PROFITABILITY OF OWN LABOUR VS. ECONOMIC AND FINANCIAL STANDING OF FARMS IN CENTRAL AND EASTERN EUROPEAN MEMBERS OF THE EUROPEAN UNION

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Abstract. Farming profitability is of special importance both for the national economy and for the farmers and their families. Despite the implementation of Common Agricultural Policy instruments, income disparity between the EU agriculture sector and other branches of the national economy continues to be a problem. The main purpose of this paper is to depict the economic and financial standing of farms in CEE countries demonstrating various levels of profitability of own labour. The author used macro-regional FADN data from 2013-2015. The population studied was split into quartiles, as justified by the variance analysis. In the groups identified, selected indices were calculated to reflect the farms' economic and financial standing. As shown by this study, the profitability of unpaid labour in CEE farms is largely affected by subsidies. Farms with high levels of own labour profitability are more willing to borrow funds and demonstrate greater investment capacities.

Key words: labour profitability, farms, Central and Eastern Europe, ANOVA, FADN.

JEL code: O52, Q14, Q18

Introduction

In addition to the socio-economic system and economic policy, the level, quality, structure and effective use of the available production capacity are the key co-determinants of competitiveness of the economy as a whole and of its specific sectors. In the agriculture, rational use of productive inputs is the decisive factor of competitiveness at national and international level (Mrowczynska-Kaminska A., 2013, p. 285; Misala J. and Slusarczyk B., 1999). While affecting the agricultural sector's contribution to the gross domestic product, the effective use of labour in the agriculture has consequences for the levels of income earned by rural households. Thus, it co-determines the structure and development pace of rural areas. Having in mind the European Union's (EU's) commitment to equalize the regional development levels, this issue seems even more important (Kolodziejczak M. and Mrowczynska-Kaminska A., 2008, p. 145). Farming profitability is of special importance not only for the national economy but also for the farmers and their families. This is because family farming incomes should compensate for the family's labour, capital employed and farming risks (Goraj L. and Manko S., 2009, p. 220). Meanwhile, according to studies, agriculture continues to be outperformed by other sectors of national economy in terms of labour productivity (cf. e.g. the research by A. Baer-Nawrocka (2016, p. 506) on EU countries in the 2005-2015 period).

Despite economic reforms and progressing macroeconomic stabilization, most of the new EU member countries demonstrate significantly lower development levels than highly developed EU-15 countries. That problem is also noticeable in the agriculture sector, as regards both the availability and effective use of production capacity (Baer-Nawrocka A. and Markiewicz N., 2012, p. 14). In Western European countries, changes which involved land consolidation, agricultural reforms and shifting to a chemicals-based approach to agriculture contributed to reducing employment in agriculture and to increasing the agricultural production volume. In turn, in Central and Eastern European (CEE) countries, collective farming failed to provide higher levels of efficiency. Furthermore, the territories where private agricultural property was maintained faced the problem of surplus labour (Janiszewska D. A. and Ossowska L., 2014, p. 44; Czerny M., 2008, p. 98-99). A. Zadura (2009), A. Lerman et al. (2002), S. Rozelle and J. F. M. Swinnen (2004) write more about the economic transformation of the agriculture sector in CEE countries. Mentioned changes

contributed to the reduction of agricultural income per full-time employee (FTE) in those countries. For instance, in Poland in 2003, that income was around 40 % of the national economy incomes, close to their level recorded in 1989, at the time of socio-economic shift. Initially, the accession to the EU did not result in any radical changes to the situation of a large number of small farms in Poland (Jozwiak W., 2008, p. 7).

The main purpose of this paper is to depict the economic and financial standing of farms in Central and Eastern European countries demonstrating various levels of profitability of own (unpaid) labour. The author has adopted the hypothesis that farms with higher profitability of own labour are generally characterized by a better economic and financial standing. The main tasks include: 1) determining the level and diversification of profitability of own labour in the CEE countries; 2) determining the economic and financial standing of farms depending on the profitability of own labour. To achieve the aim, the FADN (Farm Accountancy Data Network) database was used. The research used macro-regional data from 2013 to 2015 of eleven countries that accessed the EU in 2004, 2007 and 2013 (except for Malta and Cyprus, as only CEE countries are covered by this analysis). Based on the values of family farming incomes per full-time family employee (FWU – Family Work Unit – equivalent to 2,120 hours of work within a year (2015 Standard Results ..., 2016, p. 4, 7)), the population studied (85 farms) was split into quartiles:

- 1st quartile (group 1): farms with *low* levels of own labour profitability (21 farms);
- 2nd quartile (group 2): farms with *medium low* levels of own labour profitability (22 farms);
- 3rd quartile (group 3): farms with *medium high* levels of own labour profitability (21 farms);
- 4th quartile (group 4): farms with *high* levels of own labour profitability (21 farms).

To validate the division of this population into quartiles, the one-way analysis of variance (ANOVA) was used. In accordance with one of the basic assumptions for variance analysis, the dependent variable should follow a normal distribution within all groups compared (Stanisz A., 2007, p. 337). This was verified using the variable's histograms and the Shapiro-Wilk test. Because the above assumption was not met, the Kruskal-Wallis ANOVA on ranks (a nonparametric equivalent of the one-way analysis of variance) was performed. While this test is interpreted just as the one-way analysis of variance, it is based on ranks rather than mean values (Stanisz A., 2006, p. 386). Based on that test, it was concluded that differences exist between at least two of the groups identified. To provide more details, a post-hoc analysis of p values was performed for multiple comparisons to verify which pairs differ from one another.

Later in this paper, an analysis was performed of family farming incomes per full-time family employee by quartile groups. The basic descriptive statistics were used. Afterwards, for the groups identified, mean values of selected characteristics of the farms' economic and financial standing were calculated.

Research results and discussion

The initial step of this study was to split the population into quartiles by levels of profitability of own labour and to validate it with the analysis of variance. The assumption of normal distribution of the variable considered was verified using the histograms and the Shapiro-Wilk test. In that test, the null hypothesis (H_0) is that the variable follows a normal distribution. In three of the groups studied, the null hypothesis was rejected at $p = 0.05$ (the results of the Shapiro-Wilk test were as follows: group 1: SW-W = 0.7622, $p = 0.0002$; group 2: SW-W = 0.9538, $p = 0.3748$; group 3:

SW-W = 0.8770, $p = 0.0129$; group 4: SW-W = 0.8585, $p = 0.0060$). Therefore, instead of the classic one-way analysis of variance, the Kruskal-ANOVA on ranks was used. As the null hypothesis (H_0), it assumes the absence of a statistically significant impact of the grouping factor on the characteristic considered. According to the alternative hypothesis (H_1), the grouping factor impacts at least some pairs of groups in the general population. Based on the Kruskal-Wallis ANOVA on ranks, the null hypothesis was rejected and the alternative hypothesis was accepted at $p = 0.05$ (Table 1). To determine which pairs of groups differ from one another, a post-hoc analysis of p values was performed for multiple comparisons (Table 2). On that basis, it was concluded that statistically significant differences in the levels of profitability of unpaid labour exist between all quartile groups identified. Therefore, it seems justified to group the CEE farms into quartiles by level of family farming income per full-time family employee.

Table 1

Results of the Kruskal-Wallis ANOVA on ranks for the variable grouping the family farming income per full-time family employee in farms from CEE members of the EU (based on 2013-2015 data)

Specification	Test statistic value	p
Kruskal-Wallis ANOVA on ranks	$H(3, N = 85) = 78.75431$	0.0000

Source: author's calculations based on http://ec.europa.eu/agriculture/rca/database/database_en.cfm

Table 2

Results of the post-hoc analysis of p values for multiple comparisons between groups of farms from CEE members of the EU with various levels of family farming income per full-time family employee

Specification	Group 1 R = 11.000	Group 2 R = 32.500	Group 3 R = 54.000	Group 4 R = 75.000
Group 1		0.025795*	0.000000**	0.000000**
Group 2	0.025795*		0.025795*	0.000000**
Group 3	0.000000**	0.025795*		0.034994*
Group 4	0.000000**	0.000000**	0.034994*	

* significant at $p < 0.05$, ** significant at $p < 0.01$

Source: author's calculations based on http://ec.europa.eu/agriculture/rca/database/database_en.cfm

Figure 1 and Table 3 show the family farming income per full-time family employee in CEE farms by quartile groups. In 2013-2015, in the entire population studied, the level of that income spanned from slightly above EUR 153 to more than EUR 48,100 per full-time family employee. This is an extensive range. Also, a coefficient of variation reaching nearly 93 % reflects quite a high dispersion of the characteristic considered. Group 1 consisted of farms with low levels of own labour profitability, not in excess of EUR 3,708 per full-time family employee. The coefficient of variation of 28.5 % suggests a relatively low dispersion of profitability of unpaid labour in that group; however, the minimum and maximum values show that the income of the "wealthiest" farmers was more than 24 times higher than that of the "poorest" ones. In groups 2 and 3 (with a medium profitability of own labour), the average share of a full-time family employee in the family farming income was approximately EUR 4,800 and EUR 6,900, respectively. With a coefficient of variation of around 12 %, these groups were characterized by a significant equalization of income levels. The highest dispersion of the characteristic considered was recorded in group 4, composed of farms with high levels of unpaid labour profitability. Although the coefficient of variation was 46 %, the minimum of EUR 8,800 and the range of just under EUR 40,000 show that the income of the "wealthiest" farmers was barely 5.5 times higher than that of the "poorest" ones.

Source: author's calculations based on http://ec.europa.eu/agriculture/rica/database/database_en.cfm

Fig. 1. Box plot for the variable grouping the family farming income per full-time family employee in farms from CEE members of the EU (based on 2013-2015 data, EUR/FWU)

Table 3

Basic descriptive statistics for the variable grouping the family farming income per full-time family employee in farms from CEE members of the EU, split into quartiles (2013-2015 data, EUR/FWU)

Specification	Group 1	Group 2	Group 3	Group 4	Total
Minimum	153.6	3770.1	5860.3	8830.9	153.6
Mean	2970.1	4813.0	6936.3	19734.5	8568.8
Maximum	3707.9	5735.5	8771.6	48106.0	48106.0
Coefficient of variation (%)	28.5	11.8	12.3	46.0	92.9

Source: author's calculations based on http://ec.europa.eu/agriculture/rica/database/database_en.cfm

Table 4 shows the selected characteristics of the farms' economic and financial standing in CEE countries, grouped into quartiles. The data clearly indicate that, in the period covered by this study, high levels of own labour productivity were recorded by large-area, economically strong farms with a large production scale. Their average area of agricultural land was over 125 ha; their economic size reached EUR 122; and their production value went beyond EUR 154,000. This was, respectively, around nine, twelve and eleven times more than the corresponding figures reported by the group of farms with low profitability levels of unpaid labour. It is worth noting that as regards other variables, the differences between the extreme quartile groups were not that significant. The higher the farm's income per full-time family employee, the higher were the total labour inputs and the larger was the share of paid labour.

Table 4

Selected characteristics of the farms' economic and financial standing in CEE members of the EU in 2013-2015, grouped into quartiles

Specification	Group 1	Group 2	Group 3	Group 4	Total
Economic size (EUR)	13.2	26.8	35.1	122.0	49.0
Utilized agricultural area (ha)	10.5	28.5	42.8	126.1	51.7
Total labour inputs (AWU*)	1.4	1.9	1.9	3.3	2.1
Share of paid labour (%)	14.7	28.7	31.4	57.4	33.0
Technical equipment of labour (EUR thousand/AWU)	82.4	50.4	71.0	113.8	79.1
Utilized agricultural area per FTE (ha/AWU)	7.3	12.7	21.1	36.8	19.4
Total production (EUR thousand)	14.5	32.3	43.2	154.3	60.7
Net value added per FTE (EUR thousand/AWU)	3.8	7.2	9.1	18.0	9.5
Cost-effectiveness of output (%)	118.6	116.3	114.0	100.9	112.5
Debt ratio (%)	4.8	11.7	14.6	20.5	12.9
Gross investments per FTE (EUR/AWU)	1339.2	2776.2	4048.6	7223.7	3834.3
Net investments per FTE (EUR/AWU)	-847.3	561.2	930.4	2177.0	703.6
Share of operating subsidies in incomes (%)	75.1	80.8	93.4	160.8	102.3

* AWU (Annual Work Unit) – 2,120 hours of work within a year (2015 Standard Results ..., 2016, p. 4, 7)

Source: author's calculations based on http://ec.europa.eu/agriculture/rca/database/database_en.cfm

Favourable levels of own labour profitability were driven by higher ratios of land and capital to labour inputs. In group 4, utilized agricultural area and fixed assets per FTE were significantly above the average figures for CEE countries. The more advantageous were the relationships between productive inputs, the highest was the farms' labour efficiency measured as net value added per FTE. Therefore, it seems that the profitability of unpaid labour was co-determined by the efficiency of total labour inputs. However, account needs to be taken of cost-effectiveness of output (measured as the ratio of production value to total costs), which was progressively lower in each subsequent group. This demonstrates the significant role of operating and investment subsidies. The share of the latter in the income of the groups 1, 2, 3 and 4 was, respectively: 75 %; nearly 81 %; over 93 % and as much as 160 %. This means that farms with high profitability levels of own labour would generate losses if deprived of operating subsidies. The important role of subsidies as a determinant of labour profitability is also demonstrated in studies by Z. Golas (2010), Z. Koloszko-Chomentowska (2016) and T. Sobczynski (2010) who also emphasize the relationship between labour efficiency and profitability. However, T. Sobczynski (2010, p. 247) notes that this relationship does not apply to adjusted profitability of labour which is calculated by deducting the balance of operating and investment subsidies and taxes from the profits. The conclusions of T. Sobczynski (2010) indirectly confirm A. Baer-Nawrocka and N. Markiewicz (2012, p. 22) who indicate Common Agriculture Policy instruments as a catalyst in the equalization of differences in labour productivity in spatial terms. Interesting conclusions also result from research by Kollar and Sojkova (2016), who proved that non-investment subsidies have positive effect on the average efficiency of Slovak farms.

It should be noted that the higher the profitability of unpaid labour in the farms, the more willing were their owners to borrow funds. This was also a driver of investments: in the 4th quartile group, gross investments per FTE were over EUR 7,200, approximately five times more than the corresponding ratio in group 1. In the quartile with the lowest income per full-time family

employee, the value of net investments (i.e. investments less depreciation) was negative. This means these farms did not even manage to attain the simple reproduction level.

Conclusions, proposals, recommendations

- 1) As shown by this study, in Central and Eastern European countries, higher levels of family farming incomes per full-time family employee were reported by farms with a larger utilized agricultural area, larger economic size and higher production value. The significant fragmentation of farmland continues to be a problem for many CEE countries. This suggests the need to implement further changes to the area structure and production concentration patterns in the agriculture.
- 2) A relationship was discovered between labour efficiency (measured as net value added per FTE) and own labour profitability. However, as demonstrated by a more in-depth analysis, this may be an illusive discovery because operating and investment subsidies are actually the key growth driver for the profitability of unpaid labour.
- 3) Agricultural producers are considerably less willing to borrow funds than entities active in non-agricultural sectors of the national economy. However, it was noted that a significantly higher debt-to-capital ratio was reported by larger farms that are supported with higher amounts of subsidies while attaining higher levels of own labour profitability. That pattern was also related to a larger scale of investments.

Acknowledgement

The project was financed from resources of the National Center for Science, allocated pursuant to decision DEC-2012/05/B/HS4/04134.

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