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Are the incomes of agricultural households lagging behind? Evidence from Czechia

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ABSTRACT

The aim of this article is to compare the income of agricultural households with the income of other economically active households in Czechia and to determine the extent to which a difference can be explained by the difference in household characteristics. The research was carried out on the basis of the Czech SILC survey (2005–2016). To determine the level of poverty of agricultural households, we used the Foster– Greer–Thorbecke poverty measures. To decompose the income gap, we used Blinder-Oaxaca decomposition in the modification for longitudinal data. The incomes of agricultural workers are lower compared to other sectors, and this difference was also reflected in the equalised household incomes. Households differ in the poverty rate, but do not differ in the depth of poverty. The income gap can be explained by the difference in household characteristics of only 20%, with education and the type of occupation having the most significant influence.

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1. Introduction

Agricultural households support employment and generate income in the economy in general in many ways. Through agricultural production, they contribute to local demand for labour, support income and employment in companies in the food chain. They also contribute to the wider economy through non-agricultural activities, including on-farm diversification, non-agricultural work of household members and household's own consumption. The extent to which these activities benefit the micro-region depends on demand and supply factors, including household spending patterns, opportunities for local off-farm employment and the number and extent of local shops. The contribution of agricultural households to local economies is likely to vary between areas depending on the nature of the agricultural economy and the structure of the local economy (Roberts et al., 2013).

The share of the labour force in agriculture fluctuates much more than in other sectors, which is related to some peculiarities of the agricultural sector. In many

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countries, agricultural employment is mainly self-employed farmers who do not report wages and profits separately and do not report the work of other members of the household. This significantly affects differences in labour productivity depending on the structure of the agricultural enterprise. According to a study by Kónya et al. (2020), this may mean that a farmer's total income is lower than a farm employee's wage. In some cases, the total value added per person employed in agriculture is even lower than the minimum wage.

Migration between rural and urban areas is an integral part of urbanisation and economic development and results in the redistribution of human capital. In addition to the positive effects on productivity and income growth, migration causes a brain drain in rural regions, reduces production, increases the price of agricultural products and increases income inequality in rural and urban areas (Wang & Fu, 2019). The reduction of agricultural workers is causing an outflow of younger and more educated employees in particular. In this context, the disparity of incomes of agricultural households in comparison with other sectors of the national economy appears to be a key aspect of this phenomenon.

Although EU agricultural policy places a strong emphasis on the economic benefits of maintaining a strong agricultural sector, relatively little research focuses on agricultural households, especially their benefits to local economies or their incomes (Roberts et al., 2011). Especially due to the specific characteristics of the agricultural sector (Gardner, 1992), one of the main objectives of agricultural policy concerns the distribution of farm incomes. Income from the farm is only part of the household income and the relative importance of income outside the farm is growing over time. Thus, the diversification of income sources of farmers and their households requires that all their disposable income be monitored and analysed, not just agricultural income (Divila & Doucha, 2005). Focusing on household income could yield different results in terms of the scope and direction of the role of direct payments (Severini & Tantari, 2015).

Most farms in Europe are family businesses, defined as businesses where the family – usually a household – owns, manages and supplies most of the labour, land and capital (Wauters & de Mey, 2019). Czech agriculture differs in many respects from other EU countries. The main differences are the larger average size of the farm, the high degree of leased land, and the high representation of legal entities. According to Czech Statistical Office data (CZSO, 2018a), large enterprises manage 66% of the total area of agricultural land. The size of agricultural entities is also related to the largest volume of labour force per enterprise and, conversely, the low share of labour force per area of cultivated land.

The agricultural sector is closely related to the rural areas. In Czechia, 4.7% of workers were employed in agriculture in 2001; while in the rural areas this share was 11.1% (Zdeněk & Střeleček, 2012). Divila and Doucha (2005) compared the incomes of agricultural and other households. According to family accounts statistics for 2003, agricultural households lagged behind non-agricultural households in terms of monetary income. This lag was particularly significant for agricultural households of self-employed persons (27%) and 12% in households headed by employees.

Wages of workers in agriculture lag far behind the average. Table 1 shows the shares of the average gross wage in agriculture to the average wage in the Czech

Table 1. The share of the average gross monthly wage in agriculture to the Czech average.

Year	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16
Share (%)	79	80	76	74	76	76	76	77	79	76	77	78	79	82	83	81	82
Rank (of 19)	18	17	18	18	17	17	17	17	17	17	16	17	16	15	15	16	16

Source: Czech Statistical Office, Wages – time series, https://www.czso.cz/csu/czso/pmz_ts.

Republic (based on the wage per full-time equivalent employee). Between 2000 and 2016, this share fluctuated between 74% and 83%. The next row shows the order of the agriculture in descending order of CZ-NACE sections according to the average wage. Agriculture is located in the 15th to 18th order of 19 sections.

The following research questions therefore arise from the above text to which we would like to try to answer in this article.

1. The wage of agricultural workers is lower compared to other sectors of economic activity. Will this difference have a significant effect on household income? Will it also affect the poverty rate and poverty depth?
2. If there are differences in the incomes of agricultural households and other economically active (i.e., non-agricultural) households, to what extent can this difference be explained by differences in personnel, household and job characteristics such as education, experience, or occupation?

The rest of the article is organised as follows. The Section 2 specifies dataset, variables used, and poverty measures and method for the decomposition of differences in income between agricultural households and other economically active households. The next section presents the main results of the characteristics of agricultural households, their structure, distribution, localisation, development of their income, measures of poverty and decomposition of the income gap. The final section contains conclusions.

2. Data and methods

2.1. Database and variables used

After accession to the EU, the Czech Statistical Office has been providing a statistical survey called Living Conditions since 2005, in accordance with European legislation, which is a national modification of the EU-SILC (Statistics on Income and Living Conditions). In accordance with the Regulation of the European Parliament and the Council of the European Union, it is also provided by other EU Member States (Regulation, 2005). The purpose of the survey is to obtain representative data on the income distribution of particular types of households, the at-risk-of-poverty rate of various groups of people, data on the manner, quality and financial demands of housing, household equipment of long-term objects and working, material and health conditions of adults living in households. The sample unit is an apartment. The selection is done by random selection in two stages. The survey units are the households consisting of persons jointly paying the costs of their needs, who usually live in the selected dwelling. The questionnaire consists of several parts, the questions are asked

both at the level of individuals and entire households. The survey is conceived as a rotating panel – selected households are repeatedly visited at an annual interval for four years, with approximately one quarter of them changing every year (CZSO, 2021).

The SILC 2005 survey contains data current at the time of the investigation, i.e., in May 2005, the income is for the whole year of 2004, etc. In this article, the labels represent the years of the SILC statistical survey. We used the following variables from the SILC survey:

- Branch of activity of the head of household – used to identify agricultural households and other economically active households.
- The number of consumer units (*CU*) which represents the household size (the head of the household has the weight of 1, children under 13 have the weight of 0.3 and other members 0.5 – the OECD-modified scale[1]).
- Number of household's members.
- Labour, social, other incomes – this breakdown is used to calculate the structure of income by source.
- Number of inhabitants of the municipality (categorised) is used for the distribution of agricultural households in size groups of municipalities.
- Household's net monetary income in CZK per year (*NI*). It includes gross income from the work (both employment and business) of all household members, social incomes and other income minus health and social insurance and income tax. Equalised net income (ENI) of the household (i.e., converted to one consumption unit) in CZK per year is determined using the relationship

$$ENI = NI/CU. \tag{1}$$

- The coefficient (calibration weight) for the recalculation of results from the sample to the whole population.

Other variables that are used to explain the gap in incomes between agricultural and non-agricultural households are given in the section on Blinder-Oaxaca decomposition.

2.2. Definition of an agricultural household

As Davis et al. (1997) points out, it is difficult to establish a common definition of agricultural households across the EU According to Hill (1996), the definition of an agricultural household can be based on:

- the income composition of the entire household;
- the basis of main source of income of household's reference person (that is typically the head of household or the largest contributor to the family budget);
- the basis of declared occupation of the reference person;
- the basis of farming households (households that operate agricultural holdings).

Similarly, the OECD Glossary of statistical terms defines an agricultural household as 'A household is considered to be an agricultural household when at least one member of the household is operating a holding (farming household) or when the household head, reference person or main income earner is economically active in agriculture'.[2] Hill (2012, p. 224) specifies that the number of households where the main income of the reference person comes from farming (i.e., a 'narrow' definition) is substantially smaller than the number of households where there is some income from farming (i.e., a 'broad' definition), and generally smaller than the number of agricultural holdings according to the EU figures. In the long term, absolute numbers of 'narrow' agricultural households have been decreasing. The classification of households based only on self-employed persons (such as in Marino et al., 2021 or Rocchi et al., 2021) would be unsuitable in the case of the Czech Republic due to the low representation of self-employed farmers and the high share of employees in agricultural companies (more on the structure is given in the Section 3).

In this article we have adopted an approach where we consider a household to be an agricultural household when its head declared occupation in agriculture or in related branches of forestry or fishery.

2.3. Low incomes and poverty

Poverty research is based on the ability to define and measure poverty, but both the definition and measurement of poverty are associated with a number of problems. These are always certain concepts of poverty. The method of defining poverty then determines who is poor and its extent in society (Mareš & Rabušic, 1996). These concepts are classified according to several criteria. In relative definition, low-income households are usually considered to be those whose income is lower than the specified quantile of the income distribution or a certain share of the median or average of income. In CZSO and EUROSTAT publications, the poverty line is 60% of the median of equalised income, which will also be used in this article.

2.4. Poverty measures

To measure poverty, we used indicators from the Foster–Greer–Thorbecke (FGT) group of poverty rates (Foster et al., 1984). The basic indicator is the poverty rate (Wolff, 2009; Želinský, 2014), which relates the number of households with income below the monetary poverty line to the total number of households. In the case of using calibration weights, the poverty rate (P_{0w}) corresponds to the relation:

$$P_{0w} = \frac{\sum_{\forall i | y_i < z} w_i}{\sum_{i=1}^{n} w_i}, \tag{2}$$

where y_i is the equalised income of the i-th household, w_i is the calibration weight of the household and z is the poverty line. The poverty rate indicator measures the extent of poverty, but does not say anything about its intensity. The poverty gap ratio (also called income deficiency index) (Wolff, 2009) expresses the average relative

distance of households with incomes below the poverty line to this threshold. The poverty gap ratio including calibration weights (R_w) is calculated as:

$$R_w = \frac{1}{\sum_{\forall i|y_i<z} w_i} \sum_{\forall i|y_i<z} \frac{z-y_i}{z} \cdot w_i \tag{3}$$

where y_i is the equalised income of the i-th household, w_i is the calibration weight of the household and z is the poverty line. Summation is only performed for households under the poverty line. The poverty gap ratio takes values from 0 (in this case, poor households have incomes at the poverty line) to 1 (all households in this group have zero incomes).

2.5. Blinder–Oaxaca decomposition

The Blinder–Oaxaca decomposition is an often used methodology to study labour-market outcomes by groups (sex, race, etc.; Brzezinski, 2018; Laborda et al., 2019; Zhang et al., 2020; Dang & Nguyen, 2021). It allows to decompose mean differences in income based on linear regression models (Ben, 2008). Blinder-Oaxaca (Blinder, 1973; Oaxaca, 1973; but also known as Kitagawa-Blinder-Oaxaca) decomposition divides the income differential between two groups into a part that is 'explained' by group differences in explanatory variables (such as age, education, experience, productivity, etc.), and a residual part that cannot be accounted for by such differences in income determinants. This 'unexplained' part is often used as a measure for discrimination, but it also subsumes the effects of group differences in unobserved predictors. In addition, this unexplained component can be positive or negative (or more precisely explained and unexplained component can have different signs), which means that discrimination can be positive or negative (Tárrega et al., 2010).

The basic principle of this decomposition is based on the following equations. For example, assume two groups (A and B), the dependent variable (Y) is their income (log income respectively), and as predictors (X) are human capital indicators. The question is how much of the difference in means of dependent variable (R) is accounted for by group differences in the predictors:

$$R = E(Y_A) - E(Y_B). \tag{4}$$

Starting with linear models:

$$Y_g = X_g^T \beta_g + \varepsilon_g,\ E(\varepsilon_g) = 0,\ \mathrm{cov}(X_g, \varepsilon_g) = 0,\ g \in \{A, B\}, \tag{5}$$

the difference in means of dependent variable can be expressed as the difference in the linear prediction at the group-specific means of the regressors:

$$R = E(Y_A) - E(Y_B) = E(X_A)^T \beta_A - E(X_B)^T \beta_B. \tag{6}$$

This equation can be rearranged into a decomposition of three[3] parts to identify the contribution of group differences in predictors to the difference in means of a

dependent variable. The first component (E) amounts to the part of the difference that is due to group differences in the predictors (so called endowments effect). The second component (C) measures the contribution of differences in the coefficients. And the third component (I) is an interaction term accounting for the fact that differences in endowments and coefficients exist simultaneously between the two groups.

$$R = \underbrace{[E(X_A) - E(X_B)]^T \beta_B}_{E} + \underbrace{E(X_B)^T (\beta_A - \beta_B)}_{C} + \underbrace{[E(X_A) - E(X_B)]^T (\beta_A - \beta_B)}_{I}. \quad (7)$$

The analysis often involves not only the complete decomposition of the difference into an explained and unexplained part, but also the detailed contribution of individual predictors or sets of these predictors (Ben, 2008).

When working with longitudinal data (which is our data sample), there are two ways to decompose the difference between groups. The first method explores the contribution of past changes or events to the *levels* of output differences between groups A and B at the time t. The second method is to decompose the *change* in group differences between the groups A and B between times s and t (Kröger & Hartmann, 2021). In the case of level decomposition, essentially nothing changes on the original Blinder–Oaxaca decomposition. If we have discrete time points (waves in the survey), then the procedure is identical to the repeated cross-sectional approach. Several approaches have been derived in the past for the analysis of change.

The method of decomposition of levels is used to answer the second research question (i.e., whether a possible difference in the income of agricultural and other economically active households can be explained by the difference in households' characteristics). Then the decomposition formula must take empirical group differences in time-constant individual error terms into account.

$$Y_{g,t} = X_{g,t}^T \beta_{g,t} + u_g + \varepsilon_{g,t},\ E(\varepsilon_{g,t}) = 0,\ \mathrm{cov}(X_{g,t}, \varepsilon_{g,t}) = 0,\ g \in \{A, B\} \quad (8)$$

Taking the time-constant error-terms into account adds the differences in the expectation of u_g as a fourth component U to the decomposition. This component comprises differences between groups in the time-constant error terms and is not time-dependent (Kröger & Hartmann, 2021):

$$R_t = \underbrace{[E(X_{A,t}) - E(X_{B,t})]^T \beta_{B,t}}_{E_t} + \underbrace{E(X_{B,t})^T (\beta_{A,t} - \beta_{B,t})}_{C_t} +$$

$$+ \underbrace{[E(X_{A,t}) - E(X_{B,t})]^T (\beta_{A,t} - \beta_{B,t})}_{I_t} + \underbrace{E(u_A) - E(u_B)}_{U} \quad (9)$$

In line with previous studies that have analysed the gap in income, the dependent variable in this analysis is the logarithm of the equalised annual income. The logarithmic transformation is used here to eliminate high skewness in household income data. Furthermore, for the purpose of estimating the parameters of the regression

model, the first and last percentiles according to the ENI were cut out each year from the data sample. This removed the extreme values that occur in income distributions (especially on the right tail).

The choice of explanatory variables is given by economic theory and empirical context and is based on the model of human capital. Several are based on the characteristics of the head of the household, several describe the household as a whole. The variables used to model a household income level are the level of education (at household level – basic/secondary/high); type of employment (based on the occupational group of the head of household, here aggregated into groups: soldiers/higher professionals/lower professionals/administrative staff/skilled workers/auxiliary and unskilled workers); sex of the head of the household, age of the head of the household expressing work experience (categorised into groups up to 29 years, 30 – 39 years, 40 – 49 years, 50 – 59, 60 and more years); household size (number of household members and number of dependent children). The independent trend of income dynamics is expressed by the variable year, which enters the model as a factor variable. The breakdown of income differences is performed between a group of agricultural households and a group of other active (i.e., non-agricultural) households. Therefore, the industry variable is also included in the model, which, due to decomposition, further interacts with all explanatory variables except time.

3. Results and discussion

3.1. Basic characteristics of agricultural households, their structure, distribution and localisation

In the Czech Republic, the share of agricultural households in economically active households was 5.10% in 2005; it decreased to only 3.82% in 2016. If we look only at rural municipalities (a rural municipality is considered to be a municipality with a population of up to 2000), the share of agricultural households in them is significantly higher. Even in the case of rural municipalities, a decrease is evident, from 13.60% in the 2005 survey to 9.48% in 2016).

According to the Czech Statistical Office,[4] since 1993, the total number of workers in agriculture has been steadily declining. Causes and impacts are discussed by, e.g., Bezemer (2004) and Spěšná et al. (2009). The Green Report 2018[5] states that after 2015, employment in agriculture is stable and the number of workers is not changing.

However, the geriatrisation of the agricultural workforce is a threat to the future. An insufficient influx of young workers into this sector may lead to a situation where it will be difficult to achieve sufficient labour reproduction in agriculture after the retirement of strong cohorts (Spěšná et al., 2009). The lack of young, highly qualified workers in agriculture is not caused by insufficient capacities of agricultural universities or insufficient interest in studying. The problem is that the increased interest in studying at agricultural universities does not lead to an increase in the interest of graduates in employment in agriculture. Only a small part of university graduates shows an interest in working in agricultural production because agriculture appears

unattractive to them and they often prefer other sectors than those they have studied (Šimpachová Pechrová & Šimpach, 2018).

The ageing of the agricultural population is a global problem (Bryant & Gray, 2005; Rigg et al., 2020; Šubová et al., 2021), so policymakers seek to motivate young people to take part in agricultural activities (Balezentis et al., 2020). Nevertheless, Zagata et al. (2015) concluded that the Czech Republic is one of the countries that are not yet significantly affected by the problem of an ageing farmers' population.

In addition to the demographic structure of the population and the number of graduates in a given sector, the future influx of young workers into a given sector is significantly affected by the attractiveness of the sector, which results, for example, from wage conditions or the prestige of the sector.

A closer look at the distribution of agricultural households shows that in 2016, 5.4% lived in municipalities with less than 199 inhabitants, 17.2% in municipalities with 200–499 inhabitants, 20.3% in municipalities with 500–999 inhabitants and 20.7% in municipalities with 1000–1999 inhabitants. This means that almost 2/3 of agricultural households live in rural municipalities and 1/3 in non-rural (13.5% in municipalities with 2000–4999 inhabitants, 8.5% in municipalities with 5000–9999 inhabitants, 8.4% in municipalities with 10,000–49,999 inhabitants, 2.9% in municipalities with 50,000–99,999 inhabitants, the rest (3.2%) in municipalities with more than 100,000 inhabitants). It should be noted that there are municipalities in the Czech Republic that have more than 2,000 inhabitants and still their nature is rural. As stated by Petr (2013), this is typical, e.g., for some areas of the South Moravian Region.

From the point of view of regions (NUTS3), differences can be seen in the share of agricultural households (to economically active households). The lowest value is shown by the capital (0.46% is the average of 2005 to 2016), up to the Plzeňský region (8.12%) and the Vysočina region (9.46%), other regions are in Figure 1. If we apply a simple trend analysis to regional data, we find that only the Vysočina region (an increase of 0.09% point per year) and the Pardubice region (+0.01% point per year) show a positive trend.

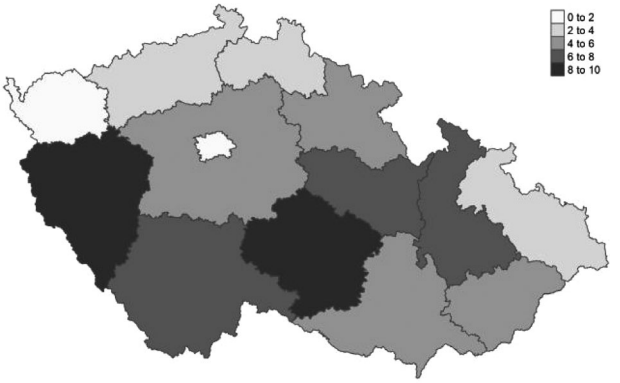

Figure 1. Share of agricultural households in economically active households in NUTS3 regions (average 2005–2016, in %).
Source: Calculations on SILC data.

Agricultural households are characterised by their larger size, which averages 3.15 people. For other economically active households it is 2.85 persons. The difference in the number of economically active members is not so significant (1.82 in agriculture compared to 1.66). A similar tendency is mentioned by Drlík (2008) when classifying households into rural and non-rural.

If we divide agricultural households into households where the head of household is: (1) an employee; and (2) self-employed, we will notice a significant shift in the structure. The trends are as follows. A slight decrease in the total number of agricultural households, a slight increase in self-employed households and a sharp decrease in employees' households. The result is a shift from the initial structure of 80.9% of employees and 19.1% of self-employed in 2005 to 68.2% of employees and 31.8% of self-employed in 2016.

Dvouletý (2020) states the motivation/causes for becoming a self-employed person. Although he does not provide a breakdown by sector of economic activity, we consider 'to continue the family business' to be a common motivation in agriculture.

In terms of the type of activity performed, skilled workers (i.e., skilled workmen, repairers, machine operators, drivers, etc.) clearly predominate with a share of 72.5% (this is the average for all years). Professional and technical workers (i.e., lower professionals) represent a share of 13.8%, 6.9% are unskilled workers, 5.1% are managers (higher professionals) and only 1.5% are lower administrative workers. The rest up to 100% (i.e., 0.2%) are members of the army (there is a state enterprise of Vojenské lesy a statky, s.p. [Military forests and farms]).

3.2. Household incomes

In agricultural households, the share of labour income is lower than in other economically active households (86.6% vs 89.4% on average 2005–2016). This is offset by a higher share of social income (11.1% vs 8.2%, the rest up to 100% being other income). The share of labour income in agricultural households increased over time, the average increase was 0.39% point of a year, and share of social income decreases with an average annual pace of 0.42% point. A higher share of social incomes in agricultural households was already reported by Divila and Doucha (2005) on the basis of family accounts statistics 2002.

The basic characteristics of net annual equalised household income are given in Table 2 (based on nominal income). In all years, the ENI of agricultural households lags behind the income of other economically active households. The average annual increase in income is higher in non-agricultural households (CZK 7451) compared to CZK 6734 in agricultural households. The difference in income is between 13 and 27 thousand CZK, the share of income is shown in the last column and fluctuates around 90%. The results of Drlík (2008) also document a share of 87% to the detriment of the rural population. The Kolmogorov–Smirnov test rejects the hypothesis of equality of the distribution of net equalised income between agricultural and non-agricultural households in all years. Marino et al. (2021) state that the incomes of agricultural households do not differ significantly from those of non-agricultural households in the case of the original EU Member States, but that significant progress

Table 2. Net equalised income (in CZK).

	Agricultural households			Other active households			
Year	Lower quartile	Median	Upper quartile	Lower quartile	Median	Upper quartile	Share of medians [%]
2005	112806	138733***	176073	121611	157500	208257	88.1
2006	122362	152918***	182231	128666	166000	216055	92.1
2007	135458	165681***	202744	140337	180776	235986	91.7
2008	145288	177089**	218136	153014	193600	248800	91.5
2009	155529	192556**	242301	166667	210112	268360	91.6
2010	155436	199318*	256457	168680	213807	278429	93.2
2011	159629	199184**	266633	169688	219891	283530	90.6
2012	152859	201204**	259528	173065	221271	284000	90.9
2013	153703	196142***	239615	176097	223754	289464	87.7
2014	155709	204004**	248285	180904	228033	296525	89.5
2015	155325	210478***	272510	185347	235021	305015	89.6
2016	176917	231331*	288537	194001	247377	321410	93.5

Source: Calculations on SILC data; Note: Two sample Kolmogorov–Smirnov test p-level < 0.05 *; < 0.01 **; < 0.001 ***; Share of medians is median of agricultural households to median of other active households.

is still to be made in the new Member States. The comparison of incomes in Table 2 therefore shows that the lagging of wages in agriculture behind the average wage is also passed on to household incomes. However, the gap is lower than for wages, so there is partial compensation from the income of other household members or possibly social income. A higher number of members in agricultural households (as mentioned above) has a negative effect on difference in equalised income.

3.3. Poverty of agricultural households

Research and social policy use a wide range of definitions of poverty. The choice of a specific definition of poverty has fundamental implications for social policy. This article uses a relatively objective approach based on the monitoring of equalised household income. The threshold for the calculation of FGT measures is 60% of the median of equalised household income (this is the median of all households, i.e., including economically inactive households not monitored in this article).

The share of agricultural households with income below the poverty line oscillates in the years under review (this instability results from the low proportion of agricultural households in the sample), so the average for 2005–2016 is added. The average poverty rate of agricultural household reached 6.3% (Table 3). In contrast, the poverty rate in non-agricultural households is lower (3.7%). The average poverty gap ratio is the same in both groups, 17%. This means that the income of households below the poverty line is 17% lower than the poverty line.

3.4. Econometric model of household income

The results of the regression model coefficient estimation are shown in Table 4. The signs of regression coefficients are intuitive in all cases and are in line with theory and previous empirical research.

Industry is an alternative variable that represents the economic activity of the head of the household (agriculture × other industries). According to this variable, the decomposition of the difference between the groups is performed in the next step.

Table 3. FGT measures of poverty.

	Agricultural households		Other active households	
Year	Poverty rate	Poverty gap ratio	Poverty rate	Poverty gap ratio
2005	0.0904	0.1466	0.0428	0.1732
2006	0.0266	0.2438	0.0410	0.1387
2007	0.0338	0.1849	0.0368	0.1863
2008	0.0530	0.0978	0.0332	0.1583
2009	0.0529	0.2158	0.0307	0.1926
2010	0.0748	0.1415	0.0358	0.2081
2011	0.0463	0.1317	0.0446	0.1683
2012	0.0667	0.2603	0.0411	0.1822
2013	0.0917	0.1760	0.0342	0.1713
2014	0.1052	0.1041	0.0334	0.1766
2015	0.0748	0.2113	0.0368	0.1722
2016	0.0429	0.1583	0.0370	0.1803
Average	0.0633	0.1727	0.0373	0.1757

Source: Calculations on SILC data.

The industry variable further interacts with all explanatory variables except Year, the interaction coefficients are not reported in the table. The reference category is agriculture, the coefficient for non-agricultural households is 0.158. This means that for identical households (which therefore differ only in the branch of activity of the head of household and other parameters – number of members, education, etc. – would be the same) the average equalised income for non-agricultural households is exp $(0.158) = 1.171$ times higher.

The number of household members and the number of dependent children enter the model as factor variables. From the estimated regression parameters, it is clear that the size of the household is directly related to the net equalised income, while the number of dependent children is indirectly related.

The reference category for the household education variable is low education level, which means that both partners have a basic education or are without education. In the secondary category, at least one of the partners has a secondary school qualification and in the higher category, at least one of the partners has a university degree. Log equalised income is higher by 0.201 in the case of secondary education and by 0.347 in the case of higher education (compared to basic education).

The type of household head activity affects the net equalised income as one would expect. The soldiers are the reference group, the type of activity has a positive effect on higher professionals, and on other groups it has a negative effect. However, the values of the coefficients are not significant at the significance level of 0.05. The age of the head of the household approximates work experience and the positive and increasing value of the coefficient with the age group agrees with the assumption of a direct dependence of experience and income.

The reference category for the sex of the household head is male, i.e., that log equalised income of household led by a female is 0.106 lower. This may not be the result of income discrimination but is based on how the head of household is identified. In complete families, the head is always the male, regardless of his economic activity. For single-parent families and non-family households, the first aspect for determining the head of household is economic activity and the second is the income of individual household members (CZSO, 2021). In single-parent families, the share

Table 4. Coefficients of regression model.

Variable	Coefficient	Std. error	*p*-level
Intercept	11.757	0.123	0.000
Industry (non-agriculture; reference = agriculture)	0.158	0.125	0.205
Household members (reference = 1)			
2	0.094	0.024	0.000
3	0.187	0.026	0.000
4	0.244	0.030	0.000
5	0.289	0.039	0.000
6	0.264	0.060	0.000
7	0.389	0.082	0.000
8	0.815	0.131	0.000
9	1.034	0.185	0.000
10	0.897	0.170	0.000
11	−0.006	0.234	0.981
12	0.978	0.270	0.000
Children (reference = 0)			
1	−0.217	0.019	0.000
2	−0.372	0.027	0.000
3	−0.484	0.041	0.000
4	−0.365	0.078	0.000
5	−0.761	0.174	0.000
6	−1.038	0.125	0.000
7	−0.843	0.161	0.000
8	−1.270	0.238	0.000
Education (reference = basic)			
secondary	0.201	0.033	0.000
high	0.347	0.039	0.000
Type of activity (reference = soldiers)			
higher professionals	0.076	0.122	0.532
lower professionals	−0.058	0.119	0.623
administrative workers	−0.125	0.126	0.322
skilled workers	−0.185	0.117	0.113
non-skilled workers	−0.229	0.119	0.054
Sex (female; reference = male)	−0.106	0.026	0.000
Age (reference = up to 29 years)			
30 to 39 years	0.053	0.030	0.073
40 to 49 years	0.054	0.029	0.060
50 to 59 years	0.083	0.028	0.003
0 and more years	0.106	0.032	0.001
Year (reference = 2005)			
2006	0.053	0.005	0.000
2007	0.133	0.005	0.000
2008	0.210	0.005	0.000
2009	0.291	0.005	0.000
2010	0.304	0.005	0.000
2011	0.320	0.006	0.000
2012	0.341	0.006	0.000
2013	0.365	0.006	0.000
2014	0.378	0.006	0.000
2015	0.401	0.007	0.000
2016	0.447	0.007	0.000

Source: Calculations on SILC data; Note: overall $R^2 = 0.41$; $\rho = 0.65$ (fraction of variance due to u_g).

of earning persons is lower, and thus the equalised income is lower. The variable Year is used in the model as a factor variable and expresses an independent trend.

We conducted a counterfactual technique, the Blinder–Oaxaca decomposition, in an attempt to quantify how much of the difference in household income between agricultural and non-agricultural household could be 'explained' by differences in household characteristics. Table 5 reports the decomposition of the

Table 5. Decomposition of income gap.

	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16
Difference	0.114	0.061	0.086	0.087	0.072	0.061	0.071	0.085	0.152	0.109	0.127	0.075
Endowments (%)	4.5	−4.3	−10.8	−4.4	5.0	17.6	54.9	38.5	36.3	30.9	37.4	34.5
Coefficients (%)	58.0	82.9	79.7	76.0	116.6	126.2	104.0	81.3	52.4	68.6	60.3	94.2
Interaction (%)	−13.6	−24.3	−14.4	−16.3	−28.9	−27.4	−22.8	−19.5	−14.5	−16.9	−16.5	−15.9
Random effects (%)	51.0	45.7	45.4	44.7	7.3	−16.4	−36.1	−0.4	25.8	17.4	18.8	−12.8

Source: Calculations on SILC data.

household type difference into the endowments, coefficients, interaction and random effect components.

The Difference row represents the difference in the average log of ENI between agricultural and non-agricultural households. The following row shows the effect of the individual components in percent. The part of the income gap that can be explained by differences in household characteristics is shown in the row Endowments. The endowments effect initially showed low values, in the second half of the observed period they stabilised around 35%. On average for all years, this effect was 20%. A closer look at the decomposition of the income gap in terms of differences in endowments shows that the share of households with a university degree has the most significant impact (it is lower for agricultural households) and explains 22–40% of the difference in individual years, and the share of skilled workers is higher for agricultural households and explains 30–52% of the difference in household income. In the opposite direction (i.e., the factor that reduced the income gap) was the gender of the head of the household, namely −12 to −26% in individual years. This effect is due to the lower proportion of households headed by women among agricultural households. Other factors have very limited power in explaining the income gap.

The share of the influence of coefficients, which is usually associated with discrimination, is positive in all years and ranges from 52% to 126%, on average the share of this influence is 83%. It is noticeable that the share of coefficient component is much larger than the share of endowment component in each year.

The proportion of the random effect should be low (more precisely close to zero) in a well-designed model. We can notice that, apart from the first four years, its share is really low. In the first years, the share of the random effect is around 50%, and it can therefore be assumed that household income in these years was a function of other variables not included in the model. The average proportion of random effects is 16%.

4. Conclusion

Although the importance of the agricultural sector in terms of GDP share and employment is rather marginal, it is largely a strategic sector in terms of food self-sufficiency, environmental functions and strong links to rural development. This is also the reason for the considerable and long-term financial support of European and national policies. Despite the fact that the size of the agricultural population is generally small, developed countries are focused on ensuring well-being and opportunities

for agricultural workers and on preventing rural areas from becoming depopulated. The aim of this article was to analyse the income of agricultural households in the Czech Republic, compare them with the income of other economically active households and try to explain any differences. The results should contribute to the assessment of the sustainability of agriculture, provide relevant evidence for policymakers and thus contribute to the development of knowledge on rural development trends and priorities.

During the observed period (i.e., 2005–2016) there was a slight decrease in the number and share of agricultural households. Since 2005, the share has decreased from 5.10% to 3.82% in 2016. If we take into account only rural municipalities, the share of agricultural households is significantly higher, but even in this case there is a noticeable decrease, from 13.60% to 9.48%.

Significant are the changes in the structure of agricultural households, which can be explained mainly by the reduction in the number of employees. According to CZSO (2018b), paid labour fell and unpaid labour increased by 19%. The slight growth of self-employed households and the sharp decline in households of employees caused a shift in the structure from the initial structure of 80.9% of employees and 19.1% of self-employed in 2005 to 68.2% of employees and 31.8% of self-employed in 2016.

In addition to the decline in the agricultural workforce, the ageing of the agricultural workforce is a significant permanent trend and a threat to the future. According to CZSO (2018b) data, the agricultural labour force decreased in all age groups except for workers over the age of 65 (an increase of 105% in the observed period). An insufficient influx of young workers into the sector may lead to a situation where it will be difficult to achieve sufficient labour reproduction in agriculture after the retirement of strong cohorts.

In agricultural households, the share of labour income is lower than in other economically active households (on average 86.6% vs 89.4%). This is offset by a higher share of social income (11.1% vs 8.2%). In all years, the ENI of agricultural households lags behind the income of other economically active households. The average annual income increase is higher in non-agricultural households. The share of the median income of agricultural households to non-agricultural ones fluctuates around 90%. Regarding the first research question, the lagging of wages in agriculture behind the average wage is thus also passed on to household income. However, the gap is lower than for wages, which means partial compensation from the income of other household members or possibly social income. At the same time, the equalised income of agricultural households is negatively affected by a higher number of members of agricultural households.

The share of agricultural households earning income below the poverty line is 6.3% on average, while the poverty rate is lower in non-agricultural households (3.7%). Household income below the poverty line is 17% lower than the poverty line in both groups. However, the poverty profile may be different. Rural poverty is mainly related to access to the labour market, education, health care and other social services.

The last part of the article dealt with the second research question. Thus, it dealt with the influence of household characteristics on the difference in incomes of

agricultural and non-agricultural households. The influence of household characteristics initially showed low values, in the second half of the observed period it stabilised at around 35% (on average, the influence of this factor is 20%). The factor increasing the income gap is education, as the share of agricultural households with a university degree is lower than in other economically active households, and a higher share of employed in manual occupations. The gender of the head of the household had the opposite effect, which is due to the lower proportion of female households among agricultural households.

Notes

1. http://www.oecd.org/els/soc/OECD-Note-EquivalenceScales.pdf
2. https://stats.oecd.org/glossary/detail.asp?ID=73
3. An alternative decomposition is the twofold decomposition, which decomposes the difference into the effect of the difference in the predictors and the unexplained part.
4. https://vdb.czso.cz/vdbvo2/faces/index.jsf?page=statistiky&katalog=30853
5. http://eagri.cz/public/web/file/648258/Zelena_zprava_2018.pdf

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