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How opportunity costs change the view on the viability of farms? Empirical evidence from the EU

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Abstract: The post-2020 Common Agricultural Policy targets at supporting small and medium-sized farms. Capping and redistribution of direct payments would have a direct impact on the economic viability of farms. Calculation of economic income is a reasonable way how to calculate the economic viability of firms. However, accounting profit has been preferred for its estimation so far. The article aims to compare the income from accounting and economic point of view and reveal how much the results differ across the EU. The literature review, an empirical analysis based on Farm Accountancy Data Network (2016–2018), and a clustered heat map were applied. The results provide clear evidence of high variability of opportunity costs when calculating the economic viability in the EU, especially between countries with small intensive farms and some post-communist countries where larger farms dominate.

Keywords: accounting income; agriculture; cluster analysis; economic income; equity; FADN (Farm Accountancy Data Network); impact evaluation; international comparison; labour; land

The evaluation of the economic viability of agricultural holdings connects with the calculation of accounting and economic income. In contrast to the accounting income, the so-called opportunity costs, which characterise the use of own production factors of agricultural holdings, are considered when calculating economic income. They are implicit costs not directly reflected in the financial statements, but economists should consider them when calculating economic income. Opportunity costs are defined as the amount of money that a company or organisation loses by deciding to do one thing rather than another (Pearce 1986). From the perspective of the business owner, the opportunity costs are the lost benefits of the best alternative capital allocation than the current one. In this article, we work with private opportunity costs, as opposed to social opportunity costs, which focus on a much more comprehensive range of effects.

It is difficult to compare economic viability between small and large enterprises due to the existence of opportunity costs that do not directly enter the business records. Small enterprises mainly manage their own production factors. Alternatively, large enterprises hire the bulk of production factors.

In addition to labour and capital, agricultural land is one of the vital production factors in agriculture. Agricultural land is specific for its irreplaceable na-

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ture, limited acreage, different quality, and immobility. Therefore, the question is how opportunity costs in agricultural production can be quantified to include them in the economic viability calculations of enterprises.

The Capital Assets Pricing Model (CAPM) model is not very suitable for agricultural holdings because it cannot distinguish the specificities of the opportunity costs of land and labour. In the Czech Republic, the INFA (Benchmarking Diagnostic System of Financial Indicators) model was developed for the calculation of economic value added.

The model is based on industry and trade data and uses accounting data, while most of the small farms keep just a tax record.

It is therefore highly important to discuss the possibilities of determining the opportunistic costs of own labour, land, and capital in agricultural production and answer the question how opportunity costs change the view on the viability of farms? Literature in agricultural economics partially deals with opportunity costs as authors use different estimation methods without comprehensive discussion. They do not compare different methods even though they lead to different results. The paper aims to compare the income from accounting and economic point of view and reveal how much the results differ across the EU. The research question is: Are there any differences in economic viability when using different opportunity cost estimation methods compared to traditional accounting methods from the international perspective? Thus, the main research hypothesis is as follows:

H: If there is a significant impact of opportunity costs on economic viability, the original viewpoint based on the accounting data provides a biased international comparison.

The international comparison of farms' economic viability with different ways of calculating opportunity costs is a new contribution to the knowledge of agricultural economics.

The literature review follows the citation databases Web of Science, Scopus, and AgEcon. The keywords were entered in the citation databases ProQuest, EBSCO, a ScienceDirect in all possible combinations: "opportunity cost", "opportunity cost of labour", "opportunity cost of land", "agriculture". The subsequent empirical part provides an international comparison of the effects of opportunity costs on family farm income based on the Farm Accountancy Data Network (FADN). The main research question is whether there are any differences in the effects of opportunity costs on economic viability in the EU.

THEORETICAL BACKGROUND

Opportunity costs of labour. Opportunity labour costs are used to quantify the labour costs of the owner, his family members working for the company, and other unpaid labour. In terms of the unpaid workforce (FWU, Family Work Unit), the best alternative benefit would be wage from employment in agriculture or a different industry. The literature does not agree on a universal approach. Unpaid work is valued at the average wage in agriculture (Ryan et al. 2016), the average wage in agriculture in a given size category of agricultural holdings (Ziętara and Sobierajewska 2017), or average non-agricultural wage (Argilés Bosch and García Blandón 2011; Ciaian et al. 2013).

These approaches can be classified from the agricultural entrepreneur or the household:

- From the agricultural entrepreneur's point of view, the alternative option is to become an employee on a farm. The opportunity labour cost is then close to the regional average labour costs in agriculture (Davidova et al. 2005). In reality, this system works on farms where family members work as employees.
- From the household's perspective, it is relatively common that some household members work outside agriculture and receive off-farm income (Pastusiak et al. 2017).

The argument supporting the latter approach is that the interest in agricultural work has been declining for a long time and farm households have income diversified into non-agricultural industries.

An alternative, though the mostly subjective approach to the assessment of unpaid work, was offered by (Isermeyer 2012), which calculated the opportunity labour cost at the level that a farmer would have to spend if he/she wanted to pay a worker who would temporarily replace him when leaving on holiday.

In connection with the opportunity labour costs, there may also raise a question of how and whether to value the unpaid workforce of an owner who is not directly involved in the operation of the company and who engaged the professional management. In this case, it is advisable not to consider opportunistic labour costs for the owner and calculate only the opportunistic costs of the capital or the land he/she has invested in the company.

Opportunity costs of land. The benefits of alternative use of the own farmland can be considered as an opportunity cost of land. The owner of the agricultural land is also the owner/shareholder of the

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holding and has the options: *i*) to use the own agricultural land for agricultural production or *ii*) to dispose of it in an alternative way, such as leasing or selling it.

Literature estimates the opportunity costs of own land at the average rate of rents in the region or directly in the enterprise (Ciaian et al. 2013), the average rents in a given economic size category of agricultural holdings (Ziętara and Sobierajewska 2017), or the average market price of agricultural land in the region or directly on the farm (Wąs et al. 2019). It is appropriate to adjust the costs of land for explicit costs in the form of land taxes.

Opportunity costs of land are closely related to the opportunity costs of equity because equity represents the resources invested by the owner in the business or generated by his/her own economic activity. Equity is also the source of financing the purchase of land, or the land may be a non-monetary investment by the owner. Therefore, when calculating the opportunity cost of equity, there are two possible options:

- The value of own land should be deducted from the value of equity, which is called "opportunity cost of own non-land capital" (Wąs et al. 2019). Then, the opportunity costs of the own non-land capital must be added to the opportunity cost of land.
- The opportunity costs of own land are included in the opportunity cost of equity. Thus, the opportunity costs of land are not calculated separately (Vrolijk et al. 2010). When the value of the own land in the balance sheet is higher than the amount of equity, the land is partly financed by bank loans or debt (in the case of Denmark). In such a case, the interests paid are explicit costs in the income statement.

Opportunity costs of equity. The choice of financing makes the cost of capital a crucial variable for every enterprise as it determines its corporates capital structure (Valaskova et al. 2019). The specifics of soil should be taken into account in agriculture, and the concept of the opportunity cost of own non-land capital should not consider the own land.

Therefore, itis the opportunity costs of the "non-land" capital that the owner has invested in the business or generated by economic activity in the form of income, which is then used to distribute between owners or to reinvest in business development. This equity is used to acquire tangible fixed assets (machinery, equipment), buildings, stud herd (investment financing), and part of current assets (operating financing).

The most common way to determine the opportunity cost of equity is the use of a percentage of equity, which is analogous to valuing foreign capital in the form of an interest rate. An alternative opportunity on how to use equity is a capital allocation in the form of investing in securities, real estate, commodities, or just using savings accounts. Income from long-term securities (with a maturity of more than 1 year) or short-term securities (with a maturity of up to one year) is used, depending on the investment or operating financing. European studies suggest using long-term convergence interest rates published by the European Central Bank (O'Donoghue et al. 2016) or 10-year government bond yields (Vrolijk et al. 2010) published by Eurostat or central banks (Pierrick et al. 2012; Ziętara and Sobierajewska 2017).

DATA AND METHODS

The impact evaluation of opportunity costs on economic viability is based on the FADN database. FADN is an instrument for evaluating the income of agricultural holdings and the impacts of the Common Agricultural Policy.

The Standard Results are a set of statistics calculated from the Farm Returns that are periodically produced and published by the Commission (European Commission 2014). They describe in considerable detail the economic situation of farmers by different groups.

Farm Net Income (FNI) approximates accounting profit adjusted by balance subsidies & taxes on investments, value added tax balance, and some extraordinary items. It is remuneration to fixed factors of production of the farm (work, land, and capital) and remuneration to the entrepreneurs' risk in the accounting year. FNI is an income rather than profit indicator because of adjustment according to the FADN standard results methodology.

It is relevant to compare Farm Net Income with opportunity costs. The difference between Farm Net Income and opportunity costs is called Economic Income and is related to the total utilised agricultural area to provide a relevant international comparison. The reference period is an average of 2016–2018 to cope with year-by-year fluctuations (European Commission 2020). The sample covers EU countries except for Malta because of the marginal size of agriculture.

The opportunity cost of own labour is calculated in two ways.

The first option supposes that farmer or family members find the second-best alternative to be employees

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in agriculture. The average wage in agriculture is used for the calculation of the opportunity cost of labour.

$$\text{The opportunity cost of own labour 1} = \text{[Average Wages Paid (SE370)/ Paid Labour Input (SE020)]} \times \text{Unpaid Labour Input (SE015)} \quad (1)$$

The second option assumes that the second-best alternative for the farmer or family member is to be employed in other industries because of relatively low earnings in agriculture. In such a case, the reference standard is the average hourly labour cost in a specific country in industry, construction, and services (except public administration, defence, compulsory social security) in 2018 (Eurostat 2019a). It includes employee compensation, with wages and salaries in cash and in-kind, employers' social security contributions, and employment taxes regarded as labour costs minus any subsidies received, but not vocational training costs or other expenditure such as recruitment costs and spending on working clothes.

$$\text{The opportunity cost of own labour 2} = \text{Average hourly non-agricultural labour cost (Eurostat 2019a)} \times \text{Unpaid Labour Input in hours per year (SE016)} \quad (2)$$

The opportunity cost of equity is calculated as a fixed percentage of Net Worth on 10-year government bonds (Eurostat 2019b). Net Worth is defined as the difference between Total assets and Total liabilities. Long term government bond yields are calculated as monthly averages (non-seasonally adjusted data). They refer to central government bond yields on the secondary market, gross of tax, with a residual maturity of around ten year.

$$\text{The opportunity cost of equity} = \text{[Net Worth (SE501)} \times \text{Interest rates of 10-year government bonds (annual arithmetic average)]} \quad (3)$$

Opportunity costs of own land are included in the opportunity costs of equity in this article. The results provide the value of economic income, which can be compared to different levels of economic viability, which also allows for Cash Flow (SE530), as defined by (Vrolijk et al. 2010).

- Level 1: Farm Net Income is higher than opportunity costs. Economic Income is positive. Cash Flow is positive.
- Level 2: Farm Net Income is positive but lower than opportunity costs. Economic Income is negative. Cash Flow is positive.
- Level 3: Farm Net Income is negative; Cash Flow is positive.
- Level 4: Farm Net Income and Cash Flow are negative.

In order to find relatively homogeneous groups of countries according to the absolute and relative difference between Farm Net Income and Economic Income and the share of own labour, land, and equity, clustered heat maps (double dendrograms) were applied.

A heat map is a two-way display of a data matrix in which the individual cells are displayed as coloured rectangles. Usually, a clustered heat map is made on variables that have similar scales. In this case, variables have different scales. So, the data matrix had to be first scaled using a standardisation transformation (proportions).

Ward's Minimum Variance (WMV) method was used as the hierarchical cluster technique. With this method, groups are formed so that the pooled within-group sum of squares is minimised (Roux 2014). The WMV method was used because it provides relatively good results towards alternative methods (Blashfield 1976) but is sensitive to outliers (Milligan 1980). The clustering algorithm uses Euclidean distance. One criterion that has become popular for the goodness-of-fit test is using the result with the largest cophenetic correlation coefficient. Cophenetic correlation is the correlation between the original distances and those that result from the cluster configuration. Values above 0.75 are felt to be good.

RESULTS

Table 1 provides Economic Income (EI) per hectare, relative and absolute differences against Farm Net Income (FNI) per hectare. Economic income has two levels:

- EI_1 works with the agricultural costs of labour.
- EI_2 works with the non-agricultural costs of labour. Because non-agricultural costs of labour are usually higher than agricultural costs of labour, EI_2 is lower than EI_1. Figure 1 presents the EI and FNI sorted by the absolute value of the difference between FNI/ha and EI_2/ha (AbsDiff_2 = FNI/ha – EI_2/ha).

The hierarchical cluster analysis identified three clusters when clustering variables and three clusters when clustering countries.

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Table 1. Farm Net Income and Economic Income of farms per hectare in EUR (2016–2018 average)

Country	FNI (EUR/ha)	Cash Flow (EUR/ha)	EI_1 (EUR/ha)	EI_2 (EUR/ha)	RelDiff_1 (%)	RelDiff_2 (%)	AbsDiff_1 (EUR/ha)	AbsDiff_2 (EUR/ha)	Share of FWU (%)	Share of own land (%)	Share of equity (%)
AUT	923.7	657.3	–250.8	–2 537.2	–127.2	–374.7	–1 174.6	–3 460.9	92.3	64.0	86.5
BEL	1 285.6	798.4	318.2	–1 815.1	–75.2	–241.2	–967.4	–3 100.7	81.0	29.2	78.4
BGR	269.5	281.6	141.4	57.2	–47.5	–78.8	–128.1	–212.3	43.2	13.5	76.0
CYP	864.2	720.1	–515.0	–3 026.8	–159.6	–450.2	–1 379.2	–3 891.0	74.7	28.3	95.6
CZE	207.2	1 127.2	61.2	7.8	–70.5	–96.2	–146.0	–199.5	26.2	24.8	70.5
DAN	196.9	297.9	–200.7	–469.4	–201.9	–338.4	–397.6	–666.3	45.7	65.5	40.0
ESP	735.1	798.5	273.8	–289.9	–62.7	–139.4	–461.3	–1 025.0	63.9	59.5	96.8
EST	66.3	51.5	–42.8	–91.2	–164.6	–237.5	–109.2	–157.5	41.4	34.9	63.8
FIN	280.0	275.2	–232.4	–781.5	–183.0	–379.1	–512.4	–1 061.5	79.3	61.8	71.2
FRA	390.5	382.0	14.2	–514.3	–96.4	–231.7	–376.3	–904.8	68.4	17.5	57.5
GBR	257.4	221.3	–109.9	–400.9	–142.7	–255.8	–367.3	–658.3	57.9	58.1	89.1
GER	473.4	439.9	–26.9	–694.5	–105.7	–246.7	–500.4	–1 168.0	63.4	34.5	76.8
GRC	1 086.1	1 285.6	–320.7	–2 696.0	–129.5	–348.2	–1 406.8	–3 782.1	80.6	44.1	100.0
HRV	538.3	218.4	–475.4	–1 161.4	–188.3	–315.7	–1 013.7	–1 699.7	82.4	47.6	95.7
HUN	474.2	–70.1	215.9	87.7	–54.5	–81.5	–258.2	–386.4	42.8	40.5	85.2
IRE	555.1	432.2	–168.4	–1 036.4	–130.3	–286.7	–723.5	–1 591.5	92.4	81.0	97.5
ITA	1 637.7	1 590.2	127.8	–1 882.8	–92.2	–215.0	–1 509.9	–3 520.5	77.6	47.0	99.0
LTU	226.8	155.9	–35.0	–255.7	–115.4	–212.7	–261.9	–482.5	81.6	51.2	81.1
LUX	621.3	576.6	85.5	–894.2	–86.2	–243.9	–535.7	–1 515.5	79.9	46.1	75.3
LVA	197.7	130.2	2.4	–111.1	–98.8	–156.2	–195.3	–308.8	60.9	53.4	66.6
NED	2 156.7	1 738.6	508.5	–1 036.4	–76.4	–148.1	–1 648.2	–3 193.1	52.9	60.8	68.6
POL	451.5	500.6	–393.7	–1 326.1	–187.2	–393.7	–845.2	–1 777.6	88.5	72.6	94.3
POR	759.7	733.9	151.3	–776.5	–80.1	–202.2	–608.4	–1 536.2	74.9	77.5	96.7
ROU	537.9	512.6	–70.6	–860.6	–113.1	–260.0	–608.4	–1 398.5	89.2	38.9	96.4
SVK	114.3	–31.3	76.9	63.8	–32.7	–44.2	–37.4	–50.5	7.9	10.0	58.5
SVN	728.9	546.8	–487.3	–3 220.7	–166.9	–541.8	–1 216.3	–3 949.6	96.4	67.3	96.1
SWE	158.1	287.7	–351.8	–718.2	–322.6	–554.4	–509.9	–876.3	74.6	44.0	75.1

AbsDiff – absolute difference; EI – Economic Income; EI_1 – Economic Income with agricultural labour costs; EI_2 – Economic Income with non-agricultural labour costs; FNI – Farm Net Income; FWU – Family Work Unit; RelDiff – relative difference

RelDiff_1 = (FNI – EI_1) / EI_1 × 100; RelDiff_2 = (FNI – EI_1) / EI_2 × 100; AbsDiff_1 = FNI/ha – EI_1/ha; AbsDiff_2 = FNI/ha – EI_2/ha

Source: Own calculation based on European Commission (2020)

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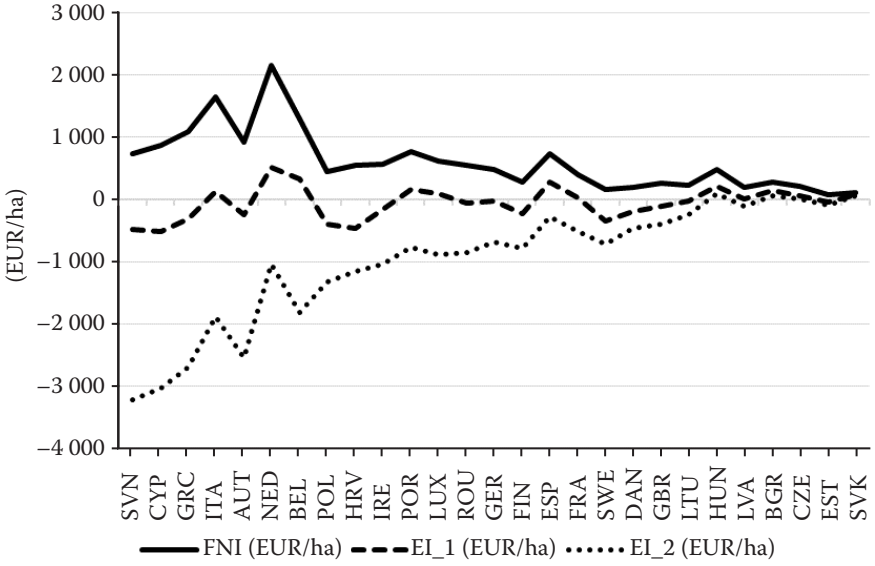

Figure 1. Farm Net Income and Economic Income per hectare in 2016–2018 average, sorted by AbsDiff_2 (EUR/ha)

AbsDiff – absolute difference; EI_1 – Economic Income with agricultural labour costs; EI_2 – Economic Income with non-agricultural labour costs; FNI – Farm Net Income

Source: Own calculation based on European Commission (2020)

- Variables: Cluster 1 (RelDiff_1, RelDiff_2), Cluster 2 (AbsDiff_1, AbsDiff_2), Cluster 3 (ShareFWU, ShareLAND, ShareEQUITY)[1].
- Countries: Cluster 1 (BEL, DAN, GER, ESP, EST, FRA, HRV, IRE, LTU, LUX, LVA, POL, POR, ROU, FIN, SWE, GBR), Cluster 2 (BGR, CZE, HUN, SVK), Cluster 3 (CYP, GRC, ITA, NED, AUT, SVN)[2].

Table 2 provides the means of economic and structural indicators if the three clusters. RelDiff_1 and RelDiff_2 represent the relative difference between Farm Net Income and Economic Income. AbsDiff_1 and AbsDiff_2 inform about the absolute difference between Farm Net Income and Economic Income.

The cluster analysis revealed two extreme groups of countries in terms of the effects of opportunity costs – Cluster 2 and Cluster 3.

Cophenetic correlation (when clustering variables) was 0.866, which indicates useful clustering of variables. Cophenetic when clustering countries was 0.655, which is lower than the minimum threshold, but clusters provide reasonable interpretation. Cluster 3 contains Cyprus, Greece, Italy, Netherlands, Austria, Slovenia. The clustered heat map (Figure 2) defines the Cluster 3 as countries with the most significant absolute difference between Farm Net Income and Economic Income 1 or Economic Income 2. Compared to the other two clusters, Cluster 3 has the highest average share of equity, the high share of family labour input, and the relatively high relative difference between Farm Net Income and Economic Income 2. Cluster 3 is affected mainly by opportunity cost. All countries have negative Economic Income 2 when calculating opportunity labour cost using non-agricultural wage. It is quite reasonable because the non-agricultural wages are much higher than agricultural wages in the countries, and share of unpaid labour input is relatively high as well. Cash Flow is positive, which means that farming provides a positive income. However, the reward for the farmers' input of labour and capital is less than he/she could earn in other economic activities. However, Economic Income 1 is positive in Italy and the Netherlands when assuming agricultural-based opportunity labour cost.

Cluster 2 includes Bulgaria, Czech Republic, Hungary and Slovakia. The clustered heat map shows relatively low absolute difference for the Cluster 2 (AbsDiff_1 = –142.44 EUR/ha, AbsDiff_2 = –212.20 EUR/ha) and relative differences (RelDiff_1 = –51.30%, RelDiff_2 = –75.19%) between Farm Net Income and Economic Income. Thus, the impact of opportunity costs on economic income is negligible on average. However, farm

[1]RelDiff_1 = (FNI – EI_1)/EI_1 × 100; RelDiff_2 = (FNI – EI_1)/EI_2 × 100; AbsDiff_1 = FNI/ha – EI_1/ha; AbsDiff_2 = FNI/ha – EI_2/ha; ShareFWU = Unpaid Labour Input/Total Labour Input × 100; ShareLAND = Own Utilized Agricultural Area/Total Utilized Agricultural Area × 100; ShareEQUITY = Net Worth/Total Assets × 100.

[2]BEL (Belgium), DAN (Denmark), GER (Germany), ESP (Spain), EST (Estonia), FRA (France), HRV (Croatia), IRE (Ireland), LTU (Lithuania), LUX (Luxembourg), LVA (Latvia), POL (Poland), POR (Portugal), ROU (Romania), FIN (Finland), SWE (Sweden), GBR (United Kingdom), BGR (Bulgaria), CZE (Czech Republic), HUN (Hungary), SVK (Slovakia), CYP (Cyprus), GRC (Greece), ITA (Italy), NED (Nederland), AUT (Austria), SVN (Slovenia).

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Table 2. Economic and structural indicators of clusters (2016–2018 average)

Cluster	FNI (EUR/ha)	Cash Flow (EUR/ha)	EI_1 (EUR/ha)	EI_2 (EUR/ha)	ShareFWU (%)	Share-LAND (%)	Share-EQUITY (%)	UAA (ha/farm)	AWU/farm
Cluster 1	454.8	400.75	–74.25	–717.47	72.08	51.37	79.57	69.07	1.71
Cluster 2	266.31	326.85	123.86	54.11	30.06	22.22	72.55	185.26	5.03
Cluster 3	1 232.89	1 089.77	–156.25	–2 399.98	79.09	51.91	90.95	20.33	1.57
Total	599.78	542.91	–63.12	–977.05	67.41	47.17	81.06	75.46	2.17

AWU – Annual Work Unit; EI – Economic Income; EI_1 – Economic Income with agricultural labour costs; EI_2 – Economic Income with non-agricultural labour costs; FNI – Farm Net Income; UAA – Utilized Agricultural Area
ShareEQUITY – Net Worth/Total Assets × 100; ShareFWU – Unpaid Labour Input/Total Labour Input × 100; ShareLAND – Own Utilized Agricultural Area/Total Utilized Agricultural Area × 100
Source: Own calculation based on European Commission (2020)

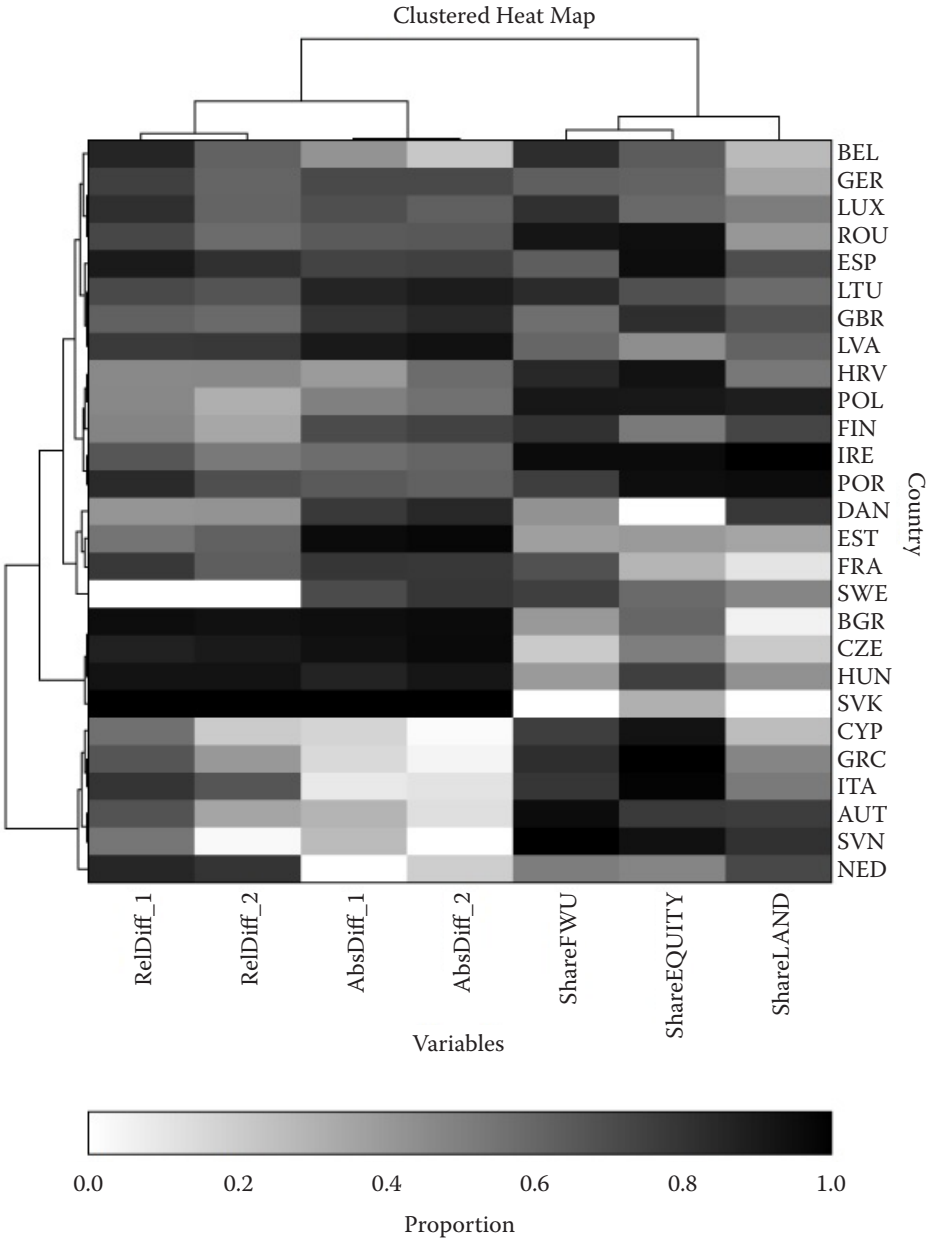

Figure 2. Clustered Heat Map (2016–2018 average)

AbsDiff – absolute difference; EI_1 – Economic Income with agricultural labour costs; EI_2 – Economic Income with non-agricultural labour costs; FWU – Family Work Unit; RelDiff – relative difference
RelDiff_1 = (FNI – EI_1)/EI_1 × 100; RelDiff_2 = (FNI – EI_1)/EI_2 × 100; AbsDiff_1 = FNI/ha – EI_1/ha; AbsDiff_2 = FNI/ha – EI_2/ha; ShareFWU = Unpaid Labour Input/Total Labour Input × 100; ShareEQUITY = Net Worth/Total Assets × 100; ShareLAND = Own Utilized Agricultural Area/Total Utilized Agricultural Area × 100
Source: Own calculation using NCSS 2020 based on European Commission (2020)

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structure is heterogeneous. For example, post-socialist transformation led to a dual farm structure in Czech agriculture: agricultural companies hold the majority of agricultural land and production, whereas private farmers make up the majority of agricultural actors (Hrabák and Konečný 2018).

In Cluster 2, the average Farm Net Income, Cash Flow, Economic Income 1 and Economic Income 2 are positive, which means that additional income provides opportunities for further investments. Nevertheless, there are differences between countries.

The countries in Cluster 2 have a relatively lowshare of family labour input and the own land. The share of equity is also relatively low but not as obvious as the share of labour input and land. Cluster 2 is also typical for higher average acreage and labour input per farm than other clusters. Large farms are typical for post-communist countries (Bogdanov et al. 2017), unlike Western European countries (Šimon and Bernard 2016). Besides, the average non-agricultural wage is much lower (EUR 9 per hour) than in Cluster 3 (EUR 24.2 per hour), which diminishes the effect of opportunity labour costs on the economic income.

Assuming EI_1, we can classify the countries in the four levels defined by (Vrolijk et al. 2010).

- Level 1 (FNI > 0; FNI > opportunity cost; EI_1 > 0; Cash Flow > 0): Netherlands, Belgium, Spain, Portugal, Bulgaria, Italy, Luxembourg, Czech Republic, France, Latvia.
- Level 2 (FNI > 0; FNI < opportunity cost; EI_1 < 0; Cash Flow > 0): Germany, Lithuania, Estonia, Romania, United Kingdom, Ireland, Denmark, Finland, Austria, Greece, Sweden, Poland, Croatia, Slovenia, Cyprus.
- Level 3 (FNI < 0; Cash Flow > 0): –.
- Level 4 (FNI < 0; Cash Flow < 0): –.

Hungarian and Slovak farms had slightly negative Cash Flow and positive Economic Income on average. Nevertheless, the explanation of negative Cash Flow needs access to the national data and in-depth investigation.

DISCUSSION AND IMPLICATIONS

It would be interesting to look at two extremes in more detail. Slovenia, Cyprus, and Greece have the biggest absolute difference between Farm Net Income and Economic Income 2. Cyprus and Greece have a relatively high long-term interest rate of 10-year government bonds which relates to the worse international country rating than most of the EU countries. The second reason for the big difference between income in accounting and economic term is the distinct difference between agricultural and non-agricultural wages in Greece (non-agricultural wages are 4.4 times higher than in wages in agriculture), Cyprus (3.7 times) and Slovenia (3.7 times), being the highest score in the EU. Farms in Greece, Cyprus and Slovenia are mostly very small family farms with an average size of 10 hectares. They do not use much debt; instead, they rely on the own labour and capital to a large extend. The question is why farmers keep farms in countries where the opportunity cost of labour in the non-agricultural branch is considerably higher than in agriculture? There are many non-financial incentives for farming, such as tradition and desire to be connected to the land and life on that land (Dunckel 2015). Moreover, a reliance on family labour, equity, and a diversification of activities in small-scale farms reduces the farming exit probability (Viira et al. 2009).

Another important reason why small-scale farms keep non-viable farming despite is off-farm income. The small-scale farm households have a considerably higher share of off-farm income than large-scale farms. So, the farm size affects the farmers participation in off-farm labour activities (Dabkienė 2020). In the EU, only 17% of agricultural workforce were employed on a full-time basis in on-farm activities, while the remaining 83% were undertaking agricultural activity as a part-time or secondary activity. A decrease in full-time farmers and an increase in part-time farm work has been a long-term trend in the EU (Schuh 2019). With sufficient off-farm income farming itself may not be viable. The Pearson´s correlation between Abs-Diff_2 and the ration between number of agricultural workforces in persons and Annual Work Unit (AWU) (coefficient = number of persons/AWU) is negative and significant ($r = -0.433$, P-value = 0.02136, $N = 27$). It indicates that the higher share of part-time labour force in the country (i.e. higher ratio between number of agricultural workforces in persons and AWU), the bigger the gap between accounting and economic income. Nevertheless, the high share of off-farm income can be counterproductive. Farmers who derive their income mainly from non-farm work are more likely to dislike farming (Agarwal and Agrawal 2017).

On the contrary, Slovakia, Estonia, and the Czech Republic have only a slight difference between Farm Net Income and Economic Income 2. The difference between agricultural and non-agricultural wages in the three countries are the lowest in the EU (approximately 1.5 times), which also reduces the differ-

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ence between EI_1 and EI_2. Country rating is good, which is reflected in the lower opportunity cost of capital. Slovakia, Estonia and the Czech Republic are typical for relatively large size of farms having high share of rented land. The size of agricultural area was found to correlate negatively to exit intentions, while a higher share of rented land increases the farming exit probability (Viira et al. 2009). Moreover, Czech and Slovak farms have a low share of the family work unit on average, compared with the EU average. The below-average share of equity is also typical for the countries.

The results have important policy implications for the Common Agricultural Policy post-2020, especially design of the capping scheme. For example, the capping scheme would affect the large farms in the Czech Republic which produce majority of agricultural production. It would be interesting to know how the Economic Income changes in the capping scenario when considering the opportunity costs. The new indicators of economic income would be included in the FADN standard results or alternative reporting for business decisions and policymaking. The new FADN indicators of Economic Income would be composite indicators reflecting different ways of construction of opportunity costs. The indicators should be inserted next to the final indicator "Farm Net Income" (SE420), to be easily comparable. Opportunity costs should be included separately in the new section of the FADN standard results. It would be useful to provide several levels of opportunity costs and Economic Income because of different structural and income conditions across the EU. For example, EI_1 works with the agricultural costs of labour and should be used in countries with a modest difference in agricultural wages and wages in other sectors. Alternatively, EI_2 works with the non-agricultural costs of labour, and it is recommended for countries where the average agricultural wages significantly differ from other sectors.

CONCLUSION

Estimating the opportunity costs of own production factors (labour, land, capital) is a prerequisite for quantifying the economic viability of agricultural holdings based on economic income. When selecting a method, it is necessary to consider its assumptions and the ratio of benefits to the costs of data availability and calculation. Linking opportunity labour costs to a region is not as crucial as for land, which is an immobile production factor, while the mobility of labour is common. On the other hand, the economic size of the enterprise, the qualification of the worker, gender, age and other socio-demographic factors affecting the wage level can play an important role in determining opportunity labour costs.

The empirical impact evaluation of opportunity costs on economic income provides clear evidence of the high variability of opportunity costs when calculating the economic viability in the EU. The opportunity cost of labour significantly impacts the economic income of farming. The share of part-time labour force is essential for interpretation of farm household viability because the higher share of off-farm income makes farming activity itself less viable, especially in the small-scale farms. From the economic point of view, the household viability is far more important than farming viability.

So, household economic viability should be incorporated as essential indicator for evaluation of agricultural entities.

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