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Agricultural Competitive Potential and Competitive Position in the International Trade of Agricultural and Food Products in the European Union

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Abstract:

Purpose: *This paper aimed to evaluate the competitive potential of the agricultural and food sector in the member states of the European Union and identify differences between them with reference to the position of such countries in international agricultural and food trade.*
Design/Methodology/Approach: *The competitive potential was evaluated using a synthetic measure designed using TOPSIS (Technique for Order Preference by Similarity to an Ideal Solution). The potential was confronted with the competitive position of the member states of the European Union in the international trade in agricultural and food products. To this end, among other indicators, the Revealed Comparative Advantage (RCA) index was used. The analysis was based on data from EUROSTAT and FADN (Farm Accountancy Data Network) for years 2007-2017.*
Findings: *The results point to a strong diversification of the level of agricultural development among the member states of the European Union. Four groups of countries characterised by a similar level of the analysed phenomenon were identified. The highest value of the synthetic measure was characteristic of the Netherlands. It was more than 3 times higher than in the country least competitive in that respect (Slovenia). Countries with the highest agricultural competitive potential such as the Netherlands, Belgium, Denmark and France, also maintain a high competitive advantage in the international agricultural and food trade. Many countries, in particular those included in EU-12 (Malta, Romania, Bulgaria, Poland) in the analysed period 2007-2017 significantly improved their competitive position in the agricultural and food trade despite a small increase in the competitive potential of agriculture.*

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Practical Implications: *The surveys made it possible to identify countries (mainly new member states of the EU) in which, despite relatively large resources of production factors in agriculture, the competitive potential measured with an aggregate measure designed in this paper, taking into account primarily an advantage in terms of quality and not costs and prices, is low. This points to a need for orienting the Common Agricultural Policy at boosting the dynamics of structural transformations in this sector so that in the future these countries are able to maintain a high competitive position in agricultural and food trade.*

Originality/Value: *An added value of this paper is the analysis of multiple factors affecting the competitiveness of the agricultural and food sector and identification of a group of EU countries by means of a synthetic measure designed using TOPSIS, whereas most papers investigate the effect of one factor with a limited number of competitiveness measures. The analysis of relationships between the competitive capacity and the international competitive position of the countries of the European Union in agricultural and food products further contributes to the originality of the study.*

Keywords*: Competitive potential, competitive position, international trade, agriculture.*

JEL Codes: *F14, F16, O13, O57, C10.*

Paper Type: *Research article.*

1. Introduction

1.1 Competitiveness in Theory

Competitiveness is an underlying notion in economic sciences. However, this notion has no clear universal definition, which is a result of the fact that it derives from at least three trends in the theory of economics: the theory of international trade, theory of economic growth and microeconomics (Strojny, 2010). Latruffe (2010) defines it as the ability to face the competition and to succeed against such competition. Most definitions of competitiveness refer to the ability to sell products with a profit margin, permanently ensure a high rate of return on the production factors and a high level of employment, which in turn provides grounds for increasing the income of the population, achieve improving life standard and, as a result, ensuring social welfare.

The European Commission (2017) in the report "Measuring Competitiveness" emphasizes that competitiveness is strongly connected with productivity and trade. A high significance of productivity in competitiveness analysis is indicated by Porter who identified sector competitiveness next to the competitive advantage of countries and nations. He notes that the only possible concept of international competitiveness of a country is the development of national productivity (Porter, 1998). In this paper the authors deem the analysis of productivity of factors shaping the agricultural competitive potential particularly important. The origins of the international theory of competitiveness should be sought in theories of foreign trade (Olczyk, 2016, Zawalińska, 2004). According to the definition by the Commission of European Communities of 1983, international competitiveness is a capacity to catch up with

international competitors. This definition evolved in the documents of the European Communities and in 1985, according to the Commission of EC, international competitiveness of countries is their ability to maintain equilibrium between import and domestic production on the domestic market in accordance with the effects obtained in export.

In 1994, the Commission of EC saw the significance of harmonisation of economic growth with balanced foreign turnover and one year later, analysing international competitiveness, noted the capacity of improving or maintaining the life standard in comparison with economies of other countries with a similar level of development without disturbing the external equilibrium in the long run (based on: Misala, 2011). Definitions of international competitiveness used most frequently nowadays refer mostly to the performance of the specific country/group in international exchange, and in particular in the capacity of domestic businesses to operate in foreign markets, the capability of developing effective export, increasing their share in export market and at the same time increase the real domestic product, ability to maintain growing productivity in the long run, utilize all production factors, high rate of return of expenditure, increase in employment and permanent improvement of living standard (Misala, 2011; Pawlak, 2012; Wosiek, 2016; Kowalski, Weresa, 2019).

Many authors, including Gorynia and Łaźniewska (2009), Misala (2011), Bossak (2013), and Bieńkowski (1995) emphasize that an important aspect of international competitiveness is differentiating between international competitive capacity (potential) and the competitive position of the economy. The competitive potential of the economy (competitive capacity) is the capacity of long-term growth in the conditions of an open economy resulting in the development of an economic structure and an export structure – constituting its extension and reflection – that correspond with changes in the global demand structure. Such a definition of competitiveness takes into account the analysis of factors such as: the size and structure of production factors and the effectiveness of their utilization (Gorynia and Łaźniewska, 2009).

In comparison with international competitive capacity and international competitiveness, the notion of international competitive position is much narrower. It denotes the status and changes in the share of a specific country in international turnover as well as the evolution of the structure of this turnover including the respective transformation of quality. This paper attempts to evaluate the competitive potential of agriculture with reference to the development of the competitive position of EU countries in the international agricultural and food trade, so the analysis covers both the competitive potential and competitive capacity, taking into account the regional research perspective in the applied commercial indicators.

In the light of the output of international trade theory, international competition is skilful utilization of natural comparative advantages of respective countries and the

related competitive advantage. According to a review of literature on international economics and international trade, the most significant sources of comparative advantages include: utilization of advantage in terms of equipment in underlying production factors and the efficiency of their utilization; degree of technological advancement; specialisation and export of products that can be produced at a relatively lower cost than in other countries; utilization of differentiating domestic and national preferences of economic entities; achieving different types of economies of scale in production and sale (Gerber, 2014; Carbaugh, 2010; Kerr and Gaisford, 2007; Krugman, 2018). In this paper the authors refer to a larger extent to traditional theories of international trade than to contemporary theories. According to classical authors, such as A. Smith and D. Ricardo (Sawyer and Sprinkle, 2015; Koo andKennedy, 2005; Ingham, 2004), the grounds for developing international specialization and international trade are absolute (Smith) and relative (Ricardo) differences in the manufacturing cost measured by labour input – this paper uses different measures of labour productivity with reference to those theories. The resource abundance theory by Heckscher and Ohlin takes two production factors – labour and capital.

According to the H-O theory, the volume and structure of international turnover derive from differences in the real cost of production following from differences in extreme productivity of both factors. Differences in productivity are due to the relative abundance of factors in respective countries (Świerkocki, 2011; Helpman, 2011; Krugman, 2018). The classical theory of resource abundance is supplemented and elaborated on by two neo-factor theories whose authors consider a larger number of production factors – e.g. Vanek (Pawlak, 2013; Vanek, 1963; Helpman, 2011) in his three-factor theory identifies natural resources as a production factor including agricultural land resources of the country. The factor-based approach is elaborated on by the theory of competitive advantage due to having products and production factors at its disposal formulated by Tesch (1980), which is connected with a variety of production capabilities of absolute and permanent nature following from natural conditions such as for example land quality or climate, and of relative and interim nature, related to differences in the level of technical knowledge and the qualifications of human resources and the resources of capital (Misala, 2011). The authors of this paper refer to the above-mentioned theories of international trade.

The opening of respective economies to the world and the internationalization of economic relations increase the growing interest in the evaluation of the international competitiveness of countries as well as of groups of countries (Strojny, 2010). International economic exchange has a significant impact on the economy of every country (Johnson, 2013). Export is one of the key direct factors accelerating economic growth (Strojny, 2018). Mercantilists were the first to consider international trade, and especially export, as an accelerator of the economic growth of nations. International competitiveness of the economy was understood in similar terms by the creators of the first theories of international trade, and in particular A. Smith – the author of the theory of absolute cost advantage, and R. Torrens and D. Ricardo – the creators of the theory of relative costs and comparative advantage. Ricardo's model was tested

multiple times and the relationship between differences in the productivity of production factors and trade flows was confirmed by studies carried out by MacDougall (1951), Stern (1962), Balassa (1963), and Golub (1995), mainly for industrial products and to lesser extent for agricultural products. Therefore, it is essential that such studies – covering trade in agricultural and food products – be undertaken for the countries of the European Union, which is the subject of this paper.

1.2 Review of Surveys Regarding Competitiveness of the Agricultural and Food Sector

Agricultural and food products play a special role in international trade. Increasing the export volume of food and other agricultural products opens possibilities of developing the production to domestic producers (Xiao and Reed, 2007). Numerous studies analyse the development of international agricultural and food trade. Most elaborations focus on analysing the outcomes of competition using specific measures or groups of measures but do not analyse the competitive potential. The analyses most often use the competitive position measures such as the Revealed Comparative Advantage Index (RCA) by Balassa (Balassa and Noland, 1989; Senyshyn *et al.*, 2019; Sarker and Shashini, 2014; Kostoska and Hristoski, 2018; Kousar *et al.*, 2019). Most studies use a whole set of indicators for evaluating the competitive position, including for example: Export Market Share Index, Trade Coverage Index, Relative Export and Import Indicators, Export Specialization Index, Cross-Country Indices of Relative Competitiveness, Grubel-Loyd Index (Jarosz-Angowska, 2019; Maksymets, Lönnstedt, 2016; Ortikov *et al.*, 2019; Juchniewicz and Łukiewska, 2015). This study also makes use of several indices for the evaluation of the international competitive position of EU countries, including Export Market Share Index, RCA Index, Trade Coverage Index and Grubel-Llyod Index.

Some researchers attempt to evaluate the international competitiveness of the agricultural and food sector in terms of costs, using the Domestic Resource Cost measure to this end (Gorton *et al.*, 2001; 2006; Yercan and Isikli, 2006). The DRC compares the social opportunity costs of domestic production to the value added it generates in international prices. Gorton (2001; 2006) used the DRC index in his assessment of the international competitiveness of agriculture in Poland and Hungary before and after accession to the European Union. The outcomes of studies generally point to the loss of competitiveness and the necessity to modernise and increase productivity in order to obtain a comparative advantage and improve the international competitiveness in the future. This is a consequence of a decrease in prices of agricultural products on the global market. Much earlier, Fagerberg (1988) noted that excessive importance was attached to the cost-based approach in the evaluation of international competitiveness, and indicated technological competitiveness as a significant factor. Recently, some authors (Pawlak, 2018) emphasized the significance of the institutional factor, and in particular the economic policy of respective

governments oriented at supporting the agricultural sector, indicating a greater importance of this factor in developing international competitiveness in comparison with the availability of natural factors.

A wider research context in analysing international competitiveness from the point of view of determinants of such competitiveness was undertaken by authors such as Ball *et al.* (2010), Viira *et al.* (2015), and Yao (2015). Ball *et al.* (2010) designed a model analysing the relationship between output defined as gross production leaving the farm, capital input, land input, labour input and relative productivity levels and their relation to international competitiveness for 11 EU countries and for the United States. Taking up studies in a wider context of evaluating the effect of institutional factors (policy), market factors, productivity, and structure of farms on international competitiveness normally reduces the analysis to one industry/sector as in the study by Viira *et al.* (2015) who analysed competitiveness of the dairy sector in Estonia. In turn, Yao (2015) designed an econometric model for evaluating the impact of factors such as agricultural modernization, economic growth and industrialization on the international competitiveness of Chinese agricultural products.

Studies regarding agricultural and food trade in EU countries have been undertaken by many authors. However, most often they cover selected countries of the European Union (e.g. countries of Central and Eastern Europe) or are based on selected partial indices only (Bojnec and Ferto, 2012; Kiss, 2011; Rytko, 2014; Drabik and Bartova, 2008). On the other hand, there are no comprehensive studies covering all member states while at the same time taking a wider research context into account. A research gap also exists as regards the evaluation of the competitive potential of the agricultural and food sector in EU countries. Meanwhile, the production capabilities and at the same time competitive capacity of the agricultural and food sector are determined by its competitive potential. This is expressed as resources at the disposal of respective countries (Nowak *et al.,* 2015). However, not only the amount of resources creates the competitive potential. It is above all determined by relations between them and their efficient utilization. Exerting adequate impact on the production potential through competitiveness management leads to specific results of competing - the competitive position (Nosecka *et al.,* 2011).

1.3 Purpose of the Study

This study mainly aims at a classification and identification of homogeneous groups of countries in the European Union according to selected factors shaping the agricultural competitive potential and analysis of differences between them with reference to the position of these countries in the international agricultural and food trade. A special contribution is the analysis of multiple factors affecting the competitiveness of agriculture and an attempt at ordering EU countries by means of a synthetic measure designed using TOPSIS, while most papers investigate the effect of one factor with a limited number of competitiveness measures. One of the purposes of this study is the analysis of relationships between the competitive capacity and the

international competitive position of the countries of the European Union in the area of agricultural and food products. The competitive potential of the agricultural and food sector of the specific country, determined by many different factors affects the development of its international competitiveness which, theoretically, should be reflected by the indicators of the international competitive position of the specific country. This paper attempts to verify this dependency among the member states of the European Union.

2. Materials and Methods

Economic phenomena can be explained using different methods. Commonly used approaches include: analytical description, model approach and synthetic measures. Synthetic measures allow quantifying a phenomenon described by a considerable number of features by means of a single value. The competitive potential of the agricultural and food sector in the countries of the European Union in the context of international trade in agricultural and food products was evaluated using a synthetic measure designed using TOPSIS (Technique for Order Preference by Similarity to an Ideal Solution). This method synthesizes factors of various nature and assigns them a synthetic aggregate measure. The analysis was based on data from EUROSTAT and FADN (Farm Accountancy Data Network) for years 2007-2017. Based on the contents and availability of figures, the variables characterising the competitive potential of the agricultural and food sector of the countries of the European Union were:

X1 - average area of a farm (ha),
X2 - gross investments per 1 ha of agricultural land (EUR/ha),
X3 - technical resources (fixed assets per 1 AWU - Annual Work Unit) (EUR/AWU),
X4 - utilised agricultural area (UAA) per 1 AWU (ha/AWU),
X5 – labour productivity (Gross Value Added (GVA) per 1 AWU) (EUR/AWU),
X6 - land productivity (agricultural output per 1 UAA) (EUR/AWU),
X7 - capital productivity (agricultural output per 1 EUR of total fixed assets) (EUR),
X8 - value of agricultural production per capita (EUR per person),
X9 - share in the EU agricultural production (%),
X10 – share of employee compensation in agricultural production output (Compensation of employees/Agricultural goods output)*100 (%),
X11 - share of respective countries in Gross Value Added of the EU (%),
X12 – share of subsidies for agriculture in Gross Value Added (%),
X13 – share of Gross Fixed Capital Formation in Gross Value Added (%),
X14 – share of Wages and Salaries in Production Value (%),
X15 - Investment per person employed in the Manufacture of food products (EUR/person),
X16 - Apparent labour productivity in the Manufacture of food products (Gross value added per person employed) (EUR/person).

The features describing the competitive potential were selected on the basis of substantive and statistical analysis, i.e. it was verified whether they were measurable, available, complete, reliable and interpretable and whether the coefficient of variation was sufficiently high (V > 15%). Features that were excessively correlated with one another, i.e. for which Pearson's correlation coefficient exceeded 0.8, were eliminated. Thus, X11 variable was not included in the final set of factors. In order to normalize the features, for every x_{ik} $(i = 1, 2, \dots, 28; k = 1, 2, \dots, 15)$, the unitarization procedure was used based on the following formula:

$$c_{ik} = \frac{x_{ik} - \min\limits_{i}\{x_{ik}\}}{\max\limits_{i}\{x_{ik}\} - \min\limits_{i}\{x_{ik}\}} \tag{1}$$

because all the features were considered to be stimulants. Furthermore
$\max\limits_{i}\{x_{ik}\}$ - maximum value of the *k*-th feature
$\min\limits_{i}\{x_{ik}\}$ - minimum value of the *k*-th feature.

In order to calculate the Euclidean distance for respective aggregate units from the pattern$c^+ = (1,1, \dots,1)$ and anti-pattern of development $z^- = (0,0, \dots,0)$

$$d_i^+ = \sqrt{\sum_{k=1}^{15}(c_{ik} - c_k^+)^2},\ d_i^- = \sqrt{\sum_{k=1}^{15}(c_{ik} - c_k^-)^2} \tag{2}$$

was determined as the basis for the values of the synthetic measure

$$z_i = \frac{d_i^-}{d_i^+ + d_i^-} \tag{3}$$

The division of units (countries) is based on the statistical criterion related to the arithmetic mean and the standard deviation from the values of the synthetic measure z_i:

I class: $z_i \geq \bar{z} + s_z$
II class: $\bar{z} \leq z_i < \bar{z} + s_z$
III class: $\bar{z} - s_z \leq z_i < \bar{z}$
IV class: $z_i < \bar{z} - s_z$

where: $\bar{z}$ – mean, s_z – standard deviation.

The evaluation of the competitive potential of the agricultural and food sector was confronted with the competitive position of the member states of the European Union in the international trade in agricultural and food products. To this end, the index of revealed comparative advantage (RCA) of export, was determined as a relation of two quotients. The first one presents the relation between food exports in the specific country and food exports in the European Union, whereas the other – the relation between total commodity export in the specific country to overall export in the European Union:

$$\text{RCA} = \frac{X_{ij}}{\sum_{i=1}^{n} X_{ij}} \div \frac{X_{iw}}{\sum_{i=1}^{n} X_{iw}} \quad (4)$$

where:
X_{ij} – export of product *i* by the specific country to market *m*
X_{iw} – export of product *i* by the group of countries to market *m*
n – number of product types

The revealed comparative advantage (RCA) index was calculated taking into account regional trade streams, which made it possible to indicate differences in the competitive position of the agricultural and food sector in EU countries within a group and evaluate their trade performance from the perspective of operating in a common market and their competitiveness in comparison with other EU countries in international trade.

The competitive position of the countries of the European Union was evaluated using the following measures, next to the previously mentioned RCA index: share of export of agricultural and food products in overall export of the country, share of respective countries in the export (intra+extra) of agricultural and food products of the EU, Trade Coverage Ratio (TC), and Grubel-Lloyd's Intra-Industry Trade Ratio (GL). All calculations took into account data covering extra+intra EU export and import.

$$\text{TC}_i = \frac{X_i}{M_i} * 100 \quad (5)$$

where:
i – analysed commodity or group of commodities
X – value of export of the country
M – value of import of the country

$$\text{GL} = \frac{[(X_i + M_i) - |X_i - M_i|] * 100}{X_i + M_i} \quad (6)$$

where:
X_i – value of exported goods in a specific country included in i
M_i – value of imported goods in a specific country included in i

Studies were carried out with reference to Section 0 and 1 of the Standard International Trade Classification (SITC) – food, drink and tobacco (SITC 0 and 1).

The subjects of the study were 28 member states of the EU. However, due to the unavailability of certain figures for Croatia, the competitive potential of this country was evaluated only for the year 2017. The time range of the study is 2007-2017.

3. Results and Discussion

3.1 Analysis of the Competitive Potential of Agriculture in EU Countries

Tables 1 and 2 present statistical characteristics of diagnostic variables taken into account respectively for the year 2007 and 2017.

Table 1. *Statistical parameters of the analysed variables describing the competitive potential of the agricultural and food sector in the countries of the European Union in 2007.*

Variables	Mean	S.D.*	V**	Min	Max
X1	74.76	113.16	151%	3.12 Malta	584.02 Slovakia
X2	440.35	477.76	108%	64.93 Spain	2194.23 Netherlands
X3	218734.22	255130.75	117%	9000.85 Bulgaria	984978.36 Denmark
X4	26.76	18.35	69%	2.08 Malta	70.24 United Kingdom
X5	28969.72	21509.87	74%	2738.79 Romania	82156.73 Denmark
X6	2601.48	2860.44	110%	678.57 Latvia	13101.60 Malta
X7	0.38	0.22	58%	0.04 Ireland	0.85 Bulgaria
X8	623.84	314.05	50%	272.35 Malta	1406.39 Czech Republic
X9	3.68	5.06	138%	0.03 Malta	19.20 France
X10	10.33	4.85	47%	3.37 Malta	21.71 Sweden
X12	41.17	28.16	68%	7.87 Romania	125.03 Slovakia
X13	45.32	24.88	55%	5.74 Ireland	90.42 Italy
X14	10.85	3.83	35%	6.60 Malta	25.58 Luxembourg
X15	7.41	3.74	51%	2.90 Latvia	17.70 Luxembourg
X16	36.21	25.49	70%	6.40 Bulgaria	120.90 Greece

Note: **S.D. - standard deviation, **V - coefficient of variation*
Source: *Own calculations based on FADN (2020) and EUROSTAT (2020).*

Table 2. *Statistical parameters of the analysed variables describing the competitive potential of the agricultural and food sector in the countries of the European Union in 2017.*

Variables	Mean	S.D.*	V**	Min	Max
X1	74.56	96.65	130%	2.75 Malta	500.69 Slovakia
X2	427.73	416.90	97%	80.56 Spain	2106.23 Netherlands
X3	281000.33	302150.84	108%	28542.73 Romania	1209455.74 Denmark
X4	30.72	20.24	66%	2.08 Malta	69.96 United Kingdom
X5	35653.81	25112.16	70%	7757.27 Romania	106877.60 Denmark
X6	3047.64	3556.18	117%	823.68 Lithuania	15434.18 Malta
X7	0.36	0.20	57%	0.09 Ireland	0.79 Slovakia
X8	668.61	319.89	48%	220.06 Malta	1503.24 Czech Republic
X9	3.83	5.15	135%	0.03 Malta	19.03 France
X10	10.94	5.46	50%	3.59 Malta	27.06 Sweden
X12	42.20	27.31	65%	7.54 Netherlands	137.27 Slovakia
X13	38.15	21.58	57%	6.19 Ireland	88.74 Slovakia
X14	11.25	3.33	30%	7.07 Belgium	22.94 Luxembourg
X15	7.22	4.05	56%	3.00 Croatia	20.50 Belgium
X16	41.64	30.25	73%	8.00 Romania	144.70 Greece

Note: **S.D. - standard deviation, **V - coefficient of variation*
Source: *Own calculations based on FADN (2020) and EUROSTAT (2020).*

The analysed variables were characterised by a different level of variation. The coefficient of variation ranged from 135% to 30%. The largest differentiation between the analysed countries was observed for variables X9 - share in the EU agricultural production and X1 - average area of a farm. The least differentiated feature was the variable X14.

At the next stage of the study, the aggregate measure of the agricultural and food sector of respective countries was determined based on diagnostic variables adopted for the needs of the study.

Table 3. *Classification of the member states of the European Union according to the competitive potential of the agricultural and food sector in 2007*

Value of the measure z_i	**Country**	**Position**	**Typology class**
0.45487	Netherlands	1	I
0.44828	Denmark	2	I
0.44792	France	3	I
0.43596	Luxembourg	4	I
0.42730	Slovakia	5	I
0.42359	Czech Republic	6	I
0.40249	Hungary	7	II
0.39641	United Kingdom	8	II
0.38520	Estonia	9	II
0.37926	Greece	10	II
0.34871	Sweden	11	II
0.32443	Belgium	12	II
0.31305	Germany	13	III
0.30581	Ireland	14	III
0.29725	Finland	15	III
0.28069	Austria	16	III
0.27609	Italy	17	III
0.27097	Cyprus	18	III
0.26359	Latvia	19	III
0.26224	Spain	20	III
0.24975	Malta	21	III
0.24854	Slovenia	22	III
0.22339	Romania	23	IV
0.21973	Lithuania	24	IV
0.21775	Bulgaria	25	IV
0.19753	Portugal	26	IV
0.15754	Poland	27	IV

Source: *Own calculations based on FADN (2020) and EUROSTAT (2020).*

Synthetic measures describing the competitive potential of the agricultural and food sector exceeded values from 0.157 to 0.454 and for most countries were not higher than general average. The highest value was recorded for the Netherlands (determined measure – 0.454), and the lowest for Poland (value of the measure – 0.157). Apart from the Netherlands, the first group of countries characterised by the highest competitive potential comprised Denmark, France, Luxembourg, Slovakia and Czech Republic. Group II consists of 6 countries, III of 10 and IV of 5. In group IV there were 4 countries admitted to the EU in 2004 or later and Portugal.

The allocation of Portugal to the class with the lowest competitive potential is a result of, among other things, low level of capital expenditure, relatively low level of technical equipment in this sector, low labour and land productivity. Studies by Nowak and Kamińska (2016) show that this country is one of the least competitive countries in terms of the level of agricultural development. The low rank of Poland, Bulgaria, Romania and Lithuania is a consequence of, among other things, structural problems of the agricultural sector and low productivity of production factors (Csaki and Jambor 2009).

Table 4. *Classification of the member states of the European Union according to the competitive potential of the agricultural and food sector in 2017*

Value of the measure z_i	**Country**	**Position**	**Typology class**
0.46887	Netherlands	1	I
0.45909	Slovakia	2	I
0.44791	France	3	I
0.44325	Denmark	4	I
0.40894	Estonia	5	I
0.39020	Luxembourg	6	II
0.38561	Czech Republic	7	II
0.37373	United Kingdom	8	II
0.37302	Hungary	9	II
0.37183	Sweden	10	II
0.35484	Belgium	11	II
0.32654	Germany	12	II
0.30203	Finland	13	III
0.30019	Greece	14	III
0.28146	Austria	15	III
0.27122	Italy	16	III
0.26776	Cyprus	17	III
0.25659	Latvia	18	III
0.25617	Ireland	19	III
0.24784	Lithuania	20	III
0.24686	Slovenia	21	III
0.24666	Bulgaria	22	III
0.23878	Malta	23	III
0.22842	Spain	24	III
0.21084	Portugal	25	IV
0.17651	Romania	26	IV
0.16006	Croatia	27	IV
0.15507	Poland	28	IV

Source: *Own calculations based on FADN (2020) and EUROSTAT (2020).*

In 2017 the value of the synthetic measure ranged from 0.469 in the Netherlands to 0.155 in Poland. Its average value reached 0.309 and only 12 countries exceeded that

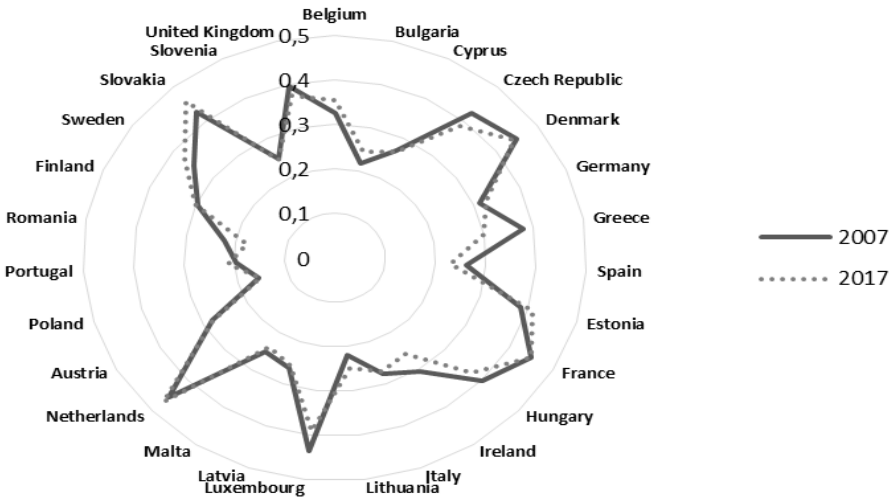
level. The class with the highest competitive potential, next to the Netherlands included Slovakia, France, Denmark, as well as Estonia, likewise in 2007. An improvement in the competitive potential of Estonia in comparison to 2007 can be explained, among other things, by a dynamic increase in capital expenditure in agriculture per 1 ha UAA and an increasing level of technical equipment in agriculture. However, the share of this country in the agricultural production of the EU is small and according to EUROSTAT (2020) in 2017 it was only 0.2%. Slovakia, although it is a new member state, shows a high level of the synthetic measure thanks to the fact that it reached the maximum value of variables X1, X2, X12 and X13. Class II consisted of seven countries, two of which (Luxembourg and Czech Republic) in 2007 were included in class I. Class III comprised 12 countries with a competitive potential below its average level in EU-28. Portugal, Romania, Croatia and Poland were characterised by the lowest potential.

Hence, Croatia, as a country that joined the EU as the last out of analysed member states, in 2017 was not very competitive in terms of the competitive potential of the agricultural and food sector. This was due to unfavourable relations between production factors in agriculture as well as a very low productivity of labour and capital. These problems are noted, among other authors, by Franić *et al.* (2014). In addition, Poland and Romania, despite their low position in the presented ranking have a relatively high share in the value of agricultural production that in 2017 amounted to 5.8% and 3.9% respectively. The results are presented graphically on Figure 1. It indicates that in 2017 the analysed competitive potential did not change much in comparison to the year 2007. At the same time, large variations in the value of synthetic measures can be observed between member states. The difference between the country with the highest (Netherlands) and the lowest (Poland) value of the synthetic measure was threefold in both analysed years

3.2 Analysis of the Competitive Position of EU Countries in Agricultural and Food industry in 2007-2017

Characterising the significance of the EU in the international trade in agricultural and food products and the competitive position of EU countries within a specific group, the following indicators are worth taking into account: their share in intra+extra EU export/ EU Export Market Share (EMS), Revealed Comparative Advantage (RCA) in intra+extra EU export and Trade Coverage (TC) ratios calculated for (extra+intra EU) trade streams in this sector of the economy. The Grubel-Lloyd Index (GL) reflecting intra-industry exchange intensity also provides interesting information about the type of export specialization in agricultural and food trade. The significance of agricultural and food trade for each of these countries, that is, the share of export in this group of commodities in their overall export, should also be examined.

Figure 1. *Values of synthetic measures of the competitive potential of the agricultural and food industry for 2007 and 2017*



Source: *Own calculations based on FADN (2020) and EUROSTAT (2020).*

Table 5. *Comparison of the member states of the European Union according to significance of the agricultural and food sector in 2007 and 2017*

	Share of export of agricultural and food products in total exports of the country		Change in the share of export of agricultural and food products in total exports of the country	Share of countries in (intra+extra) EU export of agricultural and food products		Change in the share of countries in EU export of agricultural and food products
GEO/TIME	**2007**	**2017**	**2017/2007**	**2007**	**2017**	**2017/2007**
Belgium	7.78	9.69	24.61	8.53	7.93	-7.13
Bulgaria	7.40	11.54	56.00	0.35	0.69	97.39
Czechia	3.49	4.13	18.52	1.09	1.43	31.57
Denmark	17.26	18.82	9.04	4.54	3.67	-19.05
Germany	4.51	5.32	17.98	15.16	14.64	-3.44
Estonia	8.26	8.65	4.70	0.23	0.24	3.30
Ireland	9.80	10.44	6.46	3.03	2.73	-10.04
Greece	17.11	17.59	2.82	1.15	1.09	-5.40
Spain	12.30	14.94	21.46	7.93	9.09	14.50
France	10.41	11.91	14.40	14.83	12.12	-18.31
Croatia	10.04	12.55	25.00	0.32	0.38	21.34
Italy	6.01	8.35	38.93	7.65	8.06	5.29
Cyprus	20.22	12.67	-37.35	0.07	0.08	10.11

Latvia	13.07	19.28	47.45	0.28	0.52	86.66
Lithuania	15.93	16.54	3.84	0.70	0.94	34.93
Luxembourg	4.38	8.22	87.52	0.26	0.25	-3.63
Hungary	6.05	7.25	19.75	1.47	1.57	6.68
Malta	6.24	11.09	77.67	0.05	0.06	10.05
Netherlands	11.64	12.69	9.08	16.32	15.74	-3.60
Austria	6.26	7.37	17.83	2.61	2.36	-9.64
Poland	9.24	12.79	38.44	3.30	5.70	72.80
Portugal	8.63	10.79	24.98	1.15	1.28	10.52
Romania	2.89	7.86	172.05	0.30	1.06	254.88
Slovenia	3.95	5.02	27.29	0.30	0.37	21.21
Slovakia	3.63	3.36	-7.52	0.54	0.53	-1.63
Finland	1.78	2.55	43.44	0.41	0.33	-19.04
Sweden	3.48	6.18	77.52	1.50	1.80	20.06
United Kingdom	5.26	6.41	21.78	5.92	5.38	-9.16

Source: *Eurostat, https://ec.europa.eu/eurostat/data/database and own calculations*.

In 2017 agricultural and food trade was the most significant in Latvia, Denmark, Greece, Lithuania and Spain (the export share of agricultural and food products in total exports of those countries ranged from 14.94 to 19.28%), and the least significant in Finland, Slovakia, Czech Republic, Slovenia and Germany (2.55-5.32%). In 2007-2017 the significance of export of agricultural and food products increased in nearly all EU countries (apart from Cyprus and Slovakia), and most of all in Romania (increase in the share of this group of commodities in total exports of 172.05%).

The most important exporters of agricultural and food products in the EU have long been the Netherlands, the largest countries of the EU (Germany, France, Italy), Spain and Belgium - all of them with the share in the intra+extra EU-28 exports of agricultural and food products ranging from 7.65% to 16.32% in 2007 and 2017. It is worth emphasizing that in the analysed period the share of most of the above-mentioned countries in the EU export market in this sector of economy decreased (except Spain and Italy), while in the first place new member states gained importance as exporters of agricultural and food products. Poland clearly increased its share in intra+extra EU28 exports to 5.70%, hence becoming an important player in the EU agricultural and food trade. Romania, Bulgaria, Latvia, Poland, Lithuania and Czech Republic were characterised by the most dynamic increase of their share in the EU export market. However, these economies, except Poland, are not very significant in the agricultural and food exports in the whole group of countries.

In 2007, fifteen EU countries showed comparative advantage in the export of agricultural and food products compared with the turnover of the EU, while in 2017 their number increased to 19. In the analysed period RCA in the food sector improved nearly in all EU countries, except Cyprus. The largest increase was recorded in: Romania, Luxembourg, Malta, Sweden, Bulgaria, Latvia, Italy and Poland.

Table 6. *Comparison of the member states of the European Union according to their competitive position in agricultural and food trade in 2007 and 2017*

Index	**RCA[1]**			**TC[2]**			**GL[3]**		
GEO/ TIME	**2007**	**2017**	**2017/ 2007**	**2007**	**2017**	**2017/ 2007**	**2007**	**2017**	**2017/2 007**
Belgium	1.05	1.30	24.61	116.31	117.55	1.06	92.46	91.93	-0.57
Bulgaria	1.00	1.55	56.00	85.08	115.62	35.90	91.94	92.76	0.89
Czechia	0.47	0.56	18.52	72.77	85.71	17.78	84.24	92.31	9.57
Denmark	2.32	2.53	9.04	161.59	152.68	-5.52	76.45	79.15	3.53
Germany	0.61	0.72	17.98	85.83	86.81	1.14	92.37	92.94	0.61
Estonia	1.11	1.16	4.70	67.13	76.68	14.23	80.33	86.80	8.06
Ireland	1.32	1.41	6.46	159.18	157.05	-1.34	77.17	77.81	0.83
Greece	2.30	2.37	2.82	54.96	80.60	46.65	70.94	89.26	25.83
Spain	1.66	2.01	21.46	99.16	135.96	37.11	99.58	84.76	-14.88
France	1.40	1.60	14.40	129.26	112.07	-13.30	87.24	94.31	8.11
Croatia	1.35	1.69	25.00	63.08	65.56	3.93	77.36	79.20	2.37
Italy	0.81	1.12	38.93	77.57	100.55	29.61	87.37	99.73	14.14
Cyprus	2.72	1.71	-37.35	27.24	33.85	24.28	42.81	50.58	18.14
Latvia	1.76	2.59	47.45	69.43	98.66	42.10	81.95	99.32	21.19
Lithuania	2.14	2.23	3.84	125.90	130.59	3.72	88.53	86.73	-2.03
Luxembourg	0.59	1.11	87.52	45.73	50.38	10.15	62.76	67.00	6.75
Hungary	0.81	0.98	19.75	149.77	147.68	-1.40	80.07	80.75	0.85
Malta	0.84	1.49	77.67	34.85	39.34	12.88	51.69	56.47	9.24
Netherlands	1.57	1.71	9.08	161.65	149.78	-7.34	76.44	80.07	4.75
Austria	0.84	0.99	17.83	102.01	97.34	-4.58	99.01	98.65	-0.36
Poland	1.24	1.72	38.44	133.27	156.14	17.17	85.74	78.08	-8.93
Portugal	1.16	1.45	24.98	50.27	65.44	30.19	66.90	79.11	18.25
Romania	0.39	1.06	172.05	28.71	74.34	158.97	44.61	85.28	91.18
Slovenia	0.53	0.68	27.29	56.38	67.76	20.18	72.11	80.78	12.03
Slovakia	0.49	0.45	-7.52	69.60	63.02	-9.45	82.08	77.32	-5.80
Finland	0.24	0.34	43.44	41.35	33.36	-19.33	58.51	50.03	-14.49
Sweden	0.47	0.83	77.52	54.39	58.87	8.24	70.46	74.11	5.19
United Kingdom	0.71	0.86	21.78	44.38	48.25	8.73	61.48	65.10	5.89

Note: *[1]RCA equal to or larger than one points to a comparative advantage in trading the specific group of commodities, here agricultural and food products.*
[2] TC above 100 means that the specific country generates an advantage in trading the analysed group of commodities.
[3] The Grubel-Lloyd (GL) intra-industry trade intensity ratio can range from 0 to 100; values closer to 100 mean that intra-industry trade in the specific country is more intensive.
Source: *Own calculations based on Eurostat, https://ec.europa.eu/eurostat/data/database*

However, in 2017 the group of countries having the largest comparative advantage in agricultural and food export (with RCA above 2) included: Latvia, Denmark, Greece, Lithuania and Spain. RCA was also quite high (from 1.60 to 1.72) in Poland, the Netherlands, Cyprus, Croatia and France. The group of countries without comparative

advantage in the export of food in 2017 consisted of: Finland, Slovakia and Czech Republic (RCA from 0.34 to 0.56), Slovenia and Germany (0.68 and 0.72), and Sweden, the United Kingdom, Hungary and Austria (0.83-0.99).

In 2017 the group of net exporters of agricultural and food products was composed of 10 out of 28 EU countries (one more than in 2007), and the highest trade coverage (130.59-157.05) was recorded for Ireland, Poland, Denmark, the Netherlands, Hungary and Spain. In the analysed period (2007-2017) the largest positive change in TC was observed in Romania (nearly 159% increase) and in Greece, Latvia and Bulgaria. However, in 2017 in this group of countries only Bulgaria noted TC above 100, thus joining the group of net exporters of food in the EU.

In 2017, EU countries with the highest Grubel-Lloyd (GL) index were: Italy, Latvia and Austria (each with GL index above 98), France, Germany, Bulgaria, Czech Republic and Belgium (each with GL index from 91 to 95). A high value of GL index in these countries can point to technological advancement and structural transformations in the area of production and consumption in the agricultural and food sector. In 2007-2017 the intra-industry specialisation increased in as many as 21 EU countries, and most of all in: Romania, Greece, Latvia, Portugal, Cyprus, Italy and Slovenia. In the same period, in some EU countries the significance of inter-branch exchange of food products increased. It was the case mainly in Finland, Spain and Poland, which may suggest that these countries competed more based on costs and prices than on quality - through technological and structural changes.

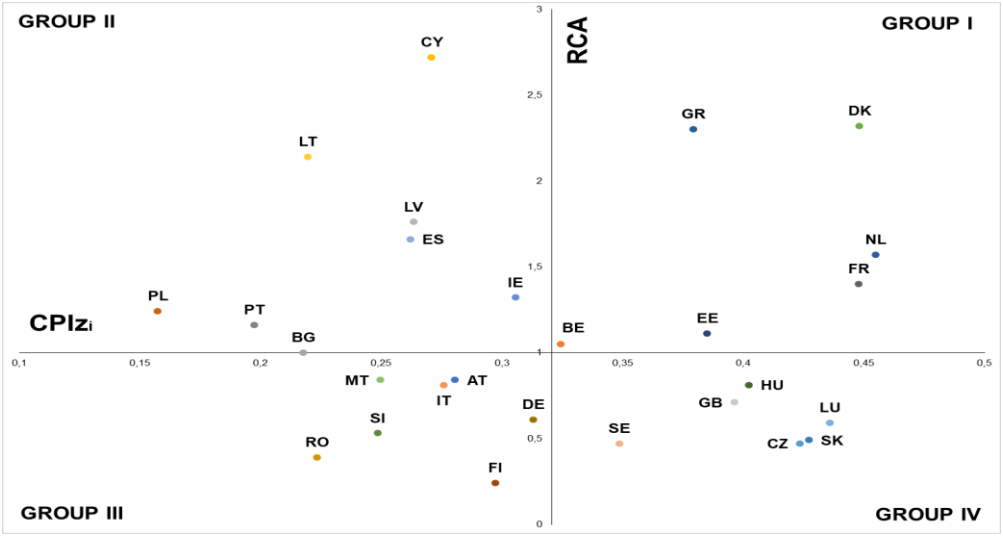
3.3 Comparison of the Competitive Potential of Agriculture and the Competitive Position in the Agricultural and Food Trade for EU Countries in 2007 and 2017

Figures 2 and 3 illustrate the competitive potential of countries of the European Union measured using the aggregate measure z_i called the Competitive Potential Index ($CPIz_i$) and the competitive position in the agricultural and food trade for EU countries measured using the Revealed Comparative Advantage (RCA) index in 2007 and 2017.

The intersection of RCA and $CPIz_i$ axes was RCA=1 as the limit of competitiveness above which a comparative advantage occurs for a specific country and the arithmetic mean of $CPIz_i$ calculated for 27 EU countries (except Croatia) for the years 2007 and 2017 ($CPIz_i$ = 0.320 for 2007 and $CPIz_i$=0.314 for 2017). EU countries can be divided into four groups according to the adopted dimensions. The first group comprises countries with a high potential of agricultural competitiveness and a high competitive position in the international agricultural and food trade. The second group is countries with a low competitive potential and a high competitive position. The third group consists of countries with both a low competitive potential and a low competitive position, while the fourth group is countries with a high competitive potential and a low competitive position.

The first group, characterised by a high competitive potential and a high competitive position, in 2007 included countries being the leaders of agricultural production and agricultural and food export such as the Netherlands, France, Denmark, Belgium or Greece and Estonia. In 2017 Luxembourg joined the group and Greece left it. The Benelux countries have the largest gross investment per 1 ha of agricultural land and the highest labour and land productivity. Land and capital productivity decreased in Greece, which contributed to a decrease in the competitive potential of agriculture but a high competitive position in trade was maintained thanks to a considerable reduction in the costs of labour.

Figure 2. *The competitive potential of agriculture and the competitive position in agricultural and food trade for EU countries in 2007*



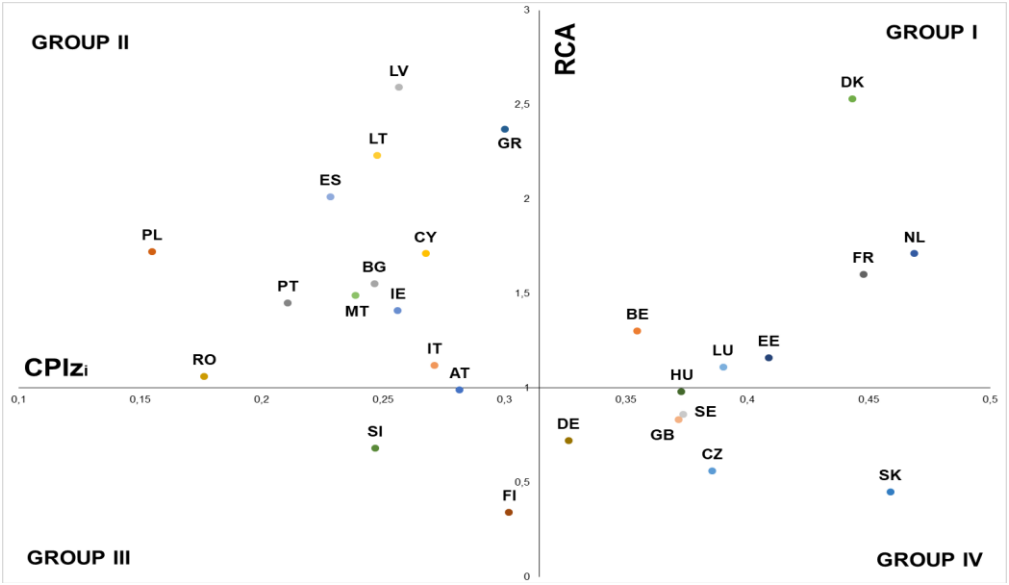
Note: *Group I ($CPIz_i$>0,320; RCA>1); Group II ($CPIz_i$<0,320; RCA>1); Group III ($CPIz_i$<0,320; RCA<1); Group IV ($CPIz_i$>0,320; RCA<1)*
Source: *Own study.*

Three countries that significantly improved their competitive position were transferred from group three to group two. These were Romania, Malta and Italy. In 2017 only two countries, Slovenia and Finland, remained in the third group. In those countries agricultural and food export is generally of little significance. Germany increased its competitive potential of agriculture and moved from group three to group four. This was due to increasing the gross investment per 1 ha of agricultural land, improving the technical equipment and labour productivity in agriculture, and to a smaller extent the productivity of land that is still high in comparison with other countries of the EU.

The competitive position of Germany in agricultural and food trade improved only to a small extent in comparison to the increase in the competitive potential of agriculture,

which is due to the fact that Germany is a traditional importer of food and the food export share in the total exports of this country is small in comparison with countries such as the Netherlands, Belgium or Denmark. The largest repositioning in the arrangement of the analysed variables can be observed for Cyprus, which resulted from a considerable loss of competitive position and for Latvia, Romania, Malta, Bulgaria and Poland – this in turn was related to a considerable improvement in their competitive position. A definite majority of EU countries, except Cyprus and Slovakia, improved their competitive position in the international agricultural and food trade.

Figure 3. *The competitive potential of agriculture and the competitive position in agricultural and food trade for EU countries in 2017*



Note: *Group I ($CPIz_i$>0,314; RCA>1); Group II ($CPIz_i$<0,314; RCA>1); Group III ($CPIz_i$<0,314; RCA<1); Group IV ($CPIz_i$>0,314; RCA<1)*
Source: *Own study.*

2. Conclusions

This paper evaluated the competitive potential of the agricultural and food sector in the countries of the European Union in the context of the possible competitive advantage in the international trade in agricultural and food products in 2007-2017. To this end, a synthetic measure designed using TOPSIS was used which made it possible to identify countries characterised by a similar level of the analysed phenomenon. In addition, the competitive position of EU countries in the international agricultural and food trade was evaluated in confrontation with the competitive potential.

The results of research point to a strong diversification of the competitive potential of the agricultural and food sector among the member states of the European Union. The value of the synthetic measure of the country with the highest level of development of this sector (the Netherlands) was more than three times higher than in the country that was the least competitive in that respect (Slovenia). Disparities can also be observed in the competitive potential of the agricultural sector between countries of the so-called old EU and countries that joined the EU in 2004 and later. A low competitive potential of those countries is largely due to the structural problems of agriculture and low productivity of the production factors. New member states of the EU, despite their low competitive potential measured using z_i measure designed in this paper, have quite a high competitive position and their competitive advantage can be due to the fact that they compete by means of other factors - mostly costs and prices.

However, this type of advantage does not provide grounds for effective competition in the long run. Thus, in most of these countries transformations of agricultural structures should foster maintaining and improving the competitive position in the international trade in agricultural and food products. An important role in boosting the dynamics of these processes should be assigned to the Common Agricultural Policy (Mucha-Leszko, 2004) the instruments of which should to a larger extent refer to changes in the level of employment in agriculture, improvement in the agrarian structure and modernisation of farms.

The largest increase in the synthetic measure of the competitive potential of agriculture can be noted in the following countries: Slovakia, Belgium, Bulgaria, Lithuania, Estonia, and Sweden. The largest decrease in the measure was observed for Greece, Ireland, Romania, Luxembourg, and Czech Republic. In turn, the largest (negative) change in the Revealed Comparative Advantage (RCA) was recorded for Cyprus, where a considerable decrease in the competitive position occurred in international agricultural and food trade. The largest improvement in the competitive position can be noted for Latvia.

The competitive position of Romania, Malta, Bulgaria, Poland, and Luxembourg also considerably improved. The new member states of the European Union – the so-called EU-12 – recorded the largest movements in the system of RCA and $CPIz_i$ coordinates. These countries generally had large capabilities of improving the competitive potential of agriculture measured using the aggregate measure z_i in this paper in comparison with the countries of the so-called old Union (EU-15) already showing high efficiency of utilizing their resources. An increase in the competitive potential of agriculture in comparison to the leading countries such as the Netherlands, Belgium, Denmark or France can have a positive impact on the competitive position in the agricultural and food trade of new member states of the EU that is already

relatively high considering the competitive capacity measured in this paper using the aggregate measure z_i.

The added value of the research and its contribution to literature on the competitiveness of international trade is demonstrated by the adopted synthetic measure designed on a broad range of variables describing the competitive potential and its relationship with the international trade performance. An additional advantage of the studies in their subjective scope comprising a group of 28 countries of the European Union.

Considering that competitiveness is a complex and multi-faceted issue, further studies should focus on finding factors that to the largest extent determine the efficient utilization of the competitive potential in agriculture and shape the competitive position in the trade in agricultural and food products.

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