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IMPACTS OF AGRITOURISM REVENUES ON FARM INCOMES IN 2004–2020 – THE V4 EXPERIENCE

Zsuzsanna Bacsi*, Péter Szálteleki

Hungarian University of Agriculture and Life Sciences (MATE), Gödöllő, Georgikon Campus, Keszthely

The present paper analyses the relationship between farm incomes and farm involvement in agritourism activities in four countries of the Visegrád Group (V4) in comparison to the European Union. The analysis is based on the Farm Accountancy Data Network database of the EU for 2004–2020, and applies descriptive statistics, correlations, and multivariate panel regression analysis. Results show that the larger share of agritourism within gross farm income is associated with lower family farm income per family worker, and this is particularly true for larger farms. This means that in area of the Visegrád Group agritourism is more important in farms with worse profitability and more in need of additional incomes while in the rest of the EU countries an opposite tendency prevails. The paper empirically assesses a rather long time period, focusing on the four countries of the Visegrád Group compared to the rest of the EU member states and it measures the impact of agritourism revenues on various measures of farm income. Agritourism profitability has been assessed by hundreds of papers but the present paper compares agritourism profitability to that of traditional agriculture, and assesses a much longer time period than earlier research.

Keywords: agritourism revenues, farm income, farm net value added, FADN

Introduction

The 28 countries of the European Union (in 2018) differ in many aspects, including geography, climate, history, economic development, and national cultures. Several aspects are used to group the member states to categories, such as geographic location, historical past, accession date, political features, social and economic indicators. The Visegrád Group (from now on: V4 countries) is a grouping based on historical and geographical traits, referring to Czechia, Hungary, Poland, and Slovakia (Novotný, Hruška and Mazur, 2015). Other categorisations also exist according to GDP/person levels, cultural traits, common language origin, etc. (Bacsi, 2020; Barkley and Eggertsson, 2017; Cimpeanu, Pirju and Mironov, 2013; Novotná and Volek, 2018).

The V4 countries have many features in common but they considerably differ in several aspects. Some differences have increased with time – features that were similar in 2004, have considerably changed, while in other features these countries have converged (see e.g. Básek and Kraus, 2011; Ivanová and Masárová, 2018; Novotný, Hruška and Mazur, 2015; Roman and Grudzień, 2021; Majerová, 2018).

From 2004, the accession year of these countries to the EU, they have a common target, i.e. to catch up with the more developed old member states, in terms of economic performance, social indicators, and quality of life. However, their progress considerably differs on the overall national level, as well as in specific sectors, including agriculture (Bašek and Kraus, 2011; Novotný, Hruška and Mazur, 2015; Majerová, 2018).

The one core problem for the EU as a whole is the urban-rural divide, therefore considerable amounts of financial support have been spent on rural development, and agriculture-related subsidy programmes. Among them, farm diversification plays an important role, bringing additional incomes to rural areas, that do not depend on agricultural production (Šimková, 2014; Garrod, Wornell and Youell, 2006; McAreavey and McDonagh, 2011; van der Ploeg, 2000; Melichová and Majstríková, 2017; Dömeová and Jindrová, 2011).

Agritourism is increasingly seen as a successful area of farm diversification (Šimková, 2014; Lupi et al., 2017; Roman, Roman and Prus, 2020; Kovács, 2020; Novotný, Hruška and Mazur, 2015; Majerová, 2018; Habán, Macák and Otepka, 2012). Rural tourism is a form of tourism closely related to the natural environmental attractions of the countryside, its cultural-traditional and historical heritage, adding a sustainable and competitive edge to the tourist market of the European Union (Klufová and Šulista, 2018). By generating competitive incomes and job opportunities, it helps to diminish out migration and retain the younger population in rural regions (Ivanová and Masárová, 2018; Mura and Kljucnikov, 2018; Melichová and Majstríková, 2017). Rural tourism is closely connected to agricultural production, the traditional rural activity, and these sectors are mutually beneficial for each other's prosperity.

Rural tourism has been extensively analysed from various aspects and for various locations. These aspects include tourist motivation and satisfaction, the service providers's personal and material endowments, their financial position (Klufová and Šulista, 2018; Gajić et al., 2021; Chase et al., 2018; Žibert et al., 2022; Lamie et al., 2021; Stanovčić et al., 2018), their socioeconomic characteristics (Joo, Khanal and Mishra, 2013), and the contribution of agritourism activities to rural livelihoods (Žibert et al., 2022; Augère-Granier and McEldowney, 2021; Arru et al., 2021). However, empirical economic impact analyses of agritourism on farm profitability or farm incomes have been mainly done in the United States, because of the lack of data and the lack of a standard definition of agritourism (Chase et al., 2018; Lamie et al., 2021, Lupi et al., 2017).

The concept of agritourism is originated from the Italian National Legal Framework for Agritourism passed in 1985, which promoted overnight farm stays, called "agriturismo" as a way for farm diversification in Italy (Chase et al., 2018). Roman and Grudzień (2021) review the relevant literature and classify the components of rural tourism into six categories: agritourism, ecotourism, adventure tourism, cultural tourism, and heritage tourism. The common features of these are: the rural location ensuring peace, quiet and unlimited contact with nature, essential reliance on local resources, the small scale of the business (limited accommodation and catering places, etc.), so as not to dominate the primary agricultural function of the area, where it develops. Rural tourism activities can also be classified according to the needs of the tourists. These classes are: agritourism (the main attraction being the agricultural activities of an operating farm), ecotourism (attracting tourists who are interested in protecting nature and enjoying closeness to nature), ethnotourism (offering encounters with local cultural heritage of ethnic

communities) and therapeutical or recreational tourism (using the natural healing factors of the area visited) in a natural environment (Roman and Grudzień, 2021; Hollas et al., 2021). The facilities provided by rural tourism include facilities available in functioning farms; rural accommodation in farms without agricultural activity; therapeutic or educational or recreational facilities; facilities providing access to the cultural traditions and values of the rural location. Roman and Grudzień (2021) also provide eight definitions for agritourism, in which the common elements are the farms as the places of business. Visitors can find active or passive leisure on an active farm, which offers various types of recreational and tourist services, while farmers, apart from farming, provide their guests with accommodation, food, and additional attractions related to the farming tasks on their farm. Very similar definitions are given by Hollas et al. (2021); and Chase et al. (2018). Agritourism has developed very successfully in many countries in Europe, Asia and the American continent (Kania and Bogusz, 2016; Roman and Grudzień, 2021; He et al., 2021; Dömeová and Jindrová, 2011; Radović, 2020), with increasing numbers of farms involved in this activity. In Italy the number of registered tourist farms increased by 60% from 2000 to 2015, in Austria 6% of all farms deal with agritourism, in the Alpine region of Germany 20% of farms offer agritourism services (Žibert et al., 2022). In 2010 8% of the farms in Hungary, 7% in Slovakia, 17% in the Czech Republic and 3% in Poland dealt with other activities than agricultural production, including agritourism (Roman and Grudzień, 2021) and the rural tourism accommodation facilities are also growing in Slovenia (Žibert et al., 2022).

When assessing the profitability of agritourism farms, the essence is the same as for any other business. The performance of tasks in agritourism generates costs and the difference of achieved revenues and incurred costs gives profit or loss. Costs include amortisation (the consumption of fixed assets), use of materials, energy, human labour, and external services. Opportunity costs are also important in agritourism farms, i. e. the farmer, when making a given choice, sacrifices the gains from any other rational choice. The revenue from sales is the sum of money obtained from the sale of goods or services. Profit on sales is the surplus of sales revenues over the incurred costs. When the owners also work on their own farm, the value of their labour should also be taken into account. Profit is a positive financial result, and the opposite, when costs exceed sales revenues, generates a loss (Olson, 2011; Kay, Edwards and Duffy, 2012; Roman and Grudzień, 2021). The profitability of agritourism reflects the gains from a given accommodation facility and the accompanying service of meals. Other revenues may be generated from offering souvenirs or from the sale of farm products (e.g. fruits, vegetables, honey, etc.) to tourists, a rental of bicycles, rafts, horses, guide services, or transportation services. Agritourism is often characterised by low income, because it is usually available only in the summer season, or because the service providers are unable to attract larger numbers of customers (Roman and Grudzień, 2021; Schilling, Attavanich and Jin, 2014). Farm profitability and farm performance can be assessed by several indicators (Básek and Kraus, 2011; Ivanová and Masárová, 2018). Bašek and Kraus (2011) gives a detailed analysis of the connections of various income indicators in the Farm Accountancy Data Network (from now on: FADN), database of the European Union but they do not deal with agritourism in particular (FADN, 2022). Some of these indicators are presented in Table 1. where the variables of the present analysis are defined.

Agritourism can generate both economic and non-economic benefits for the providers, including support for the local heritage and improvement of the financial position of family farms, and it can also serve as a marketing tool for related farm products (Barbieri and Mshenga, 2008; Hollas et al., 2021). Survey research underlines the importance of economic goals to operators dealing with agritourism, and suggest that agritourism has a positive impact on farm's financial performance. The profitability of agritourism analysed in specific contexts (Barbieri and Mshenga, 2008; Khanal and Mishra, 2014; Lucha et al., 2016) indicate that the influencing factors are operational, financial, and demographic characteristics of the farms and farmers. These authors found that larger farms, that focus on agritourism, tend to be more profitable than smaller ones, especially if agritourism has a priority in their farming practice. According to the mentioned sources the operator's level of education and motivation also contributed to higher farm income. Operators achieved significantly greater annual gross sales if they had been in business for longer and had been primarily dedicated to agriculture. In contrast, Schilling, Attavanich and Jin (2014) states that agritourism enhances profits among small-scale and lifestyle farms but has little or no impact on the net cash income per acre generated by commercial-scale farms.

Although hundreds of research publications deal with agritourism from various aspects, empirical research about the profitability of agritourism or its contribution to farm incomes is not abundant (Schilling, Attavanich and Jin, 2014). Agritourism research focuses either on the demand side (tourists) or on the supply side (farmers, ranchers, and tour operators). Limited research is available to guide practitioners about investment decisions regarding agritourism destination development. Although there are many studies that explore profitability in agritourism, separated from the profitability of farms generally, these studies usually do not deal with the national scale (Khanal and Mishra, 2014; Barbieri and Mshenga, 2008; Hollas et al., 2021), and their time span is usually not more that 3 to 5 years.

As the available research results show, annual income and profitability were found to be positively influenced by involvement in agritourism in the USA. This is especially true in larger farms that have larger tangible assets, more land, more employees, longer business experience, and more financial resources (Barbieri and Mshenga, 2008; Bagi and Reeder, 2012). According to the results by Khanal and Mishra (2014), USA farms involved in agritourism in 2008, 2009 and 2010 performed better, than those involved in off-farm work, with regard to gross farm income, debt-to-asset-ratio, government payments, and total value of production – and these farms had typically larger land areas.

Agritourism was also found to be profitable in specific regions of the V4 countries, empirical results exist for Poland (Roman and Grudzień, 2021; Kania and Bogusz, 2016; Roman, Roman and Prus, 2020), for Slovakia (Habán, Macák and Otepka, 2012; Mura and Kljucnikov, 2018), the Czech Republic (Dömeová and Jindrová, 2011; Škodová Parmová and Dvořák, 2009) and Hungary (Kovács, 2020; Szabó, 2005). However, these results are often based on particular areas, and analyse different economic indicators, in different years, therefore it is difficult to make a meaningful comparison between countries and farms.

Studies show, that the factors of agritourism profitability considerably vary by geographic regions and analysed time periods, and these controversies inspire further empirical research. The present study aims at contributing to this stream of work, focusing on the V4 countries and on the 2004–2020 time period, using the indicators related to farm incomes and farm performance, measured in a standard way in the FADN database. As farm performance differs by country, farm size, farm labour, agricultural area, and the proportions of agricultural and non – agricultural activities, the role of agritourism in farm performance will be assessed comparing these features among the V4 countries. The speciality of this research is the application of the standard indicators for a long, 17 year time span, distinguishing the farms by their economic size. The methodology – panel regression – allows the simultaneous assessment of temporal changes and geographical and

economic impacts for the analysed countries. The assessment of the role of agritourism is measured not only by its absolute value, but by its share in the gross farm income, revealing its weight in comparison to traditional agricultural production.

Material and methods

Research question

The present research aims at answering the following research question: How does family farm income change in relation to the farm's involvement in agritourism?

To find the answer, family farm income per family worker unit, as defined in the FADN database (see Table 1.), is compared to agritourism revenues, more precisely, to the share of agritourism revenues in gross farm income, as recorded in FADN, with control variables such as economic size of the farm, labour force and wages, or farm net value added per worker. The analysis is done for the EU-28, and for the V4 countries separately, to allow countrywise comparisons.

Variables used from the FADN database

The analysis uses secondary data available from the FADN Database, for 2004–2020, i.e., altogether 17 years, for 28 countries, with mean values for farms belonging to six categories of economic size, as is presented in Table 1. Our main focus is on data of the Visegrad 4 (V4) countries, i.e. the Czech Republic (CZ), Hungary (HU), Poland (PL) and Slovakia (SK), but we also use the EU-28 averages, and averages for the non-V4 countries. Variables selected for the analysis are listed in Table 1 (FADN, 2022; EC, 2021).

Statistical analyses

Annual data for 2004–2020 were used for the V4 countries separately and for the mean values of the member states of the EU (including the United Kingdom). Data were classified not only by countries but by farm economic sizes, too.

Data were analysed by descriptive statistics, correlation analysis and multiple – panel – regression analysis, using SPSS V22.0, and Microsoft Office Excel2013. The descriptive methods included comparisons of frequency distributions and means between V4 and non-V4 countries, for agritourism related series and farm performance indicators (total output, gross farm income, farm net value added, workforce, and workforce earnings).

Variable distributions were tested for normality but neither the Kolmogorov-Smirnov test, nor the Shapiro-Wilk test supported the normality assumption, either for the original data series, or the ln- or sqrt-transformed data (i.e. natural logarithm or square root of the data). Therefore nonparametric methods were chosen for statistical analysis, e.g. Spearman's bivariate correlations for finding relationships between variables.

Our data series contained countries for 17 years, for farms of different size categories, therefore the annual data values are not independent samples but panel data.

Mixed Linear Model (LMM) techniques were applied to reveal fixed and random effects of agritourism revenues and economic size, and identify

Table 1 Variables used in the analysis with FADN variable codes

Variable name and SE-code in FADN	Notation in the present analysis	Unit	Explanation
Member State	ST	country	(AT) Austria; (BE) Belgium; (BG) Bulgaria;(CY) Cyprus; (CZ) Czechia;(DE) Germany; (DK) Denmark; (EE) Estonia; (EL) Greece; (ES) Spain; (FI) Finland; (FR) France; (HR) Croatia; (HU) Hungary; (IE) Ireland; (IT) Italy; (LT) Lithuania;(LU) Luxembourg;(LV) Latvia; (MT) Malta; (NL) Netherlands; (PL) Poland; (PT) Portugal; (RO) Romania; (SE) Sweden; (SI) Slovenia; (SK) Slovakia; (UK) United Kingdom; (E8) EU-28; (E7) EU27_2020
Economic size (SE005)	Size	€'000	economic size of holding expressed in 1000 euro of standard output (on the basis of the Community typology).
Economic size category	SC	codes 1-6	by annual standard output, 1: 2,000 – <8,000 €; 2: 8,000 – <25,000 €; 3: 25,000 – <50,000 €; 4: 50,000 – <100,000 €; 5: 100,000 – <500,000 €; 6: > = 500,000 €, based on the value of size
Total labour input (SE010)	LAWU	AWU	total labour input of holding expressed in annual work units = full-time person equivalents
Total paid labour input	L_AWUpaid	AWU	total paid labour input of holding expressed in annual work units = full-time person equivalents
Total unpaid labour inpout	L_AWUunp	AWU	total unpaid labour input (i.e. family labour) of holding expressed in annual work units = full-time person equivalents
Total Output (SE131)	TO	€	total output = total value of output of crops and crop products, livestock and livestock products and of other output, including that of other gainful activities (OGA) of the farms
Gross Farm Income (SE410)	GFI	€	output – intermediate consumption + balance current subsidies & taxes
Farm Net Value Added (SE415)	FNVA	€	farm net value added = remuneration to the fixed factors of production (work, land, and capital) whether they are external or family factors
Farm Net Value Added per AWU (SE425)	FNVA_AWU	€/AWU	farm net value added per annual work unit (AWU)
Family Farm Income per FWU (SE430)	FFI	€/FWU	family farm income expressed per family labour unit. Takes into account differences in the family labour force to be remunerated per holding
Total subsidies – excluding on investments (SE605)	TSU	€	total subsidies – excluding on investments = subsidies on current operations linked to production (not investments), in €. Payments for cessation of farming activities are therefore not included
Wage paid per annual work unit	W_AWUpaid	€/AWU	wage paid to farm labour measured in annual work units
Agritourism (SE725)	ATR	€	receipts from agritourism includes returns from board and lodging, campsites, cottages, riding facilities, hunting and fishing
Agritourism revenue as % of GFI	ATRShare	%	agritourism receipts as percentage of gross farm income

Source: FADN, 2022

annual trends in family farm incomes. The unit of analysis was the group of farms of a particular size category of a particular country. Variables were applied in their standardised form (z-score values) to deal with the large differences in the value ranges.

The LMM works in the following way (IBM Corp., 2013; Landau&Everitt, 2004; Seltman, 2018; Stroup, 2013):

Let's assume that we have $i = 1...N$ subjects, e.g. farm groups. We have n measurements over time (n years) for a selected trait (y, dependent variable) for each farm group, and a set of characteristics (independent variables) for each group, also observed in n years. $X(i)$ is the matrix of independent variables for subject i, its rows containing the actual observations for the individual years.

The equation describing the relationship between the dependent and independent variables is:

$$y(i) = X(i) \times B + V(i) \times b(i) + e(i)$$

where: $y(i) = [y(i, 1)... y(i, n)]$ denote the vector of n measurements (1..., n) over time for subject i, i.e. group i, for the selected trait of this group; $X(i)$: $n \times p$ matrix of p variables and n observations for group i, representing the variables having a fixed effect on group i; $V(i)$: $n \times q$ matrix of q variables and n observations for group i, representing variables having a random effect on group i, where $V(i)$ may be a sub-matrix of $X(i)$, or a completely different set of variables; B: $p \times 1$ vector of regression parameters fixed for all groups; $b(i)$: $q \times 1$ vector of subject-specific regression parameters; $e(i)$: $n \times 1$ vector representing random effects and errors for group i.

This model was applied with the following parameters:

- $N = 24$ for V4 (4 countries $\times$ 6 size groups), and $N = 144$ (24 countries $\times$ 6 size groups) for non-V4; and $n = 17$ years;
- y: standardised (z-score) variable of FFI (farm family income per family worker);
- $X(i)$ is a matrix including the variables: Farm economic size (Size); Agritourism revenue as % of gross farm income (ATRShare); Farm net value added per annual work unit (FNVA_AWU); Wage paid per annual work unit (W_AWUpaid) (each in their standardised form); and Year (transformed to 2004 = year0, and 2020 = year16); plus the interaction of farm size and agritourism revenue percentage (ATRShare & Size), giving 6 independent variables ($p = 6$);
- $V(i)$ contains only the Year variable ($q = 1$).

Results and discussion

General features of the analysed countries – descriptives and correlations

The FADN database sample contains farms as a representative sample for earch country. This sample shows relatively uniform distributions regarding size (Table 2). In CZ, size category 1. contains no farms in the sample, the other categories (2–6) are represented by the same number of farms; and SK is very similar. The farm distribution is similar in HU and PL, farms are evenly distributed across categories, while the farm distribution in the EU-28 also follows a similar pattern.

The similar distribution of farms in the sample means, that working with these farms we refer to similar size farm groups, i.e. the analysis is not biased towards any farm size categories.

The total farm outputs (averages in 2004–2020) also vary but each country in V4 is above the EU average, PL being the lowest (114.5%), and SK the highest (234.3%), reflecting the above-average agricultural orientation of these countries, compared to the EU-average.

Workforce statistics of the V4 countries are presented in Figure 1. The left panel shows the share of paid and unpaid labour and total workforce (measured in annual work units). While in the EU-28 paid and unpaid labour per farm are nearly of the same size, the V4 countries are quite unbalanced, having 7–14 times as much paid labour than unpaid one. The only exception is Poland, where the paid/unpaid ratio is only 2.4 – still twice as much as of EU-28, but more balanced than the rest of the V4. This suggests, that in the V4 countries family labour is not easily available for farm work, either because of the age structure of farming families, or the need for external income which makes family labour less available in peak times of farming activities.

As V4 relies so much on paid labour, the share of the farm income paid to this workforce is an interesting question (see the right panel of Figure 2). Table 3 also gives the average figures of the V4 countries and the EU-28 for wage paid per annual work unit (W_AWUpaid) compared to farm net value added per annual work unit (FNVA_AWU).

Regarding wages paid per annual work unit, V4 countries are all below the EU-average in this respect, CZ being closer (85.5%), while Poland's wages are only at 46.1%. However, looking at farm net value per annual work unit, Hungary is the closest to the EU average (82.3%), and SK has the lowest figure (48.3%). This means that Hungary pays relatively low wages compared to net value added, while SK is quite generous to its paid labour force. This is illustrated by the last column of Table 3, where wages are compared to farm net value added. While the EU average shows that paid labour gets a little

Table 2 Farm size distribution and farm total output in the sample farms

Farm size categories	CZ	HU	PL	SK	EU-28
1	0.0%	16.7%	16.7%	0.0%	15.8%
2	20.0%	16.7%	16.7%	11.7%	16.8%
3	20.0%	16.7%	16.7%	22.1%	16.8%
4	20.0%	16.7%	16.7%	22.1%	16.8%
5	20.0%	16.7%	16.7%	22.1%	16.8%
6	20.0%	16.7%	16.7%	22.1%	16.8%
All farms	100.0%	100.0%	100.0%	100.0%	100.0%
Total output per farm (1,000 €)	489.7	435.7	274.4	561.6	239.7
Total output as % of EU-28 average	204.3%	181.8%	114.5%	234.3%	100.0%

Source: Author's own construction based on data from FADN, 2022

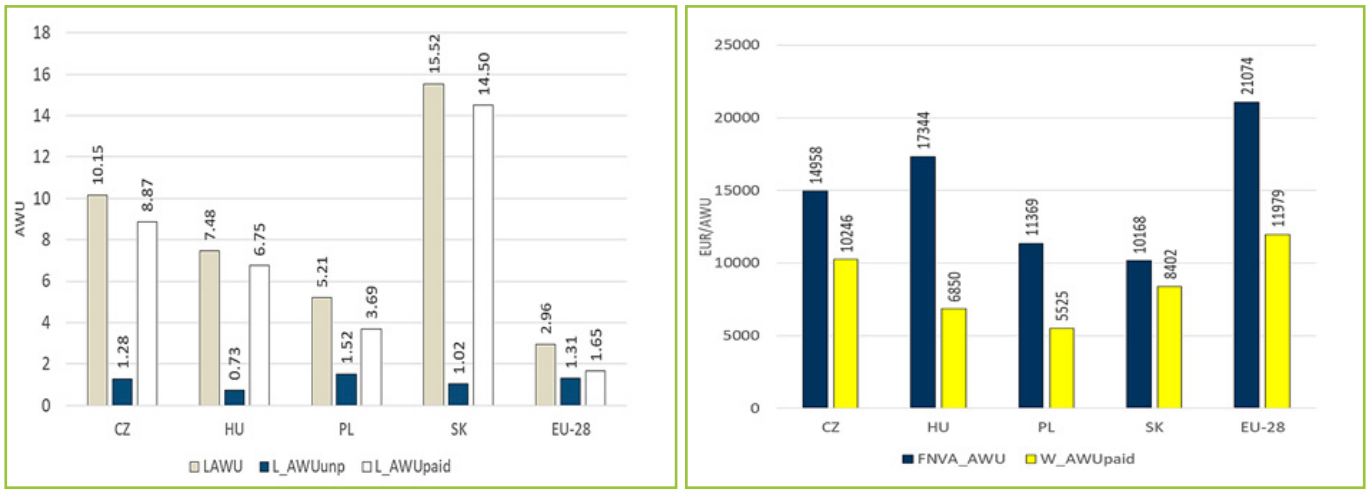

Figure 1 Workforce and incomes in V4 and EU-28
Source: Author's own construction
AWU – labour force per farm expressed in annual work units; L_AWUunp – unpaid labour per farm in annual work units; L_AWUpaid – paid labour per farm in annual work units; FNVA_AWU – farm net value added per annual work unit; W_AWUpaid – wage paid per annual work unit

more than half of the farm net value, it gets more than 80% of farm net value added in SK, (82.6%), and more than two-thirds in CZ, while this share for PL, and especially for HU, is very low. The Slovak and Czech rural labour force earns a decent income, while Polish, and especially Hungarian farm labour is badly paid, even in comparison with the EU-average.

However, these figures are all-farm averages in the countries, and may greatly vary across farm sizes. Detailed data are given in Table 4. The labour force measured in annual work units steadily grows with farm sizes. It is remarkable that the workforce indicators vary, especially in the largest size category (SC = 6), where the total labour force measured in annual work units is more 4–8 times higher than in the second largest size category (SC = 5) in V4 countries. The EU-28 average shows somewhat smaller differences in this respect.

For the V4 countries, the family farm income per family labour unit (FFI) (i.e. the income of unpaid family labour) shows similar patterns, while farm net value added per annual work unit (FNVA_AWU) is more even among the various size categories. Total agritourism revenue (ATR) varies with farm size, and its value is lower in the medium farm size categories and higher in the smallest and the largest categories. The share of agritourism revenue in gross farm income (ATRShare) shows an opposite tendency: although agritourism revenues are higher in larger farms, their share in gross farm income, and therefore their importance, is less than in smaller farms (Table 4, Figure2). This tendency differs from the EU-average, where agritourism revenue grows with farm size, although its share in gross farm income also decreases.

As our research focuses on the relationship of agritourism revenues to overall farm performance, correlation between agritourism revenue per farm (ATR) and other farm performance indicators were computed (Table 5), using Spearman's correlation coefficients (as data are not normally distributed). Correlations of performance indicators in V4 and non-V4 differ.

Agritourism variables, i.e. agritourism revenue (ATR) and agritourism revenue as a % of gross farm income (ATRShare) are very strongly correlated in non-V4 countries, but in V4 countries the correlation is smaller, though still strong. The main measures of farm performance, i.e. farm economic size category (SC), gross farm income (GFI), farm net value added per worker (FNVA_AWU), and family farm income per family worker (FFI), are strongly correlated to each other both in V4 and non-V4 group. The correlation

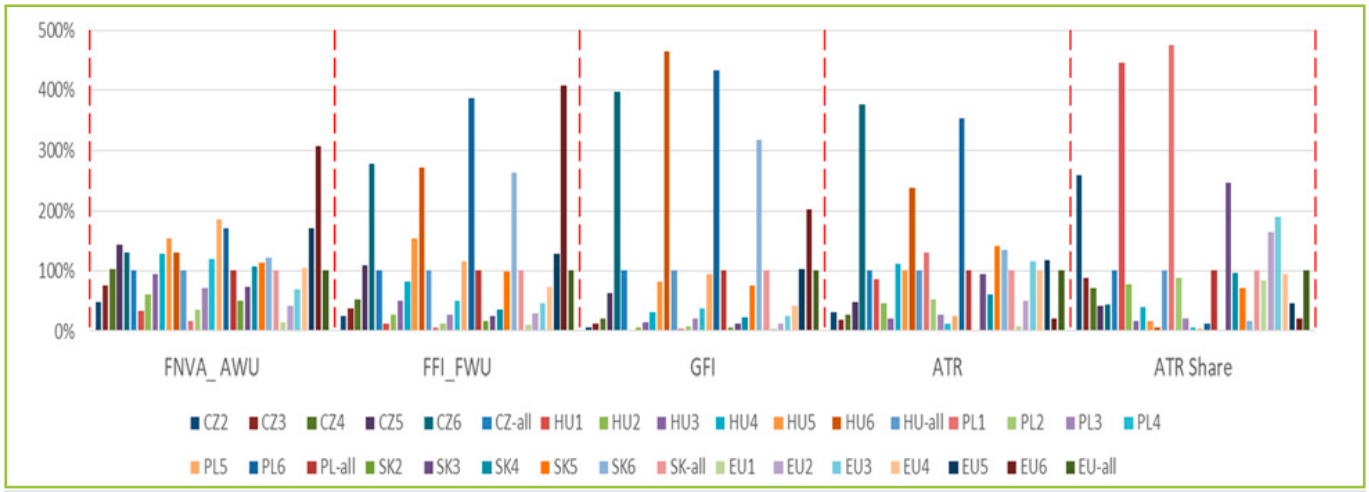

Figure 2 Farm income indicators by country and farm size, as % of country average
Source: Author's own construction
FNVA_AWU – farm net value added per annual work unit; FFI_FWU – family farm income per family labour unit; GFI – gross farm income; ATR – agritourism revenue; ATRShare – agritourism revenue as % of gross farm income; CZ2 – size category 2 for CZ, etc.

Table 3 Wage and value added in V4, mean of 2004–2020

	Wage paid per annual work unit as % of EU average	Farm net value added per annual work unit as % of EU average	Wage paid per annual work unit as % of Farm net value added per annual work unit
CZ	85.53%	70.98%	68.50%
HU	57.18%	82.30%	39.49%
PL	46.12%	53.95%	48.60%
SK	70.14%	48.25%	82.64%
EU-28	100.00%	100.00%	56.84%

Source: Author's own construction

Table 4 Mean farm indicators by country and size category (2004–2020)

State	Farm size category	Size (1000 €)	Total labour input (LAWU, heads)	Farm net value added per annual work unit (FNVA_AWU, €)	Family farm income per family labour (FFI, €)	Gross farm income (GFI, €)	Agri-tourism revenue (ATR, €)	Agritourism revenue as % of gross farm income (ATRShare,%)
CZ	2	17.68	1.25	7,155.37	6,806.67	14,229.06	325.57	2.20
	3	36.64	1.70	11,182.67	10,565.81	27,629.41	198.37	0.74
	4	72.22	2.17	15,343.04	14,645.09	47,511.88	280.46	0.60
	5	230.89	5.61	21,557.54	30,737.88	148,158.65	507.02	0.35
	6	1763.65	40.04	19,551.75	78,810.92	925,393.88	4,007.62	0.38
	total	424.22	10.15	14,958.07	28,313.27	232,584.58	1,063.81	0.85
HU	1	6.28	0.62	5,702.84	5,637.57	4,589.29	56.94	1.38
	2	16.01	0.91	10,702.68	11,833.04	11,594.71	30.19	0.24
	3	36.59	1.56	16,185.91	20,874.04	29,925.00	14.33	0.05
	4	72.04	2.29	22,202.20	34,126.87	60,447.24	74.20	0.12
	5	207.02	4.90	26,877.91	65,647.36	157,930.82	67.29	0.05
	6	1,636.44	34.59	22,394.53	115,043.69	902,508.24	159.33	0.02
	total	329.06	7.48	17,344.34	42,193.76	194,499.22	67.05	0.31
PL	1	6.62	1.26	1,995.58	1,816.65	4,511.76	116.45	2.61
	2	15.38	1.60	4,005.64	3,746.55	9,740.59	46.11	0.48
	3	36.08	1.96	8,138.23	8,079.12	22,004.06	24.24	0.11
	4	69.49	2.30	13,603.49	14,618.02	41,088.47	10.66	0.03
	5	177.79	3.92	21,077.64	32,818.20	100,273.12	21.81	0.02
	6	1,063.65	20.22	19,390.91	111,546.41	461,527.65	316.79	0.07
	total	228.17	5.21	11,368.58	28,770.83	106,524.27	89.34	0.55
SK	2	19.86	2.36	5,061.32	4,697.01	15,668.20	0.00	0.00
	3	37.18	2.59	7,444.22	7,333.12	30,756.65	1,020.31	2.89
	4	73.09	3.61	10,765.72	10,320.46	58,057.18	664.62	1.13
	5	242.51	11.27	11,521.17	28,277.12	191,018.41	1,546.05	0.82
	6	1,468.86	48.49	12,440.87	75,752.55	805,639.76	1,454.78	0.19
	total	425.58	15.52	10,167.54	28,658.91	253,854.32	1,091.20	1.17
EU-28	1	5.73	1.12	3,237.09	3,028.09	5,132.75	41.30	0.84
	2	15.69	1.25	8,622.41	8,166.01	14,075.94	229.43	1.66
	3	36.86	1.47	14,508.72	13,498.72	28,306.94	530.45	1.91
	4	72.57	1.71	22,176.22	20,990.14	49,835.59	465.20	0.95
	5	212.83	2.53	35,949.73	36,641.56	119,662.88	546.01	0.46
	6	1,145.54	9.55	40,899.61	88,317.77	476,903.12	941.60	0.20
	total	250.60	2.96	21,073.83	28,691.99	116,747.13	463.13	1.00

Source: Author's own construction

Table 5 Correlations between agritourism revenue, incomes and farm size (2004–2020)

	Spearman's correlation	SC	ATR	ATRShare	GFI	FNVA_AWU	FFI	W_AWUpaid
Non-V4	SC	1.000	.193**	-.054*	.970**	.808**	.852**	.328**
	ATR	.193**	1.000	.934**	.231**	.354**	.173**	.479**
	ATRShare	-.054*	.934**	1.000	-.021	.125**	-.055*	.357**
	GFI	.970**	.231**	-.021	1.000	.861**	.897**	.364**
	FNVA_AWU	.808**	.354**	.125**	.861**	1.000	.809**	.632**
	FFI	.852**	.173**	-.055*	.897**	.809**	1.000	.223**
	W_AWUpaid	.328**	.479**	.357**	.364**	.632**	.223**	1.000
V4	SC	1.000	.266**	-.312**	.982**	.671**	.784**	.568**
	ATR	.266**	1.000	.761**	.320**	.085	.111*	.544**
	ATRShare	-.312**	.761**	1.000	-.268**	-.309**	-.358**	.185**
	GFI	.982**	.320**	-.268**	1.000	.709**	.808**	.635**
	FNVA_AWU	.671**	.085	-.309**	.709**	1.000	.842**	.592**
	FFI	.784**	.111*	-.358**	.808**	.842**	1.000	.541**
	W_AWUpaid	.568**	.544**	.185**	.635**	.592**	.541**	1.000
EU-28	SC	1.000	.207**	-.085**	.972**	.773**	.841**	.322**
	ATR	.207**	1.000	.916**	.247**	.306**	.165**	.432**
	ATRShare	-.085**	.916**	1.000	-.052*	.064**	-.095**	.300**
	GFI	.972**	.247**	-.052*	1.000	.818**	.882**	.351**
	FNVA_AWU	.773**	.306**	.064**	.818**	1.000	.801**	.635**
	FFI	.841**	.165**	-.095**	.882**	.801**	1.000	.245**
	W_AWUpaid	.322**	.432**	.300**	.351**	.635**	.245**	1.000

Source: Author's own construction

** correlation is significant at the 0.01 level (2-tailed); * correlation is significant at the 0.05 level (2-tailed)

SC – size category; ATR – agritourism revenue; ATRShare – agritourism revenue as % of gross farm income; GFI – gross farm income; FNVA_AWU – farm net value added per annual work unit; FFI – family farm income per family worker

between wages (W_AWUpaid) and the above listed farm performance indicators is only of medium strength. The share of agritourism revenue in gross farm income is negatively correlated to farm performance indicators in the V4 group, but uncorrelated, or slightly positively correlated in the non-V4 group. This means, that in V4 the more efficient farms are less involved in agritourism, while this pattern does not exist in the non-V4 group.

Time dynamics of farm performance and agritourism revenues

Figure 3 shows the time patterns of the following indicators: Total Output (TO), Gross Farm Income (GFI), Agritourism revenue (ATR), Farm net value added per annual work unit (FNVA_AWU), Agritourism revenue as % of gross farm income (ATRShare), Family farm income per family labour unit (FFI), and Wage paid per agricultural work unit (W_AWUpaid).

The time trends of Total output and Gross farm income are similar in EU-28 and the V4 countries, though values in CZ, HU and SK are much higher than in the EU-28 and PL. This is probably due to the larger average farm sizes in CZ, HU and SK than in the rest of the EU. Farm net value added per labour is lower in V4 than the EU-28 average, again with HU getting quite close to it by the end of the period, and the other three V4-countries also catching up, though at a slower rate.

Agritourism revenue is outstanding in CZ and SK, especially after 2015, and the EU-28 also shows an increasing tendency after this date, while PL and HU have rather low values. The similar tendencies reflect the similarities of the external environment, namely, the agricultural and related support available for the EU-28 countries, and the differences reflect the countrywise efficiencies of utilising this funding, as well as the strength of traditional agriculture in the assessed countries.

The relationship between agritourism revenue and gross farm income differ considerably by countries, the agritourism revenue range is under 500 € in HU, the EU-28 average is up to 800 €, with CZ and SK ranging up to around 2,500 €.

On average the share of Agritourism revenue in gross farm income is slowly increasing in the EU – except for the Covid-impacted last year -, from under 1% to around 1.5 %, and CZ shows a similar pattern. The other three countries show similar trends up to 2013, with HU showing an extreme 2% value in 2009, but then the increase does not continue, and by 2019–2020 their ratios are back to 0.5% (with an extreme 4.5% ratio in 2015 for SK). The impacts of COVID are seen in the decrease for all countries from 2019 to 2020.

Regarding family farm income per family labour unit, country patterns are rather varied, with a general increasing trend, but SK fluctuating a lot more than the other countries. The wage paid per labour values are similar to the EU-28 in the V4 countries, with a rising tendency, but again the EU average is well above the V4 values, while CZ and SK seem to catch up by 2019, and HU and PL are still at only 50 % of the EU wage level by 2019 and 2020.

These somewhat complicated patterns suggest that more complex relationships exist between variables and countries than the ones indicated by the bivariate correlations, therefore a multivariate panel regression is carried out.

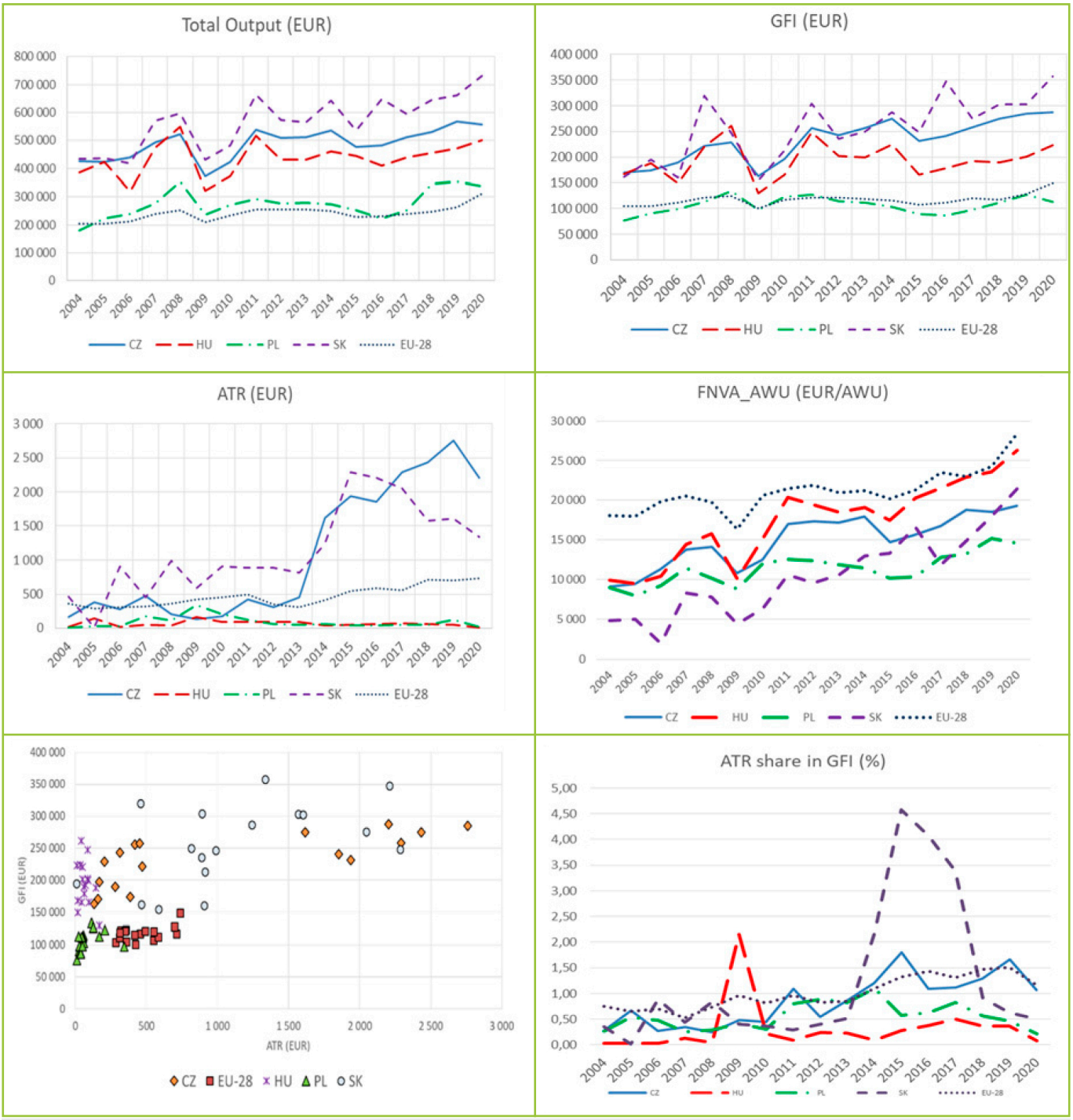

Figure 3a Time dynamics of various indicators in V4 countries

Source: Author's own construction

TO – total output; GFI – gross farm income; ATR – agritourism revenue; FNVA_AWU – farm net value added per annual work unit; ATRShare – agritourism revenue as % of gross farm income; FFI_FWU – family farm income per family labour unit; W_AWUpaid – wage paid per agricultural work unit

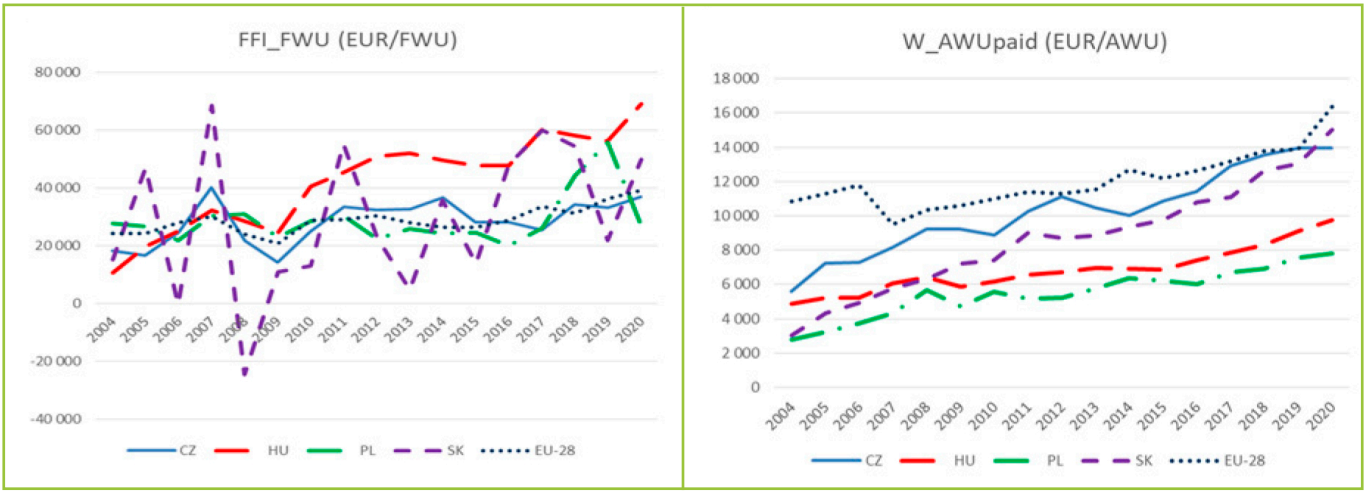

Figure 3b Time dynamics of various indicators in V4 countries
Source: Author's own construction
TO – total output; GFI – gross farm income; ATR – agritourism revenue; FNVA_AWU – farm net value added per annual work unit; ATRShare – agritourism revenue as % of gross farm income; FFI_FWU – family farm income per family labour unit; W_AWUpaid – wage paid per agricultural work unit

Panel analysis

The panel regression was focused on identifying the influence of agritourism revenues (ATRShare) on family farm incomes per family labour unit (FFI), distinguishing its impact from that of time, farm net value per worker (FNVA_AWU), farm size, wages paid to external labour (W_AWUPaid) as other independent control variables. The choice of the independent variables was based on the results presented earlier in this paper. Time patterns were shown in Figure 3a, b, farm size was found to be correlated to various income categories and to Agritourism revenues, while Farm net value added per labour was found to correlate strongly with family farm income per family labour, both in V4 and non-V4 countries. As Farm net value added per labour (FNVA_AWU) was also correlated to Gross farm income, this latter variable was omitted to avoid multicollinearity problems. Agritourism revenues were included not as absolute values, but in proportion to Gross farm income, to reveal the weight of this activity in overall farm performance. Finally wage paid per labour was included because the compensation paid to labour from farm net value added per labour influences the income of unpaid family labour.

All variables except year were used in their standardised forms. Year was transformed so that 2004 as the starting year was recoded to 0, and 2020 was recoded to 17. The relationships were derived separately for V4 and non-V4 countries. Table 6 shows the results of the panel regressions for the two country groups (V4 and non-V4).

The overall results are partly similar and partly different for the two groups. The significant positive fixed effects of farm net value added per annual work unit (FNVA_AWU) and Size, and the significant negative fixed effect of wage paid per annual work unit (W_AWUpaid) are similar for V4 and non-V4. This means that the family farm income per person is higher in larger farms and in farms having larger farm net value per worker, but the higher wage paid to external labour, the smaller the family farm income per family labour unit (FFI) value becomes. This is quite in agreement with what was expected. However, the two country groups differ in the fixed effects of

Table 6 Results of the panel regression

Dependent variable: Z-FFI	V4 countries			Non-V4 countries		
Parameter	estimate	std. err.	sig.	estimate	std. err.	sig.
Estimates of fixed effects						
Z-FNVA_AWU	.638840	.08429	.000	.314878	.02951	.000
Z-W_AWUpaid	-.150396#	.08377	.075	-.326530	.02949	.000
Z-ATRShare	-.262054	.13277	.050	.144187#	.07801	.065
Year (2004: year = 0; 2020: year = 16)	.002797	.00467	.555	.010799#	.00551	.052
Z-size	.128254	.06295	.046	.551367	.04641	.000
Z-ATRShare & Z-Size (interaction)	-.577221	.23605	.016	.261268#	.15631	.095
Random effect variances						
Residual	.158233	.01227	.000	.332108	.01093	.000
Year (2004: year = 0; 2020: year = 16)	.000236	.00013	.060	.003335	.00045	.000
R^2	0.8317			0.7674		

Source: Author's own construction
– effect significant only at 0.1 significance level
FFI – family farm income per family labour unit; FNVA_AWU – farm net value added per annual work unit; W_AWUpaid – wage paid per annual work unit; ATRShare – agritourism revenue as % of gross farm income; size – economic size of farm; Z-values – standardised values

agritourism revenue as % of gross farm income (negative in V4 and positive in non-V4), Year (no effect in V4 and positive effect in non-V4), and in the fixed effects of the interaction of size and agritourism revenue as % of gross farm income (negative in V4 and positive in non-V4). This means that the higher the share of agritourism in gross farm income, the lower the family farm income in V4, while the effect is the opposite in non-V4. The family farm income significantly increases with time in the non-V4 group, but no significant change is experienced in the V4 countries. The interaction term indicates that for larger farms the negative impact of agritourism is smaller in V4, while the positive impact of agritourism is larger in the non-V4 group.

Based on the Estimates column the following equations can be derived for the two country groups, V4 and non-V4 (# indicates effects significant only at 0.1 significance level):
V4:

$$\text{Z-FFI} = 0.638840 \times \text{Z-FNVA\_AWU} + (-0.150396) \times \text{Z-W\_AWUpaid\#} + (-0.262054) \times \text{Z-ATRShare} + 0.128254 \times \text{Z-size} + (-0.577221) \times (\text{Z-ATRShare \& Z-size})$$

Non-V4:

$$\text{Z-FFI} = 0.314878 \times \text{Z-FNVA\_AWU} + (-0.326530) \times \text{Z-W\_AWUpaid} + 0.144187 \times \text{Z-ATRShare\#} + 0.010799 \times \text{Year0\#} + 0.551367 \times \text{Z-Size} + 0.261268 \times (\text{Z-ATRShare \& Z-size}) \#$$

We can conclude, that the share of Agritourism revenue in gross farm income (ATRShare) has a significant impact on family farm incomes (FFI) in V4, and this impact is negative, i.e. one standard deviation increase in the share of Agritourism revenue in gross farm income (ATRShare) will decrease the Family farm income per family work unit (FFI) value by 0.262 standard deviation. This impact is modified by farm size, i.e. the larger farm sizes add further negative impact. The situation is exactly the opposite in non-V4 countries, the larger Agritourism share and the larger farm size lead to higher family farm income values.

The Farm net value added per annual work unit (FNVA_AWU) values positively influence family farm income (FFI), but the impact is twice as large in V4 as in non-V4 countries. The wages paid to employed workers have a negative impact (reasonably) on family farm incomes, but the negative impact in V4 is only the half of that in non-V4. Farm size effects are positive, but here the effect in non-4 countries is more than 5 times as strong as in V4. For non-V4 countries annual increase of Family farm income per family work unit is also significant, thought the extent of annual growth in the non-V4 is only 0.01 standard deviation in family farm income per family work unit (FFI). In V4 no significant change can be observed with time, besides the influence by the other independent variables. However, the year has significant random effect, so random variation exists in each year around the mean fixed effects described above. Residuals are also significant, indicating considerable unmeasured effects.

We may conclude that agritourism revenues expressed in proportion to gross farm income are related to family farm income per person, and in V4 countries this relationship is negative: more share of agritourism in gross farm income is related to smaller family farm incomes – i.e. it is the poorer farms that rely increasingly on agritourism for their livelihood. In non-V4 countries this is clearly different, the larger share of agritourism revenue in gross farm income is associated with larger family farm incomes. This result is particularly interesting, as simple correlation was unable to reveal this positive relationship. This is probably the sign of a more business-like approach to agritourism in the non-V4 countries, while in V4 countries agritourism is treated as an additional income source for farms less successful in traditional agricultural production.

Conclusions

The present research was aimed at analysing the importance of agritourism in farm level incomes in the V4 countries. The analysis was based on secondary data available in the FADN database of the European Union, for the years 2004–2020. Data were used in their absolute values and also in standardized form (z-score) to compare data series of greatly differing ranges. Statistical analysis included frequency distributions, correlation analysis and panel regression, comparing countries by their overall means, annual changes and also their farm sizes measured by standard output. The analysis compared V4 countries to the EU-28 average, and to non-V4 countries as a group, too. The analysis of the farm labour structure revealed that V4 countries rely far more on external labour than non-V4 countries. Incomes and wages generated by V4 farms are considerably below the EU-average, as well as farm net value added per annual work unit (FNVA_AWU), indicating much lower rural incomes in the V4 countries.

Considering the role of agritourism in rural incomes, simple correlation analysis indicated, that in the non-V4 countries the share of agritourism in gross farm income (ATRShare) is practically uncorrelated with farm size, farm net value added per annual work unit (FNVA_AWU), family farm income per family labour unit (FFI), and gross farm income (GFI). However, a medium-size negative correlation holds for them in V4. These correlations, being computed from pooled data, fail to reveal the changes by time, or the differences between small and large farms. Therefore a detailed panel regression was carried out, for the group of the V4 countries, and the group of non-V4 countries, separately.

The panel regression was focused on identifying the role of agritourism revenues in family farm incomes per family labour units, including farm net value added per annual work unit (FNVA_AWU), size, wages paid to paid labour (W_AWUpaid) and agritourism revenue share in gross farm income as independent, control variables, together with some interactions, and time dynamics.

We can conclude, that in the V4 group the share of agritourism revenue in gross farm income significantly – and negatively – relates to family farm incomes (per family labour units), meaning that agritourism revenues are more important in the gross farm income when family farm incomes are smaller. In larger farms (measured by economic size or farm net value-added) the family farm income is higher, but the larger agritourism share can decrease the positive impact of size, meaning, that larger farms with more agritourism revenues achieve lower family farm incomes than those dealing with traditional agricultural production. The non-V4 countries differ from the above. In these countries the share of agritourism revenue in gross farm income significantly increases family farm incomes (per family labour units), meaning that the larger the share of agritourism in gross farm income, the higher the family farm income. In larger farms (measured by economic size or farm net value-added) the family farm income is higher, and the larger agritourism share can further increase the positive impact of size, meaning, that larger farms with more agritourism revenues achieve higher family farm incomes, than those dealing with traditional farming. This means that agritourism is generally a more business-oriented activity in non-V4 countries, and is associated with large farms, while it is seen as an additional income in V4 countries, dealt with by small farms, with low family incomes, having less resources and weaker income generating capacities. The family

farm income shows a significant annual growth in the non-V4 group but none in the V4 group.

The results of our analysis for non-V4 countries – including large, developed member states – are similar to Barbieri and Mshenga (2008) ad Bagi and Reeder (2012) about the USA, stating that for larger and more profitable farms the involvement in agritourism is associated with higher incomes. Regarding V4 countries, the general finding is that farms involved in agritourism are usually profitable (Roman and Grudzień, 2021; Kania and Bogusz, 2016; Roman, Roman and Prus, 2020; Habán, Macák and Otepka, 2012; Mura and Kljucnikov, 2018; Dömeová and Jindrová, 2011; Škodová Parmová and Dvořák, 2009; Kovács, 2020; Szabó, 2005), though most of these results refer to specific regions of particular countries and shorter time periods. However, this does not say anything about the importance of agritourism revenues within gross farm income. The contribution of our results to earlier findings is, that besides dealing with 17 years of data and four countries, agritoursm revenues are analysed in comparison to their share in gross farm income. Our findings show that although agritourism revenue is positively associated with gross farm income and farm net value added per labour, countries, the higher share of agritourism within gross farm income, the less family farm income per person is generated in the farm in the V4 countries. This points to the fact, that agritourism is seen as an additional income source for farms not very successful in traditional agricultural production, rather than a profitable business activity by itself. The revealed patterns are based on 17 years of data, and clearly indicate different relationships between agritourism and farm profitability for the V4 and the non-V4 group. These differences are probably related to the historical evolution of farming and farm structures, but further research is needed to identify their explanation.

The main limitation of the present study is the handling of the V4 countries as a homogeneous group. As Figure 3. revealed, there are considerable differences between the V4 countries. Further analysis will be done to reveal the relationship between agritourism and family farm income separately for each of the four countries and this may also provide insight to the differences found between the V4 and the non-V4 country groups.

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Contact address

Zsuzsanna Bacsi, Hungarian University of Agriculture and Life Sciences (MATE), Gödöllő, Georgikon Campus, Keszthely, Hungary, H- 8360 Keszthely, Deák F u. 16

bacsi.zsuzsanna@uni-mate.hu; h5519bac@ella.hu