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DIVERSIFICATION OF COMPETITIVE RESULTS OF THE FOOD INDUSTRY OF THE 'OLD' AND 'NEW' EU COUNTRIES

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Abstract: The purpose of this elaboration was to evaluate the diversity of competitive results of the food industry in the 'old' and 'new' EU countries in 2004, 2011 and 2018. The indicators of export market share, trade coverage and revealed comparative advantages of the food industry were used. Next the chosen descriptive statistics (arithmetic mean, coefficient of variation, lower and upper quartile, median, range, interquartile range), the box-plot figures and the Mann-Whitney U test, were applied. The conducted research proved the visible disparities between the 'old' and 'new' EU members in the range of all the evaluated indicators of competitive position, mainly in the case of export market share. The evaluation of the competitive results in the selected years demonstrate that there is a gradual process of reducing the gap within the competitive position of the food industry of the 'old' and 'new' countries of the EU.

Keywords: competitiveness, export share, trade balance, comparative advantages, food industry.

1. Introduction

The economy of the European Union is characterized by a significant diversity of development level of each member state. This problem is evident especially when comparing the 'new' and 'old' countries of the EU. As shown by Maciejewski (2017) on the basis of European integration there is a case for levelling the economic development in the member states. According to this author, the importance of this

problem has increased especially after 2004, when the 'eastern enlargement' took place. In previous decades on the international markets there were some changes such as: liberalization of commerce, free flow of production factors, fast technological development and new consumer trends, which significantly changed the conditions of enterprise functionality. The processes of competitiveness were more intense, and their range became bigger from local or domestic to international (Łukiewska, 2019). This fact caused a change of the factors and results of competitiveness, which is defined as "the ability to act and survive in competitive surroundings" (Gorynia, 2002, p. 49). Some authors point out that competitiveness means "winning and gaining the benefits on the market where competition is growing" (Maroto-Sanchez and Cuadrado-Roura 2013, p. 154) or "the ability to withstand the competition, therefore to create and sell goods, whose price, quality and other qualities are much more attractive than the same products offered by competitors" (Świtalski, 2005, p. 166).

The constantly changing operating and competing conditions also concern the food industry, which is one of the most important sectors of the European economy. It has a significant share in EU production in, among others, value added, number of enterprises, employment and sold production (Eurostat, 2019). The food industry also plays an important part in fulfilling the basic needs of people, ensuring food security (Gardijan and Lukač, 2018; Wilson, 2018), and has an essential influence on sustainable economic growth and growing attention to environmental issues (Turia, Goncalvesb, and Mocana, 2014). The subject literature has indicated some specific threats, challenges and opportunities for food industry, including: the growing saturation of the food market (Szwacka-Mokrzycka, 2017), changing trends in food consumption (Miśniakiewicz, 2017), innovative pressure (Firlej, 2015), the development of digitization and industry 4.0 (Kosior, 2018), the beginning of EU cooperation with third countries, such as Canada (CETA) and Japan (EPA) (Ambroziak and Bułkowska, 2015), the formation of transnational trading corporations (Chechelski, 2016), as well as the very slow growth of the population in the EU (Turia, Goncalvesb, and Mocana, 2014). Taking into consideration the changes occurring in the economies, both social and environmental, an interesting issue is the analysis of the process of reducing the competitive gap between the EU-15 and EU-13 groups. The purpose of this study was to evaluate the diversity of competitive results of the food industry in the 'old' and 'new' EU countries in 2004, 2011 and 2018.

2. Research methodology

The subject of this article was the food industry located in various EU countries[1], divided into two groups of the 'old' and 'new' EU. The food industry was defined based on the aggregation of section 01-09 and 4 according to the Standard International

[1] In this elaboration Great Britain was also included, which was a member of the EU from January 1st, 1973 to January 31st, 2020.

Trade Classification (SITC) Rev. 3. The source of empirical data was the database of the Statistical Office of the European Union – EUROSTAT.

The evaluation of competitive results was accomplished usaging the three following result indicators for the trade of food articles:

1. Export market share (EMS).

This indicator is one of the most important in the evaluation process of competitive position. It was calculated according to the formula (Banterle, 2005):

$$EMS_i = \frac{Ex_i}{\sum_{i=1}^{n} Ex_i},$$

where: Ex_i – the value of exports of the food industry of country *i* for the EU market.

2. Trade coverage index (TC).

This indicator allows the examination of trade balance and relative advantage/ deficit in trade in foodstuffs. It was calculated according to the formula (Ambroziak, 2014):

$$TC_i = \frac{Ex_i}{Im_i},$$

where: Im_i – value of the imports of the food industry of country *i* and from the EU market.

3. Revealed comparative advantage index (RCA)

This is one of the most popular measurements of comparative advantages, formulated by Balassa (1965) which allows to define if the share of the food industry in the total exports of one country is higher or lower than the share of the food industry in the total exports of the whole analysed group of countries on a various market. The indicator is given as the formula (Balassa, 1965):

$$RCA_i = \frac{Ex_i}{\sum_{k=1}^{n} Ex_i} \div \frac{Ex_{ci}}{\sum_{k=i}^{n} Ex_{ci}},$$

where: E_{ci} – value of total exports of *i* country into the EU market.

If this is higher than 1, the importance of the food industry in the total of one country is bigger than in the EU. This means that the food industry has comparative advantages.

The diversification of the described indicators in the countries of the 'old' and 'new' EU was evaluated, based the statistics such as (Stanisz, 2006):

- arithmetic mean – the most common measure of locations and indicates the average (typical) level of a variable,
- coefficient of variation – determines how much the group of observation is varied with respect to a certain feature. It was calculated as the quotient of the arithmetic mean and the standard deviation,

- lower (first) quartile (Q_1) – the value of the unit which divides the community in such a way that 25% of the units have not higher values and 75% not less,
- median (Med) – the value of the unit located in the community in a way that divides the community into two equal parts,
- upper (third) quartile (Q_3) – the value of the unit which divides the community in a way that 75% units have values not greater than it and 25% not less,
- range – the difference between the largest and smallest statistical value,
- interquartile range – the difference between the third and first quartile.

The selected statistics are presented in the box-plot figures.

Next, the Mann-Whitney U test was used to evaluate the significance of differences of the chosen indicators describing the competitive results of the food industry in groups of the 'old' and 'new' EU. This is a test of equality of distribution of two populations, which belongs to the group of nonparametric tests. The test statistics take the form (Stanisz, 2006):

$$U = n_1 \cdot n_2 + \frac{n_1(n_1+1)}{2} - R_1,$$

where: n_1, n_2 – number of samples, R_1 – sum of ranks awarded to the values of the first attempt.

The test was verified on the significance level $p = 0.05$.

3. Research results

The conducted research proves that in all the analysed years, the biggest disparities between the countries of the 'old' and 'new' EU were present in the case of the intra-EU export share. Based on the Mann-Whitney U test, it was found that the differences from both groups were statistically significant (Table 2). In 2014 the total share of 15 countries of the 'old' EU in the exports of food was 94.08%, and for the 13 countries of the 'new' EU it was merely 5.92%. In 2011 and 2018 the disparities were gradually decreasing. During 2004-2011 the share of these countries of the EU-13 increased almost two-fold, i.e. 5.60 percentage points (p.p.) up to 11.52%. In 2011-2018, the growth continued but on a smaller scale (Table 2). During this period, the total share of EU countries increased by 2.78 p.p. up to 14.29%. The size of median also shows that in half of the EU-15 countries the share in the intra-EU export of food in 2004 was 4.62% or more. Next the median decreased to 3.88% in 2011 and 3.20% in 2018. The median in the EU-13 was significantly lower and changed in the analysed years, to 0.15%, 0.62% and 0.69%, respectively (Figure 1).

In both groups one could also observe the significant internal diversity. The coefficient of variation in the countries of the 'old' EU was at the level 95.50% to 97.70%. The range, which is the difference between the biggest and the lowest value of the food exports, was recorded in 2004, 2011 and 2018, at 18.39 p.p., 17.69 p.p. and 17.39 p.p., respectively. The clear leader in range of food exports

Table 1. Level of EMS, TC and RCA indicators in the food industry of EU member countries in 2004, 2011 and 2018

	EMS (%)			TC			RCA		
	2004	2011	2018	2004	2011	2018	2004	2011	2018
EU-15									
Austria	2.22	2.34	2.29	0.76	0.79	0.77	0.65	0.73	0.72
Belgium	10.85	9.52	8.83	1.46	1.35	1.29	1.19	1.09	1.08
Denmark	5.02	3.88	3.20	2.05	1.66	1.40	2.39	2.09	1.99
Finland	0.30	0.28	0.31	0.30	0.25	0.26	0.22	0.25	0.29
France	13.49	11.64	9.22	1.08	0.98	0.78	1.17	1.26	1.12
Germany	14.93	15.99	15.35	0.83	0.92	0.83	0.66	0.72	0.69
Greece	1.15	1.24	1.34	0.53	0.67	0.88	2.69	2.78	2.67
Ireland	3.07	2.48	2.66	1.71	1.36	1.24	1.21	1.32	1.33
Italy	7.10	6.77	6.85	0.68	0.74	0.86	0.83	0.90	0.93
Luxembourg	0.28	0.28	0.29	0.47	0.51	0.55	0.50	0.66	0.88
Netherlands	18.67	17.97	17.68	2.07	2.05	2.03	1.69	1.37	1.36
Portugal	0.72	0.96	1.20	0.32	0.40	0.51	0.66	0.85	0.96
Spain	10.30	9.35	10.38	1.75	1.66	1.98	1.97	1.80	1.89
Sweden	1.35	1.72	2.09	0.54	0.67	0.80	0.48	0.64	0.88
United Kingdom	4.62	4.05	4.01	0.39	0.40	0.38	0.59	0.63	0.73
arithmetic mean	6.27	5.90	5.71	1.00	0.96	0.97	1.13	1.14	1.17
Sum	94.08	88.48	85.71	–	–	–	–	–	–
coefficient of variation (%)	95.50	97.70	96.16	64.29	55.98	54.20	66.11	58.21	52.09
EU-13									
Bulgaria	0.21	0.67	0.82	1.17	1.09	1.29	0.86	1.48	1.49
Croatia	0.11	0.16	0.30	0.25	0.39	0.43	0.54	0.77	1.07
Cyprus	0.07	0.06	0.08	0.36	0.24	0.35	2.95	1.90	2.45
Czechia	0.82	1.41	1.56	0.60	0.71	0.73	0.35	0.41	0.38
Estonia	0.15	0.23	0.25	0.59	0.66	0.67	0.80	0.82	0.88
Hungary	1.26	2.08	1.88	1.44	1.47	1.33	0.70	0.94	0.76
Latvia	0.10	0.29	0.39	0.35	0.59	0.78	0.81	1.32	1.49
Lithuania	0.34	0.62	0.80	0.98	0.80	1.01	1.43	1.41	1.68
Malta	0.01	0.01	0.00	0.06	0.04	0.03	0.20	0.18	0.12
Poland	2.22	4.10	6.28	1.28	1.18	1.52	0.95	1.09	1.25
Romania	0.15	0.67	0.82	0.32	0.58	0.49	0.21	0.59	0.56
Slovakia	0.39	0.89	0.69	0.68	0.71	0.61	0.42	0.51	0.35
Slovenia	0.10	0.34	0.43	0.26	0.62	0.77	0.22	0.50	0.53
arithmetic mean	0.46	0.89	1.10	0.64	0.70	0.77	0.80	0.92	1.00
Sum	5.92	11.52	14.29	–	–	–	–	–	–
coefficient of variation (%)	140.00	127.23	150.0	69.27	54.82	55.31	91.69	54.44	65.62

Source: authors' calculations based on (Eurostat, 2019).

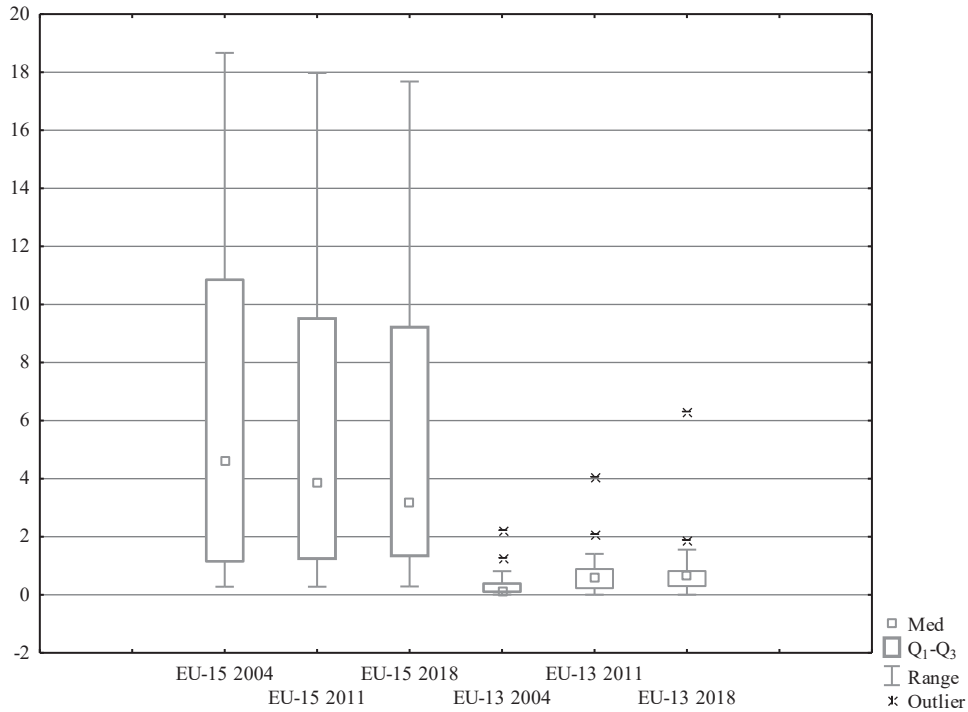

Fig. 1. Box-plot figure for the EMS index for the food industry in the 'new' and 'old' EU countries in the years 2004, 2011 and 2018

Source: the author's calculations based on (Eurostat, 2019).

to the intra-EU market was the Netherlands. The group of countries characterized by the biggest exports also included: Germany, France, Belgium and Spain. In the Netherlands, Belgium and France, during the analysed years a gradual downward trend was observed (about 0.99 p.p., 2.02 p.p. and 4.27 p.p., respectively), while in Spain and Germany the situation was observed on the similar level. A significant share in the export of food, but with a downward trend was also noted in Italy, Denmark, Great Britain and Ireland. In the remaining countries of this group, a low but gradually rising trend of share in the intra-EU exports was noted. It concerned countries i.e.: Austria (from 2.22% up to 2.29%), Sweden (from 1.35% up to 2.09%), Greece (from 1.15% up to 1.34%), Portugal (from 0.72% up to 1.20%), Finland (from 0.30% up to 0.31%), and Luxembourg (from 0.28% up to 0.29%).

A significant dispersion was also present among countries of the EU-13, the variables coefficient remained during the analysed years at the level of 127.23% to 150.0%. In 2004 the share of various countries was from 0.01% to 2.22%, and in 2018 from 0.001% to 6.28%. Out of the countries from this group, Poland and Hungary stood out: the share of these countries in the intra-EU food exports in 2004

was somewhat bigger than for other countries of this group at 2.22% and 1.26%, respectively. In the following years in Poland there was a systematic growth of the indicator up to the level of 4.10% in 2011 and 6.28% in 2018. As a result Poland took the position of leader within the EU-13 and its advantage above other countries of this group has significantly improved. It is worth noting that Poland advanced from 10th to 7th position in the ranking of the intra-EU share of exports of all member states of the EU. In the case of Hungary, the share increased only by 0.62 p.p. up to 1.88%. The share of other countries was fairly small and did not exceed 1% (apart from the Czech Republic). All the countries of the EU-13 noted high growth in the share of exports in countries of the 'new' EU and a reduction of the 'old' EU countries, the disparities between these groups are still large and significant statistically (based on the Mann-Whitney U test).

Another analysed indicator of competitive position was the trade coverage indicator which presents relative trade surplus or deficit. During the analysed years there were some significant disparities between export coverage ratio in the countries of the 'old' and 'new' EU, but the Mann-Whitney U test did not confirm the statistical significance of these differences. The average level of the TC indicator within the EU-15 in 2004 was 1.00 and was 1.55-times higher than in the countries of the EU-13, and the median was about 0.76, which was 1.26-times higher than that noted in the EU-13 (Figure 2). In later years, the difference between them reduced. In 2018, in the EU-15 it was respectively 1.25-times and 1.14-times higher than in the EU-13.

In the analysed years it was observed that the diversity of the TC indicator was decreasing, also within the groups of the 'old' and 'new' EU. This shows the decrease of the coefficient of variables (from 64.29% down to 54.20% in the EU-15, and from 69.27% down to 55.31% in the EU-13), and also the interquartile range (from 1.08 down to 0.60 in the EU-15, and from 0.66 down to 0.53 in the EU-13). Among the countries of the 'old' EU, the highest relative commercial advantage was noted in the Netherlands which was the biggest exporter and the 5th biggest importer of food articles within the EU. The value of the TC indicator suggests that the income gained from the export of food products exceeded twice the expenditure connected with the issues of import. The advantage of exports over imports was also noted in Belgium, Denmark, Finland, France, Ireland and Spain. In all these countries (apart from Spain) during the analysed years there was a decrease of the TC indicator. In the remaining member states the value of imports significantly exceeded the value of exports of food industry goods. In Finland, France, Germany and Great Britain a decrease of the TC indicator was noted, while in Austria, Greece, Italy, Luxembourg, Portugal and Sweden this indicator increased.

Among the countries of the EU-13 in 2004 it was noted that the number of net exporters was 3 and of net importers was 11. A positive trade balance was observed in Poland, Bulgaria and Hungary (the TC indicator was 1.28, 1.17 and 1.44, respectively). In Poland and Bulgaria in 2011 the TC indicator was lower than

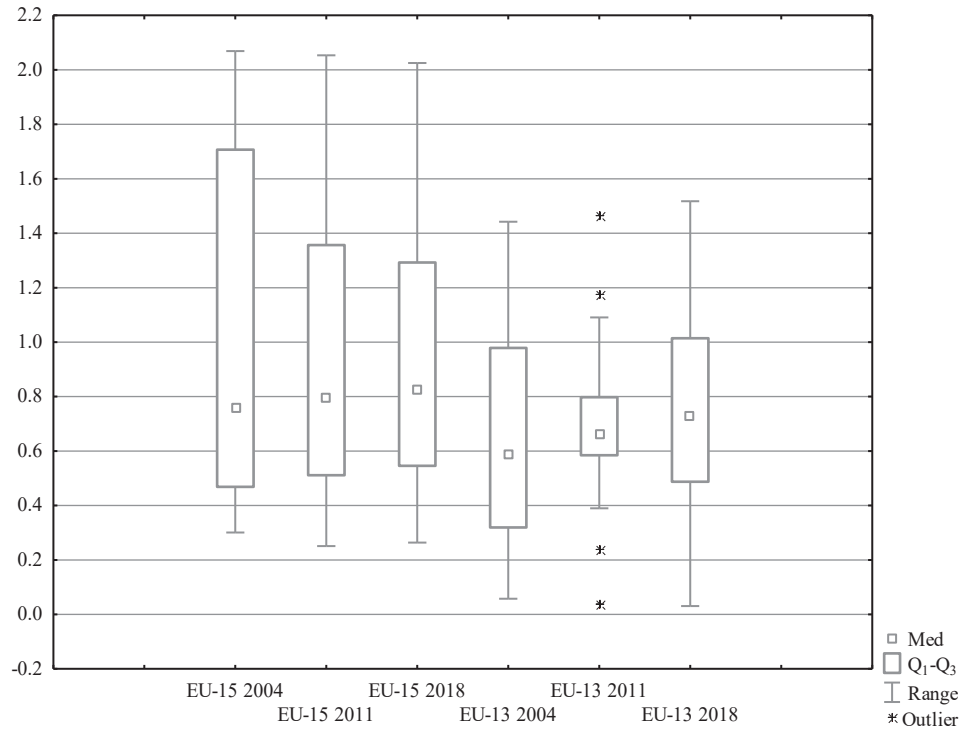

Fig. 2. Box-plot figure for the TC index in the food industry in the 'new' and 'old' EU countries in the years 2004, 2011 and 2018

Source: the author's calculations based on (Eurostat, 2019).

in 2004 (due to the higher growth of imports than exports), while in 2018 it was higher. In Poland income generated from export grew 1.52-times and in Bulgaria 1.29-times, exceeding import expenditure. In Hungary there was reverse situation; the TC indicator increased in 2011 from 1.44 up to 1.47, and then decreased in 2018 down to 1.33. In the analysed period Lithuania changed from a net importer into a net exporter of food (a growth of TC from 0.98 up to 1.01). In the remaining countries of the EU-13 in all the analysed years the commerce in food was present. In 2018, compared to 2004, the level of import increased in Croatia, the Czech Republic, Estonia, Latvia, Romania and Slovenia, and at the same time decreased in Cyprus, Malta and Slovakia.

To assess the competitive results, the importance of the food industry in total country exports was also taken into account. The usage of the elaborated comparative advantages indicator RCA allowed to compare the share of food industry exports in the total of one country with the same relations in the whole EU. The conducted research proved that the average RCA indicator in various countries of the 'new' EU

was lower than in countries of the 'old' EU, but the difference was not statistically significant (based on the Mann-Whitney U test). In both groups a gradual increase of the arithmetic mean and median of the RCA indicator distribution was observed, as well as a decrease of the coefficient of variation (Figure 3).

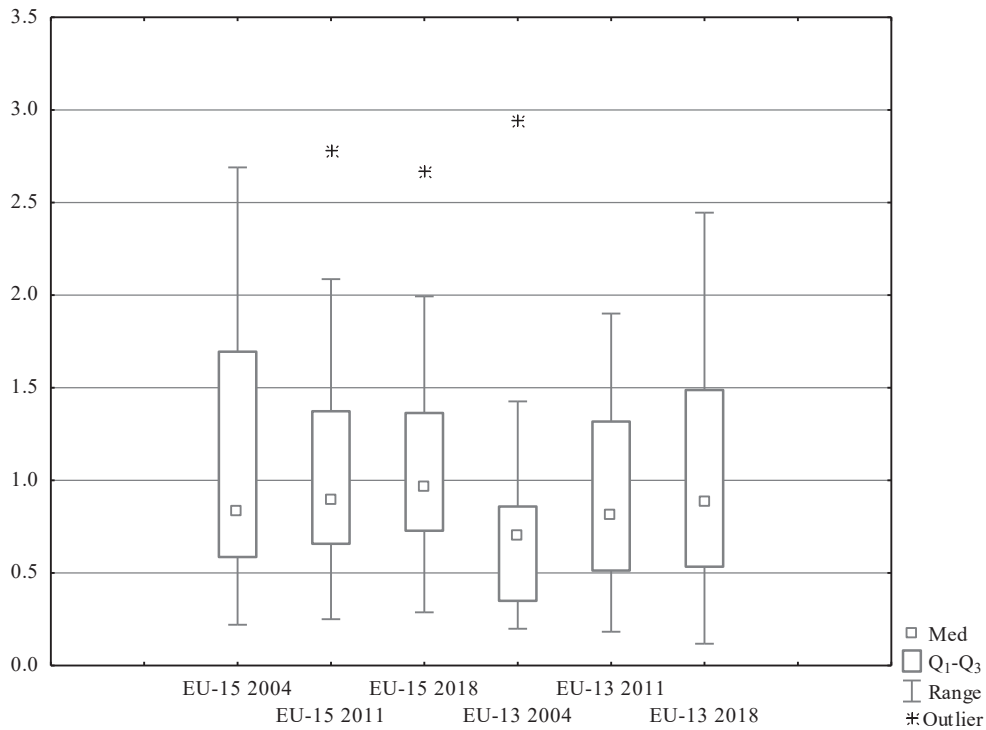

Fig. 3. Box-plot figure for the RCA index in the food industry in the 'new' and 'old' EU countries in the years 2004, 2011 and 2018

Source: the author's calculations based on (Eurostat, 2019).

Among countries of the 'old' EU, the range of the RCA indicator was around 0.22 up to 2.69 in 2004, and from 0.29 up to 2.67 in 2018. Comparative advantages were achieved by seven countries. The leaders were Denmark and Greece, where the importance of food exports in total exports was almost two-times bigger than that in the EU. An RCA indicator above 1 was also noted in Belgium, Ireland, the Netherlands and Spain. In other countries of the 'old' EU, comparative advantages were not achieved, namely in Austria, Finland, Germany, Italy, Luxembourg, Portugal and Sweden. It is worth noting that in the countries where the RCA index was relatively high, i.e. above 1, its decrease was noted (apart from Ireland), while in the countries in which it was relatively low, i.e. below 1, its growth was recorded.

Table 2. The Mann-Whitney U test results

	Statistics U	Z	p
EMS			
2004	17.00	3.685228	0.000229*
2011	30.00	3.086378	0.002026*
2018	30.00	3.086378	0.002026*
TC			
2004	63.00	1.566222	0.117298
2011	69.00	1.289830	0.197111
2018	74.00	1.059503	0.289372
RCA			
2004	68.00	1.335895	0.181585
2011	80.00	0.783111	0.433563
2018	81.00	0.737046	0.461095

* Results statistically significant at the level of $p = 0.05$.

Source: the author's calculations based on (Eurostat, 2019).

In 2004 only two countries of the 'new' EU were achieving comparative advantages. The share of the food industry in total exports in Cyprus was 2.95 times bigger, while in Lithuania 1.43-times bigger than in the whole EU. In 2011 comparative advantages were achieved also in Bulgaria, Latvia and Poland, and in 2018 also in Croatia. As a result, in 2018 in six countries of the 'new' EU the RCA indicator was above 1. At the same time, growth was present in many other countries that did not achieve comparative advantages: the Czech Republic, Estonia, Hungary, Romania, and Slovenia. A decrease of the indicator, apart from Cyprus, was also present in Malta and Slovakia.

4. Conclusion

Food industry is one of the most important branches of the EU economy in economics and social terms. Various countries, especially in the EU-13 and EU-15, are characterized by a significant diversification of the obtained commerce results of the food industry in the international arena. The conducted research shows that there are significant disparities between the countries of the 'old' and 'new' EU in the range of all the evaluated indicators of competitive position. A statistically significant difference was confirmed by the Mann-Whitney U test, however only in the case of share in the intra-EU food exports. During the analysed years the disparities between the EU-13 and EU-15 in the competitive results of the food industry were gradually mitigated. During 2004-2011, the share of EU-13 countries in food exports almost

doubled. This increase continued, but to a smaller range. It was observed that the value of the median of the EU-15 countries was gradually decreasing, and increasing in the EU-13. In the EU-13 countries with the high importance of the intra-EU food exportation, namely the Netherlands, Belgium, France, Denmark, Great Britain and Ireland, there was a decrease of the share in exports. At the same time a growth of this indicator almost tripled in Poland. In the range of trade coverage ratio, there was a decrease in the diversity of the between and inter-between groups. In these countries of the 'old' EU who were net exporters of food, the advantage of exports over imports decreased (apart from Spain), while France transformed during the analysed years from a net exporter into a net importer of food. Simultaneously, in most countries of the 'new' EU the growth of the TC indicator was observed, and Lithuania transformed from a net importer into a net exporter. Based on the analysis of the RCA indicator it was observed that comparative advantages were achieved in seven countries of the 'old' EU. All these countries noted the decrease of the RCA indicator (apart from Ireland). In 2004, two countries of the 'new' EU achieved comparative advantages, and in 2018 – six countries. The growth of this indicator was also present in many other countries from that group which did not gain comparative advantages. It must be stated however, that besides the present tendencies of the equalization of competitive results of the food sector among the 'old' and the 'new' EU, this process is still ongoing. The conducted research may become the basis for further evaluations of the future competitiveness convergence of the food industry.

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ZRÓŻNICOWANIE WYNIKÓW KONKURENCYJNYCH PRZEMYSŁU SPOŻYWCZEGO KRAJÓW „STAREJ" I „NOWEJ" UE

Streszczenie: Celem opracowania była ocena zróżnicowania wyników konkurencyjnych przemysłu spożywczego w krajach „starej" i „nowej" UE w latach 2004, 2011 i 2018. Obliczono wskaźniki udziału w wewnątrzunijnym eksporcie, pokrycia importu eksportem oraz ujawnionych przewag komparatywnych przemysłu spożywczego, a następnie zastosowano wybrane statystytyki opisowe (średnia arytmetyczna, współczynnik zmienności, dolny i górny kwartyl, mediana, rozstęp, rozstęp kwatylowy), wykresy–ramka wąsy oraz test Manna-Whitneya U. Z przeprowadzonych badań wynika, że występują wyraźne dysproporcje między krajami „starej" i „nowej" UE w zakresie wszystkich ocenianych wskaźników pozycji konkurencyjnej, głównie w przypadku udziału w eksporcie. Ocena wyników konkurencyjnych w kolejnych latach wskazuje, że ma miejsce stopniowy proces niwelowania luki w zakresie pozycji konkurencyjnej przemysłu spożywczego krajów „starej" i „nowej" UE.

Słowa kluczowe: konkurencyjność, udział w eksporcie, bilans handlowy, przewagi komparatywne, przemysł spożywczy.