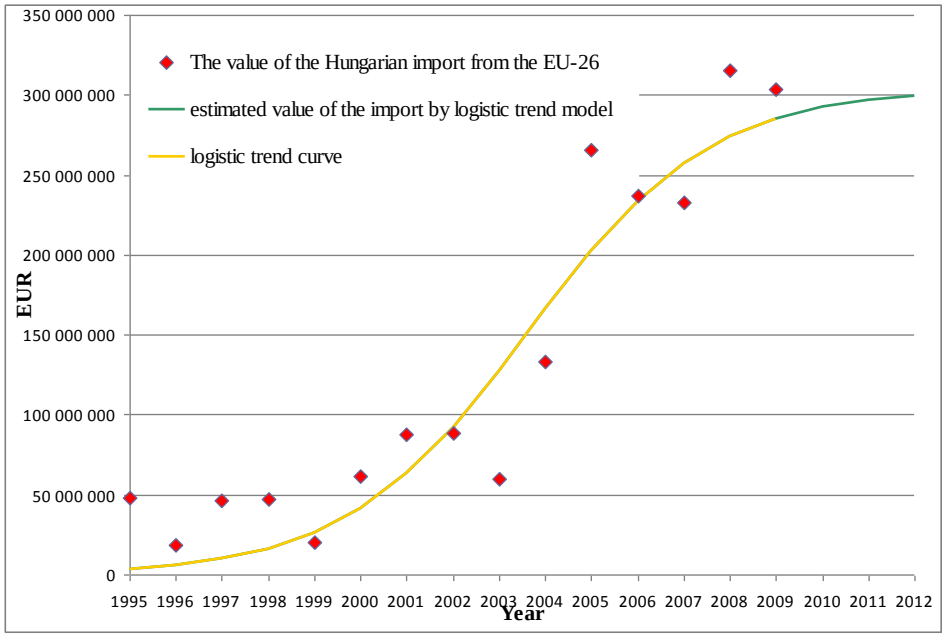


Type of function	Saturation parameter	"a" parameter/β0 of the function shift parameter	"b" parameter/β1 of the function shape parameter	Se	Vse (%)	R^2
exponential		340952666	1,0235	30 376 807	7,34	67,7
linear		336544381	9645831	30 426 619	7,35	66,0
logistic	526 321 516	-0,49	-0,11	31 171 149	7,53	66,8

Source: Author's calculations based on EUROSTAT [2010] data

Figure 11: Prognosis for the export of Meat and offal products to the EU-26

Import of the product group is expected to drop. While in 2009 the import value was more than EUR 303 million, in 2012 it is expected to be no more than EUR 300 million. (Figure 12) This decrease may be due to changes in customer habits, preferring domestic products and the changes in prices and currency rates.



Type of function	Saturation parameter	"a" parameter/β0 of the function shift parameter	"b" parameter/β1 of the function shape parameter	Se	Vse (%)	R^2
logistic	303 751 849	4,90	-0,51	36 931 273	28,19	89,1

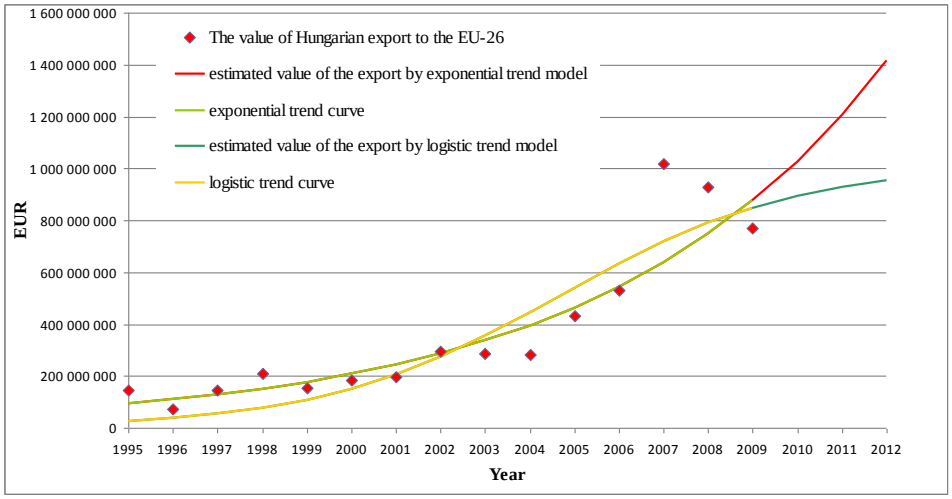
Source: Author's calculations based on EUROSTAT [2010] data

Figure 12: Prognosis for the import of Meat and offal products to the EU-26

Export of Grains (HS-10) has a defining role in our agri-food trade, which is well supported by the numbers (Figure 13).

The trend lines of the functions almost completely match each other before the estimated period. The exponential function shows a strong growth after 2009 and has a 30 degree angle with the logistic function in that period.

It is true for each of the examined products that the export values for 2008 (EUR 927.8 million) were higher than in 2009 (EUR 770.6 million). The volume of grain export in 2009 grew 20%, but in value it dropped by 10%. The export of grains in 2012 is expected to grow by EUR 184.87 million (24%) compared to 2009. The expected value of the export is EUR 955 million which is far behind the one in 2007 (EUR 1,017 million). Target countries for grain export most recently have been Italy, Romania and Greece.

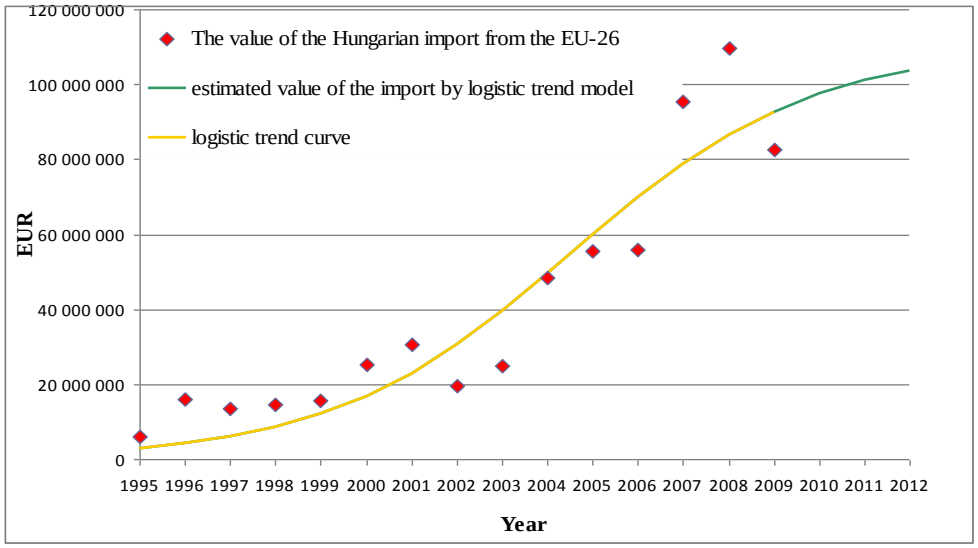


Type of function	Saturation parameter	"a" parameter/β0 of the function shift parameter	"b" parameter/β1 of the function shape parameter	Se	Vse (%)	R^2
exponential		79896168	1,1731	227 358 341	60,33	86,5
logistic	1 017 073 721	4,00	-0,37	128 371 240	34,06	83,1

Source: Author's calculations based on EUROSTAT [2010] data

Figure 13: Prognosis for the export of Grains to the EU-26

Our grain import dropped by 25% in 2009 compared to 2008, but from 2009 it got back to the upward course again (Figure 14), which shows that we may expect a 3.7% growth from 2010 to 2011 and a further 2.5% from 2011 to 2012. The total expected growth from 2009 to 2012 is 25.3% (EUR 20.96 million). The prognosis for 2012 will be 6.2 million less than the saturation level (EUR 109.79 million) in 2008. It is for this product group that we can expect the largest positive trade balance.



Type of function	Saturation parameter	"a" parameter/β0 of the function shift parameter	"b" parameter/β1 of the function shape parameter	Se	Vse (%)	R^2
logistic	109 794 967	3,97	-0,38	11 966 646	29,25	87,5

Source: Author's calculations based on EUROSTAT [2010] data

Figure 14: Prognosis for the import of Grains to the EU-26

3.6.2. The development of export and import of Hungarian agri-food products in the next 3 years with the EU-9

In case of the EU-9 group I have determined the maximum level at the highest export and import values. In case of the export of selected product groups 2009 gave data for Oilseeds and -fruits, various seeds, industrial plants, herbs, straw and fodder, 2007 for Grains and 2008 for all the rest**.**

In case of import 2005 gave the maximum for Meat, offal and chitterlings, 2007 the ones for Grain, Vegetable and fruit processed products, 2009 for the Oilseeds and -fruits, various seeds, industrial plants, herbs, straw and fodder and 2008 for all the rest.

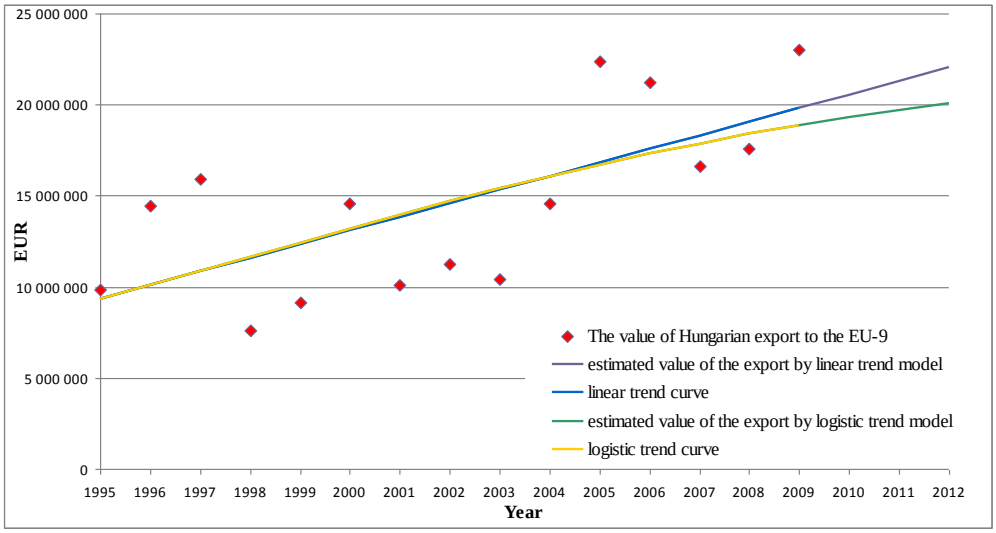
For the export prognosis I did not only use the logistic function, but also used the exponential one mainly to prove the problem mentioned earlier.

In this thesis I only concentrate on Oilseeds and –fruit product group for the EU-9 group.

The Export value of Oilseeds and -fruits, various seeds, industrial plants, herbs, straw and fodder (HS-12) grew 30,8% from 2008 to 2009, and dropped almost 16% in the next year. The two most significant products in this group sunflower seeds and rapeseeds give more than 90% of the turnover.

The value of export in 2012 is expected to come EUR 2.9 million short of the one in 2009. We may conclude based on the value of R^2 that the trend function does not mach the timeline data closely. (Figure 15)

Moderate growth of the export of sunflower seeds can be anticipated.

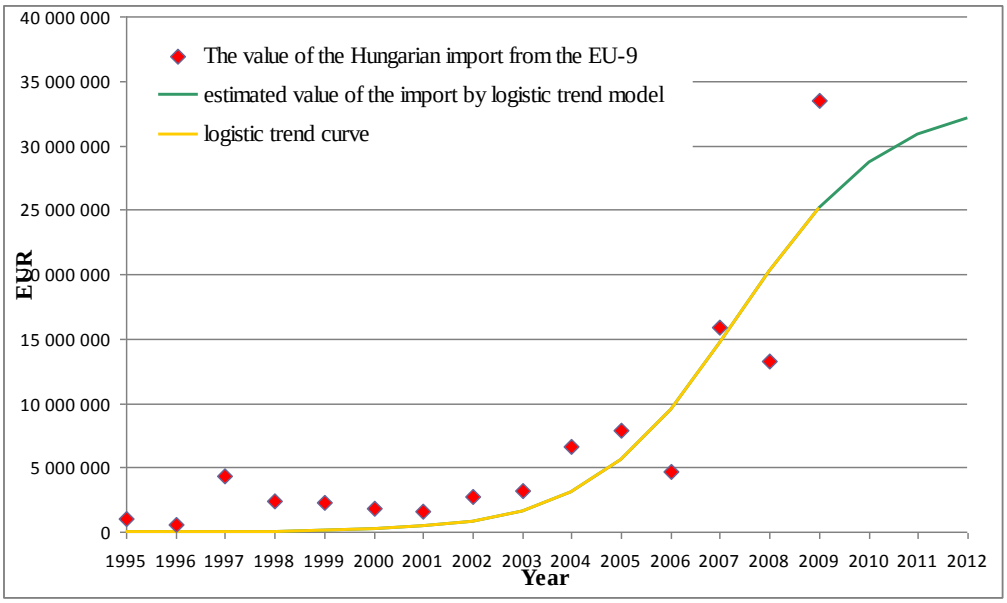


Type of function	Saturation parameter	"a" parameter/β0 of the function shift parameter	"b" parameter/β1 of the function shape parameter	Se	Vse (%)	R^2
linear		8612342	746115	3 761 259	25,80	41,7
logistic	23 021 289	0,52	-0,14	3 862 312	26,49	42,926506

Source: Author's calculations based on EUROSTAT [2010] data

Figure 15: Prognosis for the export of Oilseeds and -fruits, various seeds, industrial plants, herbs, straw and fodder to the EU-9

Our import reflects a growing trend from 2010, but it should be noted that it is 1.6 times of the export. On the import side the most important product is margarine which gives roughly 38% of the value in 2009. We may anticipate a 4.1% decrease for the oilseeds from 2009 to 2010. (Figure 16)
The negative balance of oilseeds is expected to be more than EUR 12 million.



Type of function	Saturation parameter	"a" parameter/β0 of the function shift parameter	"b" parameter/β1 of the function shape parameter	Se	Vse (%)	R^2
logistic	33 466 317	9,10	-0,68	3 928 213	57,80815483	80,7

Source: Author's calculations based on EUROSTAT [2010] data

Figure 16: Prognosis for the import of Oilseeds and -fruits, various seeds, industrial plants, straw and fodder to the EU-9

Proof/refutation of my H-5 hypothesis based on the analysis above is as follows:

H-5: "Our anticipated trade turnover in the coming years (2010-2012) in relation to some country groups and product categories will be as follows:

In case of the **EU-26 export of food grade meat and offal** in 2012 **will not reach the level it did in 2009**, while the **import value** a will grow dynamically and **will exceed it**. As a result the contribution of the product category to the active balance of the sector will decrease even more."

This first part of my hypothesis could **not be confirmed** because our **export in 2012 most likely will not reach the 2009 level**, and the **import value is expected to exceed it** (2009).

"The **export of grains will grow significantly,** the **import value** though, **will not reach the** record **level of 2008.** This way the positive effect of the product category it has on the active trade balance will further increase."

This part of my hypothesis **got confirmed**, since the **export value of grains is increasing steadily**, the **import level at the same time stays under the 2008 level**. This way it further improves the positive foreign trade balance.

"In case of the **EU-9 export and import values of oilseeds and oil rich fruits is going to decrease** compared to 2009."

This part of the hypothesis is also **confirmed** because neither the export nor the import level reached the 2009 level.

In conclusion: We should strive to reach the 2008 maximum level not only for the product groups discussed here, but also for the 21 other products. It would be beneficial to prepare prognoses with other methods and for longer periods as well. I think it would be a tremendous help for agricultural and food industry professionals.

3.7. New or fresh scientific statements

1.) Analysing the ***Constant Market Share*** (CMS) I have examined the value of Hungarian agri-food export to two groups of countries (EU-9 and EU-2) accessed 1st May 2004 in connection with 24 groups of products. I have concluded that according to the CMS analysis of almost 10 years of data, that the export increase to these countries was mainly due to the "market size effect", in case of the EU-9 the "market composition effect" had a slight positive effect but the "competition effect" had negative effect on it. In case of the EU-2 the difference was, that the "market composition effect" was negative, the "competition effect" was negligible, which meant that the "market size effect" played an even more significant role in our export.

2.) With the help of the ***Grubel–Lloyd index*** using data from three years (2001, 2004, 2009) I have analyzed the intensity of the intra-industry trade of 24 product groups in relation to several groups of countries from EU-2 to EU-26 and to several other relations (CEE/EU-22, Baltic countries/EU24, Mediterranean countries/EU-25, etc.) that have not been analyzed before. As a result we could track the change of the intensity of Hungarian food trade by product groups, and could identify those products that have a high intra-industry trade, or it is completely missing.

3.) Based on the ***Balassa/Vollrath indices*** (RCA and RTA) I demonstrated the comparative advantages and disadvantages of Hungarian products on different market segments of the European Union, at various time periods over the last 10 years. Since the results were very diverse concerning the competitiveness trends, we may only conclude that Hungary has lost its comparative advantages for several important products in the past 10 years, regardless of the reference markets.

4.) With the help of the ***BCG-matrix*** as a method of portfolio analysis I ranked the product groups into four fields (stars, question marks, milking cows, and dead dogs) based on data from the last 6 years. These groupings revealed for each groups of countries the changes Hungary's agri-food product structure has gone through in the last 6 years. The BCG matrices presented in the dissertation show that in relation to the EU-26 only 10-15% of the product groups belong in the "star" field, and almost 40% are "dead dogs". Of course in relation to various country groups there are other ratios. The analysis points out the structural problems of the industry and provides a lesson for the decision makers of the agricultural policy.

5.) I prepared prognoses using e***xponential and logistic trend functions*** for the time period of 2010-2012 in connection to the EU-26 and the EU-9 for the most important product groups. The analysis shows probable tendencies both in export and import and give an overview of the products marketable in the future. I have concluded that we will keep the positive trade balance of the agri-food industry in the next three years.

4. CONCLUSIONS AND SUGGESTIONS

My dissertation examined primarily the international positions of the Hungarian agri-food industry in relation to the EU countries. In order to make the EU and Hungary more liveable it is necessary to reform the entire rural development policy and Common Agricultural Policy (CAP) to correct imperfections, make them more reasonable, and more effective.

The most important tasks are to produce enough food through sustainable production, proper management of natural resources and sustain the agricultural production in the rural Hungary.

For this reason in the first part of my dissertation I detailed the purposes and methods, development characteristics of the European Union as an integration, obviously concentrating on the agricultural policy segment. As a result I have been able to conclude the following:

- With the expansion of the Union in 2004 countries – including Hungary– with significant development and growth potential, and with extensive experience in managing deep and fast changes have become members of the community. This in and of itself could improve the chances of the community for growth, and if the Union gains Hungary also gains. It has also become obvious that the preparedness of Hungary's agricultural industry was less than desirable for the competition in the uniform market, and factors endangering the future of the entire industry dominate the scene. It is primarily the performance and business structure of the primary producer agricultural industry which spectacularly falling behind the EU agro-economy year by year.
- It soon became clear that the countries accessed 1st May 2004 and 1st January 2007 in many ways struggle with similar problems than those welcomed us. One of the most severe of these seems to be the demographic problem with the decline of the active population, aging of the society, which not only presents an ever increasing social difficulty, but also hinders competitiveness. We have to see clearly that striving for enforcement of interests is a natural behaviour of human society. In other words: enforcement of interests continues between groups of society and countries in the EU. If a country is not competitive enough, its population does not have relevant knowledge, does not have sufficient institutions it will be left hanging in the EU as well.

This situation explains why I attributed a special role to the analysis of the competitiveness of the Hungarian agri-food industry. During this analysis I have come to the general conclusion (using various methods), that in connection with the various groups of countries Hungary's potentials lie in various areas (product groups), which at the same time set the directions for support and development.

Based on the analysis a further lesson was that although it decreases faster than we would desire, our positive foreign trade balance gives reason for optimism.

Which on the other hand gives reason for worries is the trend that the export of processed goods is gradually falling opposed to the unprocessed raw material. This trend is very disadvantageous from two sides. On the one hand from the side of national production level as it decreases the added value of the agri-food sector and on the other hand from the national employment structure as it reduces the need for higher qualified work force.

Of course both the domestic and the European political/economical government has a crucial role in helping the agri-food businesses in every possible way in order to be able to utilize the opportunities available.

In order to improve their competitiveness investments are needed that help improve efficiency and market positions, as well as useful producers' organizations and cooperation. Producers interest has

to be created in order to see this happen. In order to keep our most important markets we have to know them and we have to be aware where to sell what. This is the reason why I chose the 10 most significant export destinations of the past 15 years.

Our most important partner is Germany, where we have a market determining role with meat and meat products, and also have a significant sunflower seed oil and wine export, although it is decreasing. In Italy we primarily trade grains. It would be worth considering the broadening of the product palette.

Austria is also an important trade partner. On the Austrian market we are present with processed meat products, paprika and honey as a significant determining factor.

Romania has stepped up to the fourth most important trade partner of ours since their accession into the Union. We have been exporting animal fodder and grains onto their market. The grain export has significant potentials for expansion.

Out of the countries that were accessed with Hungary Poland, the Czech, Slovakia and Slovenia are among the 10 most important markets for our export. We primarily ship meat and grains into these countries, but we also have a significant tomato paste export into Poland. Slovakia is not self sufficient in vegetable oil, wine, fresh vegetables and fruits. Since we have free capacities in these areas Slovakia could be a good direction for expansion.

Trusting in sustaining our advantages over the new members, using our knowledge we can minimize our loss of market due to the better competitive positions of older members.

Holland is eighth and France is tenth in the list of our most important export markets. Grain has the most significant role in our export to these countries, but Holland is a good market for oilseeds, while France is for meat.

I have examined the export goods with two different methods: I have ranked them into categories according to EU country groups using the BCG matrix, and then I also ranked them using cluster analysis. I compared the results. In conclusion we can say that similarities can be pointed out between the BCG and the cluster methods in ranking EU-9 and EU-2 products.

I assessed the competitiveness, comparative advantages and disadvantages of the product groups using the Balassa-index and Vollrath's method. The number of product groups with comparative advantages decreases in all reference groups, except the Mediterranean countries.

Various regions display significant differences in this regard as well. In spite of the notable changes in Hungarian agriculture the distribution of the B-indices proved to be fairly stable. If we compare the Balassa index result with that of Vollrath's we can conclude, that in the 2001-2009 period there were 7 products that lost their previously gained advantages, in 2004-2006 and 2007-2009 there were two and up until today another four products lost their competition positions.

I also examined the frequency distribution of GL-indices in trade between various country groups. Results suggest that the growth of the agri-food trade between Hungary and the EU has been primarily between industries.

I have ventured to give prognoses for export and import in the next 3 years using function analysis. These results project that we will continue to have a positive trade balance with EU countries.

I have to mention that for those studying this area have great difficulty because various databases contain vastly differing data. It is difficult to discern which data is worthy of using, or how to interpret the differences in order to arrive to the most accurate results. It would be worth to conduct studies and calculations using data from various sources considering short time spans in order to get more accurate readings.

RELATED PUBLICATIONS AND SCIENTIFIC ACTIVITY OF THE AUTHOR OF THE DISSERTATION

Scientific publications

Foreign language publications in journals:

Rozália Surányi Szitáné: AGRI-FOOD EXPORT TRADE OF HUNGARY WITH EU MEMBER COUNTRIES AND WITH THE MOST SIGNIFICANT COUNTRIES OUTSIDE THE EU (2010), 163-167. pp. XVII Congress of the Polish Association of Agricultural and Agribusiness Economists (SERiA), Annals of The Polish Association of Agricultural and Agribusiness Economists Vol. XII No.6
ISSN 1508-3535 2010. September 7-9. Warszava – Poznan –Szezecin

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Szitáné Surányi Rozália: A gabona-kereskedelem logisztikai aspektusai (2008)
Supply Chain Monitor IV. évfolyam 6. szám 2008. július – augusztus 54-57.pp. ISSN 1786-6634

Other journal articles:

Szitáné Surányi Rozália: Kulcskérdés a minőség (2008)
Magyar Mezőgazdaság 63. évfolyam 2008. szeptember 10. 14-15.pp. ISSN 0025-018X

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Az Európai Unió Agrárgazdasága 2008. 13. évf. 9. szám 21-22.pp. ISSN 1416-6194

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Magyar Mezőgazdaság 65. évfolyam 2010. március 24. 12 p. ISSN 0025-018X

Conference material published

In foreign language:

Rozália Szita-Surányi: THE CONFORMATION OF THE AGRICULTURAL AND COMMERCIAL RELATIONS FROM 2001 UNTIL THE YEAR OF JOINING Budapest Tech Keleti Károly Faculty of Economics BUSINESS SCIENCES SYMPOSIUM FOR YOUNG RESEARCHERS Feast of Hungarian Science 2006. PROCEEDINGS Budapest, November 3, 2006. (Előadás) ISBN 9637154531 (p.197-207)

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