CHANGES IN THE PROFITABILITY OF FARMS IN EUROPEAN UNION MEMBER STATES – CONVERGENCE OR DIVERGENCE?

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This paper aimed at evaluating the differences within the European Union (EU) regarding profitability of farms and answering the question whether in 2007-2015 any trends at convergence of their income position occurred between member states. The survey covered farms maintaining farm accounts under FADN (Farm Accountancy Data Network) in 27 member states of the EU. Convergence was evaluated based on the coefficient of variation (sigma convergence) and the relative index of variation in respective member states of the EU in comparison to the EU average in the analyzed period (beta convergence). The surveys point to large disparities in the level of profitability between farms in European Union member states. The highest profitability of work was recorded in countries such as Luxembourg, Netherlands, Ireland, Italy and Belgium. In all new member states the analyzed ratio was relatively low and none of them exceeded the average level for the EU. In 2015 the lowest profitability of land was characteristic of Slovakia, Estonia and Denmark, whereas the highest income per 1 ha was achieved by agricultural producers in Malta, Italy and Greece. In the analysed period no clear trends were observed in convergence or in profitability of work or profitability of land, which means that inequalities between countries with a different level of agricultural development did not disappear.

Keywords: convergence, European Union, farms, income

INTRODUCTION

Convergence means a trend to decreasing differences in the level of development between states, regions, whereas divergence is the opposite process. Currently, convergence is one of the most dynamically developing research areas within the broadly understood growth theory (Brelik, Grzelak, 2011).

Convergence has various definitions but it always refers to "approximating", "assimilating" different areas of activity in the states or regions (Głodowska, 2012). Literature also offers multiple definitions and classifications of economic convergence deriving from two main concepts: sigma and beta convergence (Skórska, 2013). The first one (σ) occurs when the dispersion of the ratio adopted between regions or states decreases in time. It is most often measured by means of standard deviation or coefficient of variation. Beta convergence (β) refers to the relationship between the mean rate of increase in the specific parameter and its initial value (Stilianos, 2010; Łaźniewska et al., 2011). It occurs when entities with a lower level of the analyzed parameter show a higher rate of growth compared to more developed ones. Empirical studies indicate that beta convergence is a necessary condition but it is insufficient to ensure sigma convergence (Young et al. 2008). Irrespective of its type, convergence always leads to disappearance of inequalities between entities that are different at the beginning.

In economic and social sciences convergence most often refers to categories such as GDP per capita, income of the population, level of technological advancement, or changes in the effectiveness of production factors (Sapa, Baer-Nawrocka, 2014). However, as noted by Łaźniewska et al. (2011), the process of convergence should not be identified with those ratios alone but it should be considered in the context of approximating the levels of different categories characterizing social and economic conditions or reflecting the structure of markets and sectors in a specific state or region. With reference to agriculture in the European Union, literature offers studies concerning the effectiveness of this sector, among other sources in the works of Ball et al. (2010), Fogarasi and Latruffe (2009), Baráth and Fertő (2017). In turn, the problems of convergence of the income position in agriculture in European Union member states were undertaken in the works of Brito and Ronco (2000) and Brasili et al. (2006). Analysis of reference literature suggests that this area still has a huge cognitive potential as a result of transformations in the agriculture of respective member states

in consequence of the processes of globalization and European integration and when this sector is affected by the instruments of the Common Agricultural Policy.

Considering the significance of studies concerning convergence processes in agriculture, this paper aimed at evaluating the differences within the European Union regarding profitability of farms and answering the question whether in 20072015 any convergence trends in the income position of these entities occurred between member states.

MATERIAL AND METHODS

Convergence to the extent of differences in profitability of farms in European Union member states was evaluated based on the coefficient of variation (sigma convergence) and the relative index of variation in respective member states of the EU in comparison to the EU average in the analysed period (beta convergence). The coefficient of variation was calculated based on the following formula:

$$V = \frac{s}{\overline{X}} \tag{1}$$

where:
s - standard deviation
$\overline{X}$ – average.

In turn, the relative index of variation for respective variables covered by the study was determined using the following formula:

$$X = (Z_{i-2015}/Z_{i-2007})/(Z_{P-2015}/Z_{p-2007}) \cdot 100 - 100 \tag{2}$$

where:
X – relative growth index in a specific member state in comparison to EU in 2007-2015
Z_{i-2014} – value of the analysed variable in a specific member state in 2015
Z_{i-2006} - value of the analysed variable in a specific member state in 2007
Z_{P-2014} – value of the analysed variable in the EU in 2015
Z_{P-2006} – value of the analysed variable in the EU in 2007

The survey covered farms maintaining farm accounts under FADN (Farm Accountancy Data Network) in 27 member states of the EU. With regard to the lack of data Croatia, which joined the EU in 2013, was not included in the analysis. The samples of farms covered by the survey are fully representative of all commercial farms in respective states. The measure of the income position of farms was the work profitability ratio measured as the relation of the farm's income to the number of FTEs (AWU) and the land profitability ratio expressed as income per 1 ha of cropland. Figures used for analyses are standard results pertaining to years 2007-2015 available in FADN public database.

RESULTS

Table 1 presents selected characteristics of farms covered by FADN in respective member states of the European Union in comparison with the EU average in the first and last year of the study period, i.e. 2007 and 2015.

Data presented in Table 1 shows that farms in the European Union are differentiated both in terms of their production potential and its effective utilization. Farms having the largest cropland area can be found in Slovakia, Czech Republic and the United Kingdom. However, considering economic size, farms in the Netherlands, Denmark or Belgium are predominant. In addition, strong disparities occur between workforce productivity on farms in old and new member states of the EU. In 2015 among new member states only in the Czech Republic and in Hungary the average value of this production factor was higher than on average in the EU. The differentiation also refers to the intensity of production because total costs per 1 ha of cropland in 2015 ranged from 23.9 Euro/ha in Slovakia to 1510.4 Euro/ha in Italy.

For the purposes of this paper the work profitability ratio measured as the relation of the farm's income to the number of FTEs (AWU) was evaluated. Profitability ratios are widely used for evaluating the economic and financial effectiveness of agriculture and farms (Gołaś 2015). Data in Table 2 indicates that in 2015 the highest value of the analyzed ratio was recorded in countries such as Luxembourg, Netherlands, Ireland, Italy and Belgium. The highest average work profitability in 2007–2015 was noted down in Belgium (26.2 thousand Euros/AWU), while its average value in 27 EU member states in that period amounted to 10.9 thousand Euros per AWU. In all new member states the analysed ratio was relatively low and none of them exceeded the average level for the EU. It can be noticed that the dynamics of increase in work profitability between the extreme years of the analyzed period was different among member states and it ranged from – 196% in Slovakia to 484% in Denmark. This differentiation must be explained, among other things, by investments implemented on farms at different time and on a different scale. Among new member states the highest increase in work profitability in 2015 in comparison to 2007 is observed in Bulgaria and Romania. The analysis of parameters of the relative index of changes in 2007–2015 indicates that among the so called old EU member states they were the least favourable in Austria, France, United Kingdom and Germany, whereas among

new member states – in Slovakia, Malta and Estonia. It is difficult to state unambiguously whether beta convergence occurred in the analysed period, because only in some of the Community's new member states the values of the analysed index were high. Such states included Romania, Bulgaria, Cyprus, Czech Republic or Hungary. A high level of the studied index was also recorded in some of the EU-15 states such as Denmark or Portugal. The analysis of the coefficient of variation indicates that in the years covered by the survey no sigma convergence to the extent of work profitability was observed either. This coefficient increased in 2007–2009, which points to an increase in the differentiation of the analysed parameter between member states. In 2010–2015 the variation decreased and then it slightly increased, so in 2015 the level of the coefficient of variation was similar to that recorded in 2007.

Table 1. Selected characteristics of farms in FADN regions compared with farms in the member state in 2007 and 2015

Country	Average utilised agricultural area per holding (ha)		Total inputs per 1 ha utilised agricultural area (EUR/ha)		Farm Net Value Added per 1 AWU (EUR/AWU)		Economic size of farm (thousand EUR)	
	2007	2015	2007	2015	2007	2015	2007	2015
UE-15								
Austria	31	28,7	769,4	476,5	23835,1	13674,2	51,4	56,6
Belgium	43,2	51,1	983	696,2	42473,3	35548,1	195,4	292,7
Denmark	91,6	97,6	657,8	637,3	60277,4	62217,9	242,7	348,5
Finland	51,4	61,3	508,8	421	26148	25818,5	64,2	91,2
France	84,7	87,4	406,5	287,8	34439,5	25145,2	141,6	221,5
Germany	78,4	88,5	458,7	409,4	35964,2	36238,1	206,3	233,5
Greece	7,6	10,2	1755,5	1228,8	13271,9	12570,2	16	20,6
Ireland	45,9	49,4	499,4	527,9	22916,7	26094,3	36,4	48,9
Italy	14,8	20,4	1573,7	1510,4	23243,2	30826,7	47	81,9
Luxembourg	76,5	82,8	514	490,9	39335,3	40649,9	143,7	193,1
Netherlands	34,5	36,3	1305	1426,1	44995,4	51723,8	312,6	432,1
Portugal	25,2	25,6	301,5	508,7	7601,2	12998,2	29,1	35,9
Spain	36,3	47,3	654,6	564,7	23740,9	26686,8	50,7	77,5
Sweden	90,7	108,9	372,6	454,7	33779,5	49502,6	109	160,2
United Kingdom	154,5	157,7	262,5	213,9	40554,6	33743,9	164,5	213,4
New member states of EU								
Bulgaria	21,4	38,4	152,8	221,3	3268,7	8508,1	16,5	32,9
Cyprus	7,6	11,2	1088,8	976,7	8242,3	10949,1	38,9	37,1
Czech Rep.	222,5	204,4	61	97,8	13581,3	19987,9	218,2	250,8
Estonia	109,3	127,2	123,2	123	13455,6	15644,3	52,9	89,6
Hungary	54,4	50	265,7	366,8	14457,1	18347,2	48,4	57,2
Latvia	68,6	64,2	116,3	158,2	7980,8	10156,9	28,1	39,9
Lithuania	43,9	46,3	211,5	193,7	9292,7	8974	20	28
Malta	3,1	2,7	4266,8	849	13312,3	2326,2	32,9	37,9
Poland	18,3	18,5	366,1	325,2	6710,2	6003,5	20,3	28,1
Romania	8,2	9	271,2	472,8	2223,8	4231,5	7,1	9,4
Slovakia	584	528,6	13,9	23,9	8089,3	12626,5	311	485
Slovenia	10,8	9,8	410	330,7	4444,7	3231,1	19,7	20,2
UE-27	29,4	34,1	509,0	527,8	14979,2	17986,5	49,2	70,3

The second analysed ratio is land profitability calculated as the value of farm income per 1 ha of cropland. The absolute value of this ratio differed between member states and over the analysed years. In the first year of the survey it ranged from 13.3 Euros per 1 ha in Slovakia to 5523.1 Euro per 1 ha in Malta. In 2015 the lowest profitability of land was characteristic of Slovakia, Estonia and Denmark, whereas the highest income per 1 ha was achieved by agricultural producers in Malta, Italy and Greece. In most EU member states in 2015 land profitability was worse than in 2007, as its average decrease in the EU amounted to 21%. Similar to work profitability it cannot be unambiguously stated that beta convergence occurred to the extent of land profitability in the analysed period. The index of relative changes in 2007-2015 indicates that in some new member states of the EU the rate of changes in the analysed phenomenon in comparison to its initial values was higher than in countries where this ratio was initially high. However, it did not refer to all member states whose initial ratio of land profitability was low, as in Slovakia, Estonia and Slovenia the rate of convergence was low. It means that a low level of agricultural development in the specific member state in the period of accession to the EU is not "automatically" translated into a high rate of "catching up" with member states demonstrating a higher level of development. The rate was successfully accelerated only in member states where measures connected with restructuring of the agricultural sector were undertaken and European funds were used for modernisation of that sector. The progress

in the modernisation of agriculture in member states is testified by surveys illustrating changes in the productivity of production factors used in agriculture in EU member states (European Commission, 2016).

Table 2. Changes in income of an average family farm per 1 AWU in EU member states in 2007–2015

Country	Farm Net Income per 1 AWU (thousand EUR/AWU)										Relative index of variation in 2015 compared to 2007
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2015:2007	
UE-15											
Austria	19,61	20,48	15,24	16,78	20,86	20,16	17,64	9,72	8,36	0,43	-59,86
Belgium	29,77	21,73	20,6	30,85	24,44	31,71	28,68	25,85	22,41	0,75	-29,17
Denmark	1,53	-29,78	-25,99	5,4	18,56	35,88	33,58	14,56	7,38	4,84	355,16
Finland	18,43	14,73	11,63	18,51	16,71	17,51	13,67	16,79	14,21	0,77	-27,44
France	21,57	17,51	8,86	21,35	23,38	23,49	15,48	13,01	12,59	0,58	-45,04
Germany	19,88	12,63	10,28	16,26	17,3	22,06	22,64	17,63	14,2	0,71	-32,76
Greece	11,6	10,54	10,23	11,17	10,36	9,77	9,49	11,99	10,83	0,93	-12,08
Ireland	18,78	16,63	14,33	15,6	21,38	18,39	18,19	22,49	23,48	1,25	17,65
Italy	18,9	16,56	17,73	17,81	17,61	18,63	17,75	24,57	23,76	1,26	18,33
Luxembourg	30,29	25,26	15,26	15,89	29,05	22,21	25,68	34,89	31,42	1,04	-2,38
Netherlands	17,96	12,04	8,46	21,74	14,49	24,75	25,96	19,29	23,15	1,29	21,31
Portugal	6,1	6,96	7,13	8,05	7,84	8,26	8,64	8,44	10,5	1,72	61,98
Spain	19,46	17,22	13,86	16,31	15,68	15,18	16,24	15,03	19,48	1	-5,75
Sweden	16,69	18,04	3,83	11,84	11,95	11,12	11,74	2,01	14,88	0,89	-16,09
United Kingdom	22,98	22	18,54	24,95	29,44	23,15	20,9	23,13	14,09	0,61	-42,29
New member states											
Bulgaria	1,93	2,06	1,73	3,2	3,17	3,56	3,36	4,01	3,93	2,03	91,51
Cyprus	4,82	7,9	5,83	8,49	8,39	5,96	7,31	6,01	7,18	1,49	40,14
Czech Rep.	4,86	4	1,72	3,57	7,86	7,89	8,27	10,07	7,06	1,45	36,72
Estonia	9,07	7,6	4,53	8,89	10,99	13,09	8,33	4,08	6,79	0,75	-29,53
Hungary	7,15	8,61	4,17	8,09	12,53	12,25	11,58	13,24	9,92	1,39	30,56
Latvia	6,34	5,19	3,55	5,11	6,4	6,54	4,62	4,99	7,03	1,11	4,43
Lithuania	8,33	8,36	7,3	8,42	8,92	9,24	7,37	4,94	8,14	0,98	-8,05
Malta	11,49	10	5,6	6,63	5,29	6,77	7,99	8,36	2,18	0,19	-82,15
Poland	5,67	4,58	3,79	5,94	6,33	6,32	5,8	5,27	4,97	0,88	-17,46
Romania	1,41	3,32	2,32	3,6	4,24	4,27	4,64	4,42	3,27	2,31	117,35
Slovakia	0,43	0,05	-6,24	-3,32	1,04	-0,56	-0,42	1,06	-0,84	-1,96	-284,45
Slovenia	4,09	3,2	4,32	3,97	4,74	3,53	3,59	3,44	3,47	0,85	-20,17
UE-27	10,26	9,46	8,06	11,47	12,11	12,52	11,56	11,38	10,9	1,06	-
V (sigma)	0,7	1,06	1,29	0,67	0,59	0,65	0,65	0,71	0,68	-	-

Thus, such a situation does not mean that all member states with a lower initial level of profitability would "catch up" faster. Sigma convergence takes place when the analysed elements become less dispersed with time. According to data presented in table 3, in the analysed period inequalities between EU member states with different level of agricultural development did not disappear. From 2008 the coefficient of variation was decreasing, however in subsequent years its value increased and in the last year of the study period it was similar to the value recorded in the first year.

CONCLUSION

The surveys point to large disparities in the level of profitability between farms in the European Union member states. In the analysed period no clear convergence trends were observed in work profitability or in land profitability. Thus, inequalities between member states that were initially different did not disappear. With regard to the fact that convergence is a long-term process, the studies should be regarded as preliminary studies on the differentiation of the income position of farms within the European Union. There is a need for further monitoring of changes in farm profitability and for evaluating convergence trends. In addition, further research should focus on the processes of convergence with reference to more uniform groups of farms, thus studies depending on the specialization of farms also seem reasonable.

Table 3. Changes in income of an average family farm per 1 ha in EU member states in 2007–2015

Country	Farm Net Income per 1 utilised agricultural area (thousand EUR/ha)										Relative index of variation in 2015 compared to 2007
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2015:2007	
UE-15											
Austria	0,97	0,98	0,7	0,75	0,98	0,9	0,77	0,54	0,46	0,47	-40,53
Belgium	1,34	1,0	0,91	1,36	1,08	1,28	1,15	1,05	0,92	0,69	-13,64
Denmark	0,03	-0,57	-0,5	0,1	0,33	0,62	0,6	0,26	0,13	4,59	477,96
Finland	0,51	0,38	0,29	0,44	0,4	0,38	0,29	0,36	0,3	0,59	-26,19
France	0,51	0,41	0,21	0,5	0,54	0,56	0,37	0,39	0,37	0,72	-9,95
Germany	0,56	0,35	0,27	0,43	0,45	0,56	0,58	0,44	0,36	0,64	-18,89
Greece	1,95	1,81	1,6	1,64	1,35	1,19	1,04	1,32	1,13	0,58	-26,79
Ireland	0,47	0,41	0,37	0,39	0,55	0,45	0,44	0,53	0,56	1,19	49,91
Italy	1,69	1,47	1,38	1,45	1,43	1,47	1,35	1,61	1,51	0,9	12,78
Luxembourg	0,66	0,55	0,32	0,34	0,64	0,48	0,56	0,78	0,66	1	26,47
Netherlands	1,32	0,87	0,64	1,65	1,11	1,83	1,94	1,43	1,76	1,33	67,59
Portugal	0,41	0,44	0,44	0,52	0,5	0,51	0,52	0,5	0,65	1,59	99,82
Spain	0,79	0,68	0,56	0,62	0,6	0,53	0,54	0,51	0,65	0,83	3,97
Sweden	0,27	0,29	0,06	0,17	0,17	0,16	0,17	0,02	0,18	0,66	-16,66
United Kingdom	0,33	0,3	0,25	0,33	0,4	0,31	0,27	0,3	0,2	0,61	-23,72
New member states of EU											
Bulgaria	0,21	0,23	0,14	0,24	0,22	0,24	0,21	0,22	0,24	1,13	41,91
Cyprus	0,86	1,22	0,87	1,36	1,48	1,01	1,09	0,65	0,84	0,98	22,81
Czech Rep.	0,16	0,13	0,05	0,1	0,22	0,23	0,24	0,28	0,19	1,19	49,56
Estonia	0,21	0,15	0,08	0,15	0,18	0,2	0,12	0,06	0,1	0,48	-39,29
Hungary	0,24	0,29	0,14	0,26	0,41	0,4	0,38	0,44	0,32	1,34	69,08
Latvia	0,22	0,18	0,11	0,15	0,18	0,19	0,14	0,15	0,22	0,97	22,01
Lithuania	0,37	0,36	0,28	0,32	0,34	0,35	0,27	0,19	0,3	0,81	2,1
Malta	5,52	5,15	2,52	3,55	2,82	3,53	4,26	4,21	4,34	0,79	-1,04
Poland	0,54	0,42	0,35	0,54	0,58	0,58	0,52	0,48	0,44	0,81	2,13
Romania	0,37	0,67	0,36	0,48	0,57	0,56	0,6	0,54	0,39	1,06	33,15
Slovakia	0,01	0,01	-0,17	-0,09	0,03	-0,01	-0,01	0,02	-0,02	-1,49	-287,83
Slovenia	0,66	0,52	0,66	0,61	0,63	0,46	0,47	0,47	0,47	0,71	-11,17
UE-27	0,62	0,53	0,41	0,56	0,59	0,59	0,53	0,52	0,50	0,79	-
V (sigma)	1,36	1,46	1,25	1,11	0,87	1,01	1,19	1,24	1,30	-	-

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