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PRODUCTIVITY OF EUROPEAN UNION AGRICULTURE IN 2009-2018. MEASUREMENT AND ANALYSIS USING THE AGGREGATED PRODUCTIVITY INDEXES

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Abstract: The study measured the Total Factor Productivity (TFP) of European Union (EU) agriculture in 2009-2018. Aggregated Färe-Primont productivity indexes were used for this purpose. The indexes are relative in nature, i.e. their level is determined in relation to other countries, and thus, first of all, productivity indicators were calculated for 25 EU countries. Then, an analysis of the changes in these indicators in the analysed years was performed. Based on the analysis, countries were grouped into four specific groups distinguished by differences in the level of productivity and by the dynamics and nature of changes taking place at this level. In essence, group A are countries with the highest levels of productivity throughout the period under analysis. Group B are countries characterized by an average level of productivity. Group C are countries where the level of productivity is decreasing, while group D are countries with the lowest productivity. In the next stage of research, an attempt was made to compare the identified groups in terms of selected indicators. The aim of the research was to show the differences in the level of productivity between EU countries and to try to find factors affecting this level.

Keywords: agricultural productivity, Total Factor Productivity (TFP), Färe-Primont index.

1. Introduction

The economic and social conditions in Europe and around the world, which are subject to various types of change, require undertaking a series of actions to adapt to them in various areas of economic life. This also happens in agriculture. In order to adapt to these changes, the European Union implements, within the framework of the Common Agricultural Policy (CAP), a number of decisions in the form of reforms, such as "Agenda 2000", "Mid-Term Reform", and "Health Check", a system of direct and indirect payments, and combining payments in connection with non-market (mainly environmental) objectives. The unquestionable assumption of these reforms are actions consistent with permanently sustainable development, which in light of research on productivity and efficiency is reflected in the concept of sustainable intensification (SI) as in [Czyżewski, Staniszewski 2018]. The implementation of CAP by affecting the value of inputs and effects, their efficiency, operational risk, growth and development opportunities in the sector, also affects the level of productivity. Reflection on this topic can be found in [Kumbhakar and Lien 2010; Zhu, Oude-Lansink 2010; Swinnen and Vranken 2010; Quiroga et al. 2017]. However, the sustainable development policy implemented in the European Union assumes evening up the level of individual regions. This means that as long as there are differences, funds for this purpose should also be distributed based on the analysis of differences in productivity. It can be assumed that, on the one hand, higher productivity means the better and more rational use of funds, while on the other, in implementing the CAP, the European Union should strive to equalize the level of this productivity between countries and regions. Hence, the goal of the research was to find differences in the level of productivity as well as to try to find the factors that affect it. The results of such research will be able to be used to make more rational decisions related to the distribution of funds serving the implementation of the CAP objectives. Decisions of this type should be based on various alternative measurement methods, hence the proposal for a certain approach to these studies at national and regional level.

European agriculture is one of the sectors for which productivity analyses are conducted more frequently. This is due to the fact that the sector is heavily subsidized and there is a need to fill the information gap in order to properly create agricultural policy, as noted by [Marzec et al. 2019]. They also signalled that over the years, both the context of these studies and the measurement methods used have changed. Due to the context, the themes can be divided into several periods. The first period was the works that dealt with the problems of economic transformation. In the next period, the research focused on pre-accession issues with competitiveness issues as the background. In turn, in the post-accession period, these issues shifted towards 'levelling' agriculture between individual countries.

The most commonly used method of measuring productivity is estimation using different techniques, TFP (Total Factor Productivity) indexes. Most of the research uses non-parametric methods, mainly DEA models. Examples of such research at supranational level are [Cankurt et al. 2013; Akande 2012; Latruffe et al. 2012; [Rusielik 2013; Cechura et al. 2014] and especially the paper by [Baráth and Fertő 2016].

A smaller part of the research uses parametric methods where SFM (Stochastic Frontier Models) dominate. For example, studies by [Kumbhakar, Lien 2010; Quiroga et al. 2017; Zhu et al. 2008].

Of these methods, the most popular TFP index is the Malmquist index. It is used in research to measure productivity, changes in productivity over time and after decomposition to measure various efficiency measures. In the presented studies, however, the aggregated TFP of the Färe-Primont productivity indexes were used. This type of index measures the relations of aggregate effects and inputs between the analysed objects using alternative, aggregate distance functions calculated on the basis of available data, proposed in [O'Donnell 2010; 2012; Hoang 2011], showing more usefulness of this type of indexes than traditional ones assuming constant returns to scale.

2. Methods

In a multidimensional situation, TFP (Total Factor Productivity) can be defined as the ratio of the aggregated effects vector to the aggregated input vector. The most commonly used productivity indexes are the Laspeyres, Paasche and Fisher indexes, however, they require knowledge of effect and input price vectors as weights of individual factors. This problem can be solved by using a variety of aggregate distance functions, calculated on the basis of available inputs and effects. This study uses the aggregate TFP productivity indexes proposed by [O'Donnell 2008]. This type of index measures the relation between the analysed objects and the calculated productivity is relative in nature, i.e. it refers to other objects. Aggregate distance functions in various forms can be used here, which can be calculated using linear programming methods (LP) and Data Envelopment Analysis (DEA) assumptions, while this study uses the TFP Färe-Primont index based on [O'Donnell 2011a].

Assuming that: $x_{it} = (x_{1it},\ldots, x_{Kit})'$ and $q_{it} = (q_{1it},\ldots, q_{Jit})'$ are vectors of inputs and effects for the TFP object i in the t period, then:

$$TFP_{it} \equiv \frac{Q_{it}}{X_{it}}, \qquad (1)$$

where $Q_{it} = Q(q_{it})$ is an aggregated effect, $X_{it} = X(x_{it})$ is an aggregated effort while $Q(.)$ i $X(.)$ are non-decreasing, non-negative, linearly homogenous functions [O'Donnell 2011].

In turn, the index of productivity changes (dTFP), which measures the TFP of object i in the t period in relation to the TFP of the h object in the s period can be represented by the equation:

$$TFP_{hs,it} \equiv \frac{TFP_{it}}{TFP_{hs}} = \frac{Q_{it}/X_{it}}{Q_{hs}/X_{hs}} = \frac{Q_{hs,it}}{X_{hs,it}}, \tag{2}$$

where $Q_{hs,it} = Q_{it}/Q_{hs}$ is the index with the effects size and $X_{hs,it} = X_{it}/X_{hs}$ is the index of the input size. In this context, the dimension of productivity changes will be the ratio of changes in effects to changes in inputs. Indexes in the form (2) were determined by [O'Donnell, 2008, 2010, 2011] as multiplicatively-complete. These assumptions can also be used to measure productivity changes (dTFP) for a group of objects (countries) in individual years of analysis.

As mentioned above, depending on the adopted form of aggregate functions of distance $Q(q)$ and $X(x)$, the TFP indexes may take an alternative form. Assuming that q_0, x_0 are effect and input vectors, t_0 means the reference period in time, while $D_0(.)$, $D_I(.)$ are functions of effects and inputs, respectively, and that $Q(q) = D_O(x_0, q, t_0)$ and $X(x) = X_I(x_0, q_0, t_0)$, then the Färe-Primont (FP) index oriented towards effects is presented by equation (3) [O'Donnell 2011a]:

$$TFP^{FP}_{hs,it} = \frac{D_O(x_0, q_{it}, t_0)}{D_O(x_0, q_{hs}, t_0)} \frac{D_I(x_{hs}, q_0, t_0)}{D_I(x_{it}, q_0, t_0)}. \tag{3}$$

The effect and input distance functions were estimated using the DEA method by solving the corresponding linear programming tasks[1].

The research used an approach assuming variable scale effects (VRS) and effect--oriented models, i.e. assuming maximum effects at a constant level of inputs. For editorial reasons, this paper discusses partial results of broader research, focusing on the TFP indexes without analysing the changes in dTFP productivity.

3. Data

Data on agriculture of European Union countries from the EUROSTAT database were used for research. The data covers 2009-2018.

Based on the analysis of literature, a model was built covering the basic factors of production in agriculture, i.e. land, capital and labour. The data was grouped into a set of variables whose combination reflects agricultural production technology. The following set of variables was adopted: (*y1*) agricultural production (million EUR), (*x1*) arable land area (thousand ha), (*x2*) labour (thousand AWU), (*x3*) direct costs (million EUR), (*x4*) overheads (million EUR) and (*x5*) depreciation (million EUR). Direct costs (*x3)* include expenses for: seeds and seedlings, fertilizers, protection, veterinary medicine and feed. Costs including variable (*x4*) include: energy, materials, building maintenance, agricultural services and other indirect costs.

[1] A detailed description of how to estimate unknown parameters of the distance function can be found, e.g., in the publication [O'Donnel 2011]. The DPIN 3.0. and R 'productivity' package version 1.1.0. [Dakpo et al. 2018] were used for the estimation.

The effect of the preliminary analysis of variables was to exclude three countries from the study, namely Cyprus, Luxembourg and Malta. Due to the fact that the agricultural activity model is too different in these countries, the system of variables was not sufficiently consistent with the analysed group. Therefore, according to the assumptions of the DEA method, they were eliminated from further research.

The basic descriptive statistics of the variables adopted for the model for the first and last year of the analysis are presented in Table 1.

Table 1. Descriptive statistics of variables in 2009 and 2018

	Year	Mean	Minimum	Maximum	Standard deviation	Coefficient of variation
y – agricultural production (mln EUR)	2009	13237.0	524.6	61851.4	16469.2	124.4
	2018	16662.3	807.7	74649.0	20141.2	120.9
x1 – arable land area (thous. ha)	2009	7485.3	468.5	35177.8	8645.0	115.5
	2018	7146.6	477.9	29020.2	7804.9	109.2
x2 – labour (thous. AWU)	2009	447.6	29.3	2213.8	599.4	133.9
	2018	369.0	20.1	1675.8	458.9	124.4
x3 – direct costs (mln EUR)	2009	4782.1	266.7	25132.5	6090.4	127.4
	2018	5692.5	340.3	24454.0	6655.5	116.9
x4 – overheads costs (mln EUR)	2009	3389.3	121.3	15510.5	4015.7	118.5
	2018	4226.6	232.2	18995.9	4847.3	114.7
x5 – depreciation (mln EUR)	2009	2216.4	82.5	11623.4	3157.1	142.4
	2018	2509.4	132.4	11812.1	3432.8	136.8

Source: own study based on EUROSTAT data.

4. Results

The TFP Färe-Primont productivity indexes were calculated for each country in 2009-2018. The calculated indexes are presented in Table 2.

In the analysed years, the average agricultural productivity index in EU countries showed a slight upward trend and ranged from 0.584 to 0.660, while the lowest productivity rates in the analysed years were from 0.417 to 0.508. In turn, the highest productivity rates ranged from 0.770 to 0.802. It can be seen that the diversity in the level of productivity between the analysed countries was steadily decreasing in 2009-2011, while in the following years it began to increase until 2018.

Based on the analysis of the TFP productivity indicator level in individual countries, they can be divided into three groups:

Group A are countries where the highest productivity was recorded throughout the entire analysed period. These countries include Italy, Spain, the Netherlands, Greece and France.

Table 2. Agricultural productivity (TFP) in EU countries in 2009-2018

EU25	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Austria	0.586	0.622	0.657	0.639	0.618	0.614	0.607	0.617	0.682	0.671
Belgium	0.618	0.667	0.615	0.651	0.611	0.604	0.615	0.611	0.627	0.594
Bulgaria	0.525	0.561	0.592	0.604	0.619	0.645	0.635	0.653	0.680	0.675
Croatia	0.708	0.680	0.651	0.617	0.606	0.563	0.583	0.611	0.615	0.640
Czechia	0.496	0.537	0.600	0.587	0.588	0.605	0.580	0.606	0.598	0.590
Denmark	0.583	0.662	0.646	0.697	0.637	0.670	0.619	0.595	0.668	0.618
Estonia	0.437	0.510	0.551	0.597	0.566	0.562	0.533	0.446	0.544	0.499
Finland	0.526	0.543	0.515	0.525	0.525	0.527	0.496	0.487	0.508	0.503
France	0.610	0.699	0.693	0.693	0.654	0.689	0.701	0.674	0.717	0.742
Germany	0.597	0.652	0.668	0.637	0.677	0.679	0.605	0.623	0.664	0.610
Greece	0.815	0.812	0.750	0.779	0.746	0.769	0.817	0.774	0.812	0.784
Hungary	0.524	0.556	0.625	0.592	0.621	0.661	0.655	0.671	0.690	0.682
Ireland	0.479	0.535	0.580	0.561	0.564	0.596	0.607	0.603	0.675	0.606
Italy	0.765	0.762	0.770	0.780	0.827	0.796	0.839	0.808	0.822	0.822
Latvia	0.417	0.454	0.466	0.508	0.469	0.484	0.520	0.492	0.530	0.487
Lithuania	0.480	0.510	0.557	0.612	0.572	0.556	0.575	0.533	0.577	0.529
Netherlands	0.790	0.833	0.762	0.769	0.788	0.800	0.803	0.809	0.835	0.793
Poland	0.639	0.687	0.675	0.682	0.689	0.652	0.646	0.672	0.724	0.686
Portugal	0.649	0.666	0.620	0.615	0.657	0.663	0.682	0.670	0.720	0.718
Romania	0.572	0.571	0.630	0.546	0.596	0.594	0.591	0.590	0.639	0.669
Slovakia	0.531	0.556	0.604	0.616	0.596	0.603	0.577	0.595	0.598	0.580
Slovenia	0.550	0.562	0.592	0.548	0.557	0.588	0.611	0.578	0.569	0.656
Spain	0.762	0.780	0.737	0.729	0.744	0.752	0.757	0.784	0.839	0.815
Sweden	0.542	0.593	0.603	0.611	0.586	0.612	0.623	0.614	0.637	0.577
UK	0.619	0.619	0.663	0.659	0.659	0.684	0.658	0.641	0.684	0.656
Min	0.417	0.454	0.466	0.508	0.469	0.484	0.496	0.446	0.508	0.487
Max	0.815	0.833	0.770	0.780	0.827	0.800	0.839	0.809	0.839	0.822
Geometric mean	0.584	0.618	0.629	0.630	0.626	0.634	0.632	0.624	0.660	0.641
Standard deviation	0.108	0.100	0.074	0.075	0.082	0.081	0.088	0.093	0.092	0.096
Coefficient of variation	18.2	16.0	11.7	11.9	12.9	12.6	13.8	14.8	13.9	14.8

Source: own study.

Group B are countries at an average level or on a path towards increasing productivity and include Poland, Portugal, the UK, Germany, Denmark, Hungary and Bulgaria.

Group C are countries that show a trend to reduce productivity, and included Sweden, Belgium, Croatia, Slovenia, Romania and Austria.

Group D are countries that showed the lowest productivity in the analysed period such as Latvia, Finland, Estonia, Lithuania, Ireland, Slovakia and the Czech Republic.

Sets of individual groups are presented in Table 3.

Table 3. Groups of EU countries separated by the level of productivity

GROUP A	GROUP B
Italy, Italy, Spain, the Netherlands, Greece and France	Poland, Portugal, the UK, Germany, Denmark, Hungary and Bulgaria
GROUP C	GROUP D
Sweden, Belgium, Croatia, Slovenia, Romania and Austria	Latvia, Finland, Estonia, Lithuania, Ireland, Slovakia and the Czech Republic

Source: own study.

For comparative purposes, Table 4 presents the average geometric variable values for the ABCD group assumed for the analysis in the first and last year of analysis.

Table 4. Average values of variables for countries from the ABCD groups in 2009 and 2018

Variables	Group	2009	2018
1	2	3	4
y – agricultural production (mln EUR)	A	29516.1	35454.4
	B	10635.5	13839.1
	C	4252.9	5074.6
	D	1876.0	2647.3
x1 – arable land area (thou. ha)	A	10113.8	9699.5
	B	7469.1	7264.4
	C	2189.0	2164.5
	D	2291.3	2351.8
x2 – labour (thou. AWU)	A	566.7	544.5
	B	382.5	307.5
	C	163.7	139.3
	D	90.6	70.5
x3 – direct costs (mln EUR)	A	8915.0	10621.3
	B	4216.0	4961.8
	C	1643.6	1862.7
	D	844.5	1101.0

Table 4, cont.

1	2	3	4
x4 – overheads costs (mln EUR)	A	6521.2	7787.1
	B	3041.6	3932.8
	C	1043.4	1240.2
	D	607.7	900.7
x5 – depreciation (mln EUR)	A	4894.0	4988.8
	B	1247.9	1613.0
	C	759.5	840.9
	D	284.8	374.4

Source: own study.

In the later part of the research, an attempt was made to describe the differences between individual groups on the basis of the analysis of the development of several selected indicators converted into arable land area. The analysed indicators are:

- agricultural revenues in thousand EUR/ha,
- labour expenditure AWU/100 ha,
- direct costs thousand EUR/ha,
- indirect costs thousand EUR/ha,
- depreciation costs thousand EUR/ha.

The indicators were grouped according to groups of ABCD countries. The harmonic mean was calculated for each group that was then analysed.

In the period covered by the study, agricultural revenues in the analysed groups ranged from 1.0 to 3.0 thousand EUR/ha. A clear upward trend can be observed only in group A. In other groups, until 2011 the level of revenues increased, while after this period it remained at a similar level with smaller or larger fluctuations. The evolution of this indicator is shown in Figure 1.

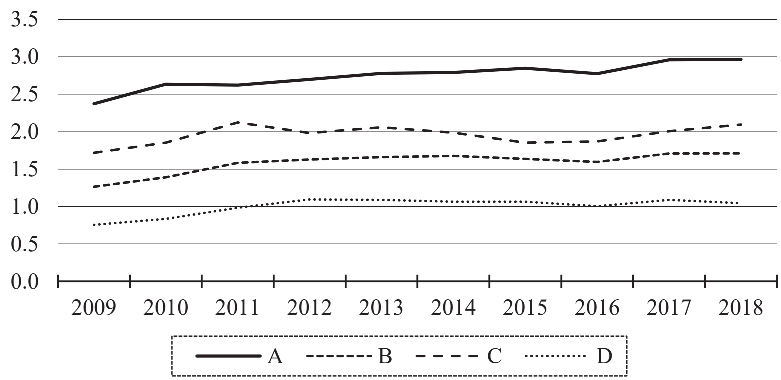

Fig. 1. Agricultural revenues in groups of EU countries in 2009-2018 (thousand EUR/ha)

Source: own study.

The highest level of revenues from agricultural activity was in group A, i.e. in the group of countries with the highest level of total TFP productivity. In this group, the indicator ranged from 2.4 to 3.0 thousand EUR/ha. In group C, i.e. in countries showing a trend to reduce the level of productivity, the index ranged from 1.7 to 2.1 thousand EUR/ha. In group B of countries with the average level of productivity, this indicator was lower and was at the level from 1.3 to 1.7 thousand PLN. In turn, in countries with the lowest productivity, i.e. in group D, the level of revenues from agriculture was also the lowest and ranged from 0.8 to 1.1 thousand EUR/ha. The analysis shows that compliance of the TFP productivity level and the level of agricultural revenues occurs only in the case of groups of countries with the highest and lowest productivity, while in the group of countries with an average level of productivity, lower revenues were recorded than in countries that reduced the level of productivity.

The next indicator analysed was labour input expressed in the level of AWU/100 ha of arable land. The level of this indicator in all analysed groups shows a decreasing trend, while both the level and the dynamics of these changes vary from group to group. The level of labour input in AWU/100 ha of arable land is shown in Figure 2.

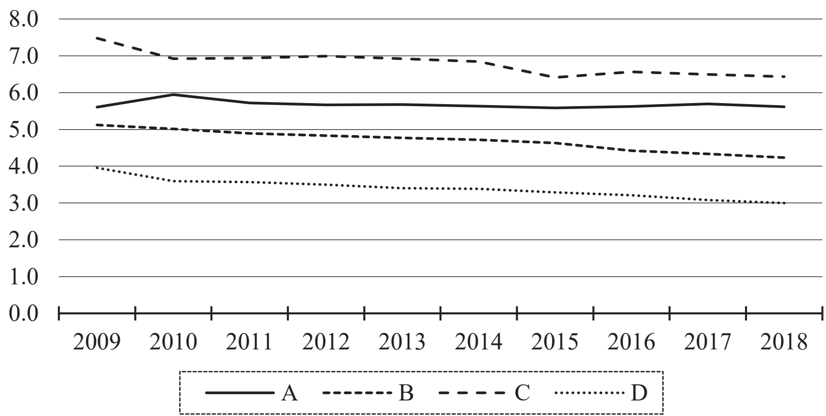

Fig. 2. Labour expenditure in groups of EU countries in 2009-2018 (AWU/100 ha)

Source: own study.

The highest workloads occur in group C, i.e. in countries with a decreasing level of productivity. They range from 7.5 to 6.4 AWU/100 ha. The second group in terms of the amount of workload is group A, i.e. the group of countries with the highest productivity. However, it can be seen that in this group, these inputs remain at a similar level, i.e. 5.6-5.7 AWU/100 ha. Both in group B and in group D a clear downward trend of this indicator can be observed. In group B, it decreases from 5.1 to 4.2 AWU/ 100 ha, and in group D, respectively, from 4.0 to 3.0.

Inputs of direct costs (thousand EUR/ha) in the analysed groups show a slight upward trend. In 2009, this indicator ranged from 0.34 to 0.73 thousand EUR/ha, while in 2018 it was, respectively, from 0.43 to 0.90 thousand EUR/ha. The evolution of this indicator in the analysed groups is shown in Figure 3.

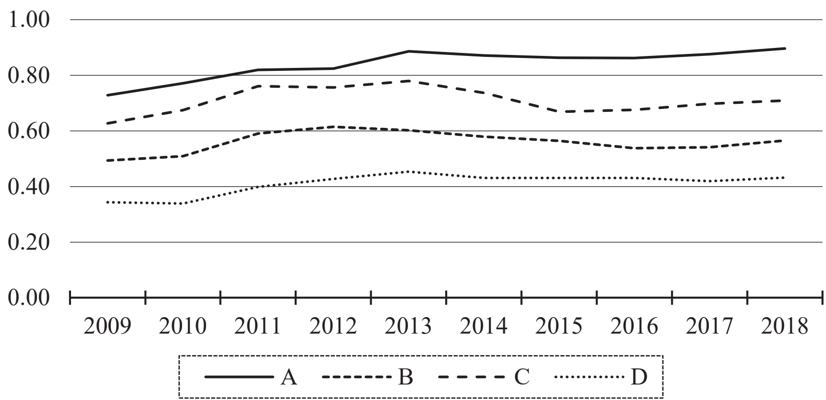

Fig. 3. Direct costs in groups of EU countries in 2009-2018 (thousand EUR/ha)

Source: own study.

The highest direct costs are incurred in group A, i.e. countries with the highest productivity. In turn, the lowest level of direct costs occurs in the group D, i.e. countries with the lowest level of productivity. The chart shows that there are large fluctuations in the level of these costs in group B and in particular in group C, where the level of these costs increased from 2009 to 2013, reducing the distance to the level of group A. In the next two years, their volume decreased to the level of 2010. Similar fluctuations occurred in group B but had less dynamics.

In turn, inputs of indirect costs (thousand EUR/ha) showed an upward trend in the analysed period except for group C, i.e. countries with decreasing levels of productivity as shown in Figure 4.

In the case of direct costs, those highest were incurred in group A, i.e. countries with the highest productivity, while the lowest level of these costs was in group D, i.e. countries with the lowest level of productivity. In countries from group B, an increase in these costs can be observed from 0.36 to 0.48 thousand EUR/ha, while in group C the level of indirect costs oscillated between 0.44 and 0.50 thousand EUR/ha. In addition, in the initial study period, in group C, indirect costs were at group A level, but then began to fall, and from 2015 they equalled group B.

The last analysed indicator was depreciation costs in thousand EUR/ha. Individual changes in this indicator can be observed in individual groups (Figure 5).

The highest depreciation costs were observed in countries from group A and were at the level of 0.37 – 0.40 thousand EUR/ha. In group C, depreciation costs initially

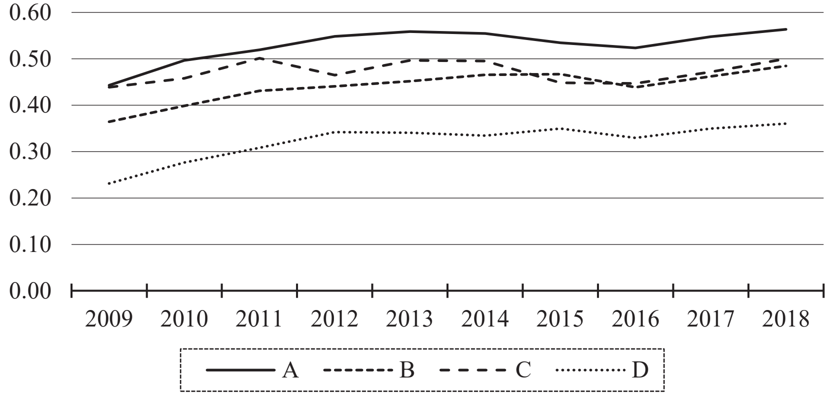

Fig. 4. Indirect costs in groups of EU countries in 2009-2018 (thousand EUR/ha)

Source: own study.

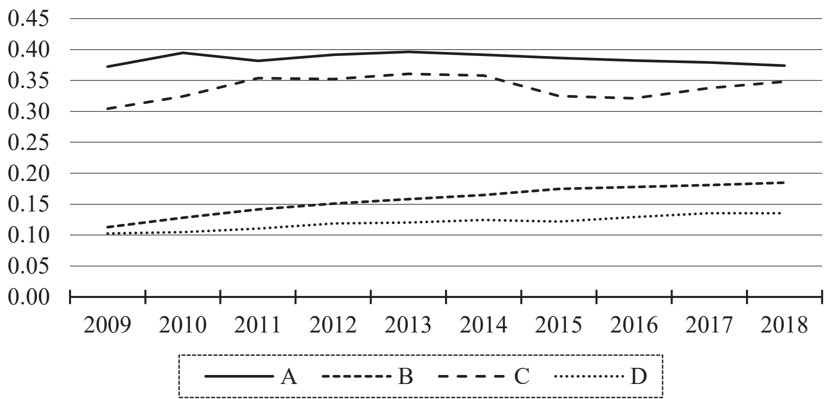

Fig. 5. Depreciation costs in groups of EU countries in 2009-2018 (thousand EUR/ha)

Source: own study.

approached the level of group A, but in 2015 they dropped to 0.32 thousand EUR/ha. In the case of group B and D in 2009, the level of depreciation costs was similar, i.e. around 0.10 thousand EUR/ha. In the following years, a positive trend can be seen, and in group C it was stronger, in 2018 reaching the level of 0.18 thousand EUR/ha, whereas in group B, the increases were less dynamic and reached the level of 0.14 thousand EUR/ha.

5. Conclusion

The TFP total productivity indexes were calculated for 25 European Union countries from 2009 to 2018. The Färe-Primont total factor productivity indexes were used for this purpose. The calculated level of productivity is relative.

In the first part of the study, the analysis of the level formation and the dynamics of changes in the calculated TFP indicators for each country allowed to group them into four sets of ABCD. Group A (Italy, Spain, the Netherlands, Greece and France) are countries with the highest productivity throughout the period under study. Group B (Poland, Portugal, the UK, Germany, Denmark, Hungary and Bulgaria) is a group of countries at an average level of productivity but on the path towards increasing productivity. Group C (Sweden, Belgium, Croatia, Slovenia, Romania and Austria) is a group of countries that show a trend to reduce productivity. Group D (Latvia, Finland, Estonia, Lithuania, Ireland, Slovakia and the Czech Republic) are countries that showed the lowest productivity in the analysed period.

In the second part of the study, the differences between the individual groups were analysed on the basis of several selected economic indicators. Group A are countries characterized by (calculated per ha of arable land), the highest level of revenues from agricultural production and the highest level of direct and indirect outlays as well as depreciation. What is also noticeable is that the level of the analysed indicators increased over time, except for depreciation which showed a slight negative trend. In turn, the workloads in this group remained at almost the same level over the years. Group D had the lowest level of indicators analysed, but the level of revenues has shown virtually no trends in recent years, as well as direct expenditure per ha. On the other hand, the workload decreased and the level of depreciation increased. Group B, with the growing level of productivity showed an increase in the level of agricultural revenues as well as an increase in indirect costs and depreciation costs. In turn, direct costs in this group have been at a similar level since 2012, while labour expenditure is decreasing. Group C is a group in which the level of productivity decreased. Incomes in agriculture oscillated in the analysed years at the average level in the EU. One can also see a high level and no trend in direct and indirect costs, as well as high depreciation costs. This group also had the highest labour costs.

The TFP productivity analysis showed variations in its level between individual countries. Some common features were also observed in separate groups of countries. The European Union, implementing the CAP and various specific and regional policies within it should, when redistributing funds for their implementation, also take into account the aspects of productivity of individual groups of countries. This will allow their more efficient use.

The studies presented in further stages will be complemented by other alternative methods of productivity study in order to verify the presented conclusions.

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PRODUKTYWNOŚĆ ROLNICTWA UNII EUROPEJSKIEJ W LATACH 2009-2018. POMIAR I ANALIZA Z WYKORZYSTANIEM ZAGREGOWANYCH INDEKSÓW PRODUKTYWNOŚCI

Streszczenie: W badaniach został wykonany pomiar poziomu produktywności całkowitej *Total Factor Productivity* (TFP) rolnictwa Unii Europejskiej (UE) w latach 2009-2018. Wykorzystano w tym celu zagregowane indeksy produktywności Färe-Primonta. Indeksy mają charakter względny, tj. ich poziom wyznaczany jest w relacji do innych krajów. I tak, po pierwsze, obliczono wskaźniki produktywności dla 25 krajów UE. Następnie wykonano analizę zmian tych wskaźników w analizowanych latach. Na podstawie analizy wykonano grupowanie krajów na cztery specyficzne grupy wyodrębnione ze względu na różnice w poziomie produktywności oraz ze względu na dynamikę i charakter zachodzących zmian tego poziomu. W uproszczeniu grupa A to kraje o najwyższym poziomie produktywności przez cały analizowany okres. Grupa B to kraje charakteryzujące się średnim poziomem produktywności. Grupa C to kraje, w których poziom produktywności się zmniejsza, natomiast grupa D to kraje o najniższej produktywności. W kolejnym etapie badań podjęto próbę porównania wyodrębnionych grup pod względem wybranych wskaźników. Celem badań było wykazanie różnic w poziomie produktywności pomiędzy krajami UE i próba znalezienia czynników mających wpływ na ten poziom.

Słowa kluczowe: produktywność rolnictwa UE, *Total Factor Productivity* (TFP), Färe-Primont indeks.