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The Relationship of Agricultural and Non-Agricultural Income and Its Variability in Regard to Farms in the European Union Countries

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Abstract: Many authors emphasize that reducing the income deprivation of the agricultural sector in relation to the non-agricultural sectors is a prerequisite to the growth of sustainability of agriculture. Thus, this raises the question: despite the impact of the Common Agricultural Policy (CAP) on the value of agricultural income in EU countries, is there still income deprivation for agriculture in relation to non-agricultural sectors? If so, is its depth comparable among farms with a different scale of production from the same EU country or among farms with the same scale of production from different countries? The answers to these questions constitute the added value of the article. The aim of the paper is to compare the ratio of agricultural income to non-agricultural income in regard to family farms in EU countries. Results show that the CAP solutions do limit the agricultural income disparities but that there are significant differences in the income deprivation of farms with different production values in the same country. These differences also apply to farms with a similar production volume in different countries. This publication includes critical analysis of literature, spatial-analysis and panel regression. The time scale of the research is 2004–2017, the spatial scope is individual EU countries and the subjective scope is representative EU Farm Accountancy Data Network (FADN) farms.

Keywords: income disparities; agriculture; European Union; CAP



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1. Introduction

The problems involving agricultural income are caused by the dependence of production results achieved by the agricultural sector on the land factor. Through indivisibility, lack of mobility and limited productivity, the land remains uncompetitive with respect to labor and capital [1,2]. A cause of farmers' income deprivation is also the "market treadmill" phenomenon, which was first mentioned by Willard Cochrane. In his opinion farmers are on a market treadmill, which, in spite of their constant efforts to improve productivity, wears away any profits that might result. Therefore, the essence of the treadmill is that agricultural income does not grow with an increase in productivity. This causes a serious social problem, i.e., the relative deprivation of farmers' incomes [3]. Taking this into account, agricultural policies should stimulate the level of agricultural income to move towards parity. Increasing agricultural income is the most important factor for increasing the economic sustainability of the agricultural sector [4–6]. The reduction of income disparities within the agricultural sector is, in turn, an element of social sustainability. The achievable, disposable income is in many cases crucial for achieving social well-being [7]. One's financial status determines the quality of life, by which we mean, among other aspects, access to social services and infrastructure (health, education, culture), housing conditions and

demographic issues (the birth rate, and migration rate) [8,9]. These factors are indicated by many authors as measures of social sustainability [10–13]. The distribution of income in society is therefore at the heart of improving social sustainability levels. Due to the income deprivation of the agricultural sector in relation to non-agricultural sectors, the agricultural policy influences the relative level of sustainability of this sector compared to other sectors. This results from the impact of agricultural income support instruments [14,15]. It should be remembered, however, that the unequal distribution of income in the agricultural sector determines, at the same time, the wealth disparity among the farms constituting this sector and the level of social balance achieved by them. This concerns, among other factors, agriculture in the European Union countries. The question then arises: does the Common Agricultural Policy (CAP) reduce the income gap between agriculture and non-agricultural sectors to the same degree in all EU countries, or are there any inequalities in this regard? Another question is: is the impact of the Common Agricultural Policy on income differences between farms with similar production volumes in individual EU countries comparable? It would be related to a similar impact of this policy on the level of social balance achieved by all farms in the European Union. The reason these questions are relevant is the universal and centralized character of the EU Common Agricultural Policy [16]. Given this, a similar impact of the CAP on the sustainability of farms from different EU countries may be implied. However, the results of studies by various authors indirectly indicate differences in this area [17–19]. Therefore, the hypothesis in the paper is that the existing solutions within CAP contribute to limiting income disparities in EU-countries but there is a significant variation in the income deprivation of farms with different production values in the same country, despite the agricultural income support policy. These differences also apply to farms from different EU countries with a similar production volume. Such a state of affairs is not conducive to the social and economic sustainability of EU agriculture.

The paper therefore focuses on the impact of the EU Common Agricultural Policy on the sustainability of farms in the economic and social context. The problem of the impact of the CAP on the sustainability of farms concerning environmental issues tends to be neglected. This publication includes a critical analysis of literature, spatial-analysis and panel regression. The time scale of the research is 2004–2017, the spatial scope covers individual EU countries and the subjective scope—representative EU Farm Accountancy Data Network (FADN) farms in these countries.

2. Literature Review

In the EU, the relative deprivation of farmers manifests itself through the ratio of entrepreneurial income in agriculture to a similar income measure in other sectors, which on average amounts to only 40%. Average incomes in the agricultural sector are still much lower than the average wages in non-agricultural sectors in most of the EU Member States, which is contrary to one of the CAP's initial objectives of ensuring a fair standard of living for the agricultural community [20]. The problem of income disparity between farmers and those who work in other sectors is linked to the issue of the fair distribution of wealth and measuring the equal distribution of income. Usually the Gini coefficient based on the Lorenz curve is used to determine these inequalities, as a measure of the concentration (inequality) of the income distribution in a studied group [21,22]. Another example is the Index of Sustainable Economic Welfare (ISEW) developed by H.E. Daly and J.B. Cobb in 1989 [23]. In the case of this index, the basis is the individual consumption expenditure adjusted for losses resulting from uneven income distribution [24]. Equality in income distribution determines the subjective and objective dimensions of material deprivation [25]. The increase in agricultural income is the most important determinant of increasing the sustainability of farms in the economic and context. The Common Agricultural Policy plays a key role in this respect in the European Union. The research results of Martino and Muenzel [26] suggest that the public's support is essential to reduce the socio-economic deprivation of Europe's marginalized farming systems. This is also confirmed by the results of the work of Czyżewski et al. [3] in which it was concluded that: "after the mid-90s,

the level of agricultural income was positively influenced by productivity, subsidies and improvement of the price gap (prices of products sold by farmers compared to the prices of products purchased)". This demonstrates the long-term positive impact of the common agricultural policy on the relative deprivation of farmers. Furthermore, the results of the research by Guth et al. [14] confirmed that: "thanks to the CAP support, the average income of farm households is approaching the average income of non-agricultural sectors, but distribution of this support is uneven among the farms. This leads to an increase in income disparities for small, medium and large farms. In other words, the EU's agricultural policy improves the general level of economic sustainability of the agricultural sector, but it is not an instrument serving the income equilibrium". Besides the differences in income disparities between small, medium and large farms, there are differences in income variability between EU farms depending on their production orientation. Grain-feeding and field crop farms have the greatest volatility of income. The most stable incomes are found in the farms which have specialized in horticulture and the types of production referred to as "other permanent crops" [27]. The results produced by many researchers also indirectly indicate that the impact of the CAP on agricultural income is uneven in different EU countries. The European Commission's report includes the following statement [27]: "[a] Common Agricultural Policy does not appear to result in a common absolute level of income for the average farm in different Member States. Belgium, Denmark, Germany, France, Luxembourg, the Netherlands and the UK stand out as having high farm incomes. Amongst the EU-10 Member States (countries that joined the EU in 2004), only in the Czech Republic, Estonia and Hungary do farm income indicators exceed or come close to the EU-27 average". Czyżewski et al. [3] showed that in the EU-12 countries, larger dynamics of agricultural income growth can generally be observed than in the EU-15 countries. This is connected, among other factors, with a lower income baseline. This is confirmed by the results of the study conducted by Smeździk-Ambroży and Sapa [17], which show that the positive impact of the Common Agricultural Policy on the income situation for agricultural workers is visibly higher in the case of the countries that joined the EU in 2004 than in the EU-15. In turn, the results of the study by Guth et al. [14] show that in the EU-15 countries, the average agricultural income in 2005-2015 was 14 percentage points higher than in the countries that had joined the EU in 2004. In some of the countries that joined the EU in 2004 (mainly the Baltic states), these relations improved because they effectively lobbied for a fairer distribution of direct payments after 2013 [28]. At this point, it is also worth mentioning the results of the research conducted by A. Poczta-Wajda [29]. Considering the experience of various countries, not only those in the EU, it indicates that in countries with a significant growing trend of a relative deprivation of farmers, there typically is an increase in the level of support or a transformation from the policy of agricultural taxation to the policy of supporting this sector.

The disparities in the impact of the CAP on farm income in different EU countries may seem odd, considering its universal nature. Therefore in our research, we were strongly motivated to identify the differences in income of farms in EU countries, characterized by different scale of production. Thus, the study included a comparative analysis between EU countries and an analysis of agricultural income deprivation between farmers. The research focused on family farms. As a result of the political transformation in many EU countries, a dual system of agriculture was created, with a relatively small number of strong, large-scale enterprises and a significant number of family farms [30]. The latter are of crucial importance for the functioning of rural areas as, in addition to their strictly productive function (food supply), they create a range of both environmental and social public goods [31–34]. Therefore, their vitality is in the interest of the whole society, and appropriate economic conditions are necessary for their sustainable development. This explains the focus in the analyses on family farms. Moreover, it would be methodologically unjustified to make comparisons between countries with significantly different shares of livestock and family farms in their agricultural structure. Therefore, the analyses covered only family farms from individual EU countries.

3. Material and Methods

This research is based on the data of representative family farms, which keep farm accounts according to Farm Accountancy Data Network (FADN) standards from individual EU countries in the years 2004–2017. At the time of preparing the manuscript, the latest available data of the EU-FADN was from 2017; therefore, the time range of the research covers the years 2004–2017 (the data of FADN are published with a three-year delay). With regard to Bulgaria and Romania, the analyses cover the years 2007–2017, and the years 2013–2017. We used the family farm income per family working unit (FWU) as a measure of farm income. As non-agricultural income in each country, we used the average annual gross salary per employee in EUR as reported by the OECD. In the analyses, the differences in the volume of agricultural production were due to the farm's belonging to a given economic class, expressed in terms of the value of the farm's standard output in EUR. We adopted ranges of values of the farm's standard output in EUR according to the FADN methodology.

In the first stage of the research, we compared average incomes from a representative FADN farm per FWU without the value of CAP subsidies with non-agricultural income, and did so separately for each country. In this way, we could assess whether there would be differences in the ratio of agricultural income to non-agricultural income between EU countries if the EU agricultural policy did not affect the income situation for European agriculture. The conclusions from these analyses are a starting point for the assessment of the impact of the CAP on the income situation of European agriculture in relation to other social groups. Then, we determined the share of the balance of subsidies and taxes on investment and operating activities in regard to the income from family farms in particular countries in the years 2004–2017. This enabled us to conclude the impact of the Common Agricultural Policy on the income achieved by farms from individual EU countries.

In the second stage of research, we compared average incomes from representative FADN farms per FWU with the non-agricultural income. At this stage of analysis, we decided to divide the farms into classes according to the size of agricultural production. This allowed us to identify the size of the disparity of the agricultural income to non-agricultural income in particular EU countries and the differences between EU countries in this regard, taking into account the size of the agricultural production. Thanks to the applied methodology, we were able to deal with the issue that the incomes of farms with a large scale of production supposedly cannot be compared with the incomes obtained by non-agricultural branches with different and also small scales of production. Obviously, this would distort the results of the analysis and lead to wrong conclusions. Therefore, we have applied a methodology that allows us to maintain the appropriateness of the comparisons of the analyzed income ratios regardless of the production volume. For this purpose, we divided the values of the income earned by the farms belonging to different classes of production volume in a given year by the incomes earned this year by the farms belonging to the class of farms with the lowest production value. We multiplied the resulting values by the values of non-agricultural income in a given country. Having done that, we were able to obtain the ratio of agricultural income generated by farms of different production volume to non-agricultural income achieved by entities with similar production volumes. At this point, it is worth mentioning that only the income from a family farm per FWU in farms with the lowest production scale was compared to the average non-agricultural income in individual EU countries. In other cases, as explained above, non-agricultural income was multiplied by the value resulting from dividing the average income achieved by a given class of farm production by the income of farms belonging to the class with the lowest production value (from 2000 EUR to 8000 EUR).

The procedure described above was applied in order to answer the question of whether, after taking into account the impact of the CAP, there are differences in the ratio of agricultural income to non-agricultural income in regard to farms with different production values from the same country, and whether income differences exist between farms with similar production volumes from different EU countries. The existence of these differ-

ences was assumed by the hypothesis put forward in this article. In the cases of Bulgaria, Cyprus, Croatia, Malta and Romania, we did not find data on income development in non-agricultural sectors for the years 2004–2017, which resulted in excluding these countries from the analyses regarding the ratios of agricultural income to non-agricultural income.

The research was also motivated by the estimation of the impact of the CAP on the incomes of farms with different scales of production in the EU. We used a panel regression model in order to determine which of the CAP subsidy and subvention groups had the biggest impact on the increase in the agricultural incomes of family farms with a different value of production in the EU. The division of CAP subsidies and grants into groups was applied earlier by Czyżewski and Smędzik-Ambroży [35], Guth et. al. [14] and Smędzik–Ambroży et. al. [15]. Since the data analyzed combined cross-sectional data (for standard output classes) and data concerning the time series (2004–2017), we examined the dependence of net farm income per family work unit (FWU) on various groups of subsidies with the use of a panel regression model. After the analysis of the scatter plot, we decided to use the linear model:

$$Y = b_0 + b_1X_{1it} + b_2 X_{2it} + b_3X_{3it} + b_4X_{4it} \quad (1)$$

where: Y_{it} —net farm income/FWU in economic size classes i and years t .

X_{1it} —the value of subsidies for public goods (understood as the sum of payments on account of setting fields aside and agri-environmental payments, support for less favored areas and other subsidies within the framework of rural area support programs per FWU).

X_{2it} —the value of subsidies for crop and livestock production (the sum of other subsidies for crop and livestock production, balances of subsidies and fines for milk producers, subsidies for other cattle, and subsidies for sheep and goats per FWU).

X_{3it} —the value of decoupled payments per FWU.

X_{4it} —the value of other subsidies per FWU.

Since the data concerned the population of FADN farms, and therefore were aggregated, they were estimated as the models for fixed effects (FE). The collinearity of variables was assessed on the basis of variances of inflation (*Variances Inflation Factors*—VIF). Since none of the variables exceeded the critical value $VIF = 10$ [36], an inference was made based on estimated models. Due to the problem of heteroskedasticity, we avoided using the classical method of least squares and chose to make the estimation using robust regression.

4. Results and Discussion

4.1. Income of Family Farms in Relation to Non-Agricultural Incomes in the European Union Countries

If we considered the ratio of the income from a family farm with subsidies for a full-time employee to the non-agricultural income for a full-time employee in EU countries, it turned out that parity is achieved by family farms in Hungary. Farms from Great Britain, the Netherlands, Belgium, Italy and the Czech Republic are also close to the parity relation—see Appendix A. On the other hand, there is a significant group of countries where the ratio of income from a farm without subsidies per full-time family member to non-agricultural income in the country is negative. This group is as many as 10 out of all EU-27 countries. In these countries if not for the CAP subsidies, farmers would have made losses from their activities (on average in the years 2004–2017). The question therefore arises: what benefits does the taxpayer derive from subsidizing completely inefficient agriculture in some countries if at all? In such a situation, the indirect benefits of such a state take on importance, such as maintaining a certain vitality of rural areas and their biodiversity, preventing depopulation of these areas or securing the internal demand for food [37–39]. We are also dealing with the problem of rent-seeking, where a relatively small interest group (in this case, trade unions and chambers of agriculture and other farmers' associations) forces those in power to regulate in favor of such a group in exchange for political support. As Poczta-Wajda notes [29], according to M. Olson's theory of interest

groups, farmers, who constitute a relatively small social group (only a few percent in highly developed economies), are willing to take more active actions for agricultural support policy than the rest of the society, which could be against this intervention policy [40,41]. However, whether this policy gives the desired effects, e.g., in the form of reducing income deprivation in agriculture, is not obvious and unambiguous. As Czyżewski [42] argues, the higher the support (the share of agricultural subsidies in the value of global agricultural production), the greater the deprivation of agricultural income. Attention is also drawn to the significant spatial diversity of the farm income to non-agricultural income ratio in the EU (Figure 1).

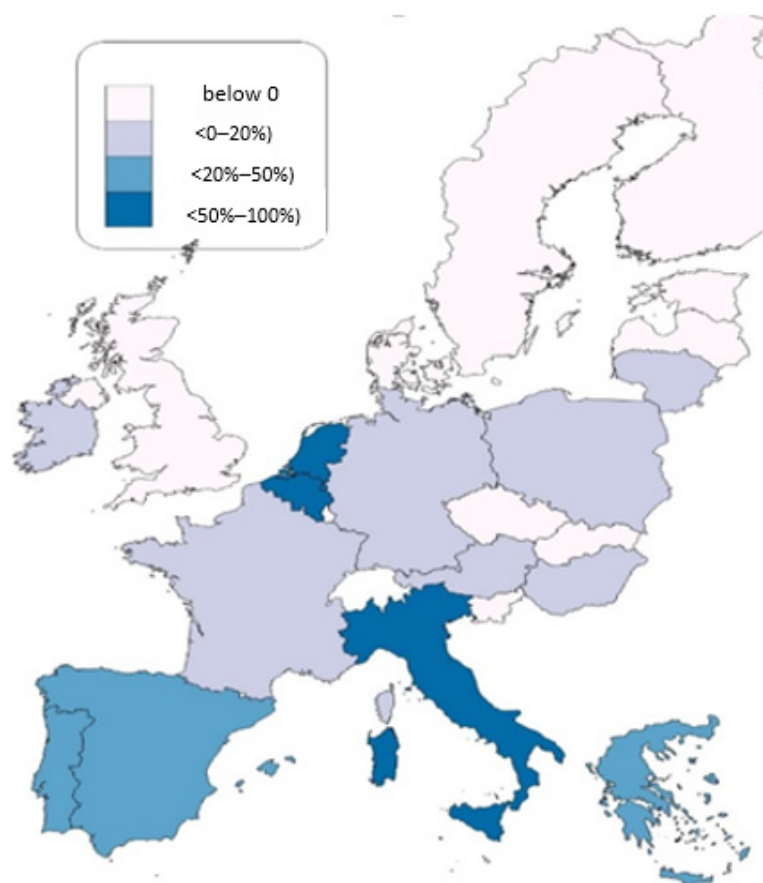


Figure 1. Ratio of family farm income without family work unit (FWU) subsidies to non-agricultural income per capita in EU countries, average for 2004–2017 (for Bulgaria and Romania years the average covers 2007–2017, and for Croatia it covers the years 2013–2017). Source: own elaboration based on Farm Accountancy Data Network (FADN) and OECD [43] data.

The issue of agricultural income disparities between EU countries intensified particularly strongly in the mid-20th century, when the low total income of the agricultural sector (due to the specific supply-demand relationships in this sector) led to decreasing farm incomes, thus causing an imbalance between agricultural and non-agricultural income [44,45]. The evolution of farm income in the last 20 or 30 years indicates that in some highly developed countries, parity has been achieved or even exceeded [46,47]. Nevertheless, many studies compare the profitability of agricultural and non-agricultural activities [48–50], and their results prove that agricultural activity is almost always less profitable than non-agricultural activity. This is confirmed by our analysis results. It has been proven that there are still significant spatial differences in the relationship between agricultural and non-agricultural income in the EU. Thus, it is justified to say that the conclusions from previous analyses concerning the income differentiation of agriculture in the EU remain relevant.

Financial support for the agricultural sector is seen as a panacea for the disparity between agricultural and non-agricultural income. Different institutional solutions aim to bridge these differences (e.g., in the form of a tax policy supporting agriculture, which compensates for income disproportions). Many studies indicate that this goal has been achieved, emphasizing that thanks to the support through agricultural policy instruments, the average agricultural income of farms comes close to the average income from non-agricultural sectors [14,51,52]. However, there are also those that do not confirm this thesis [42]. In the next step, therefore, we analyzed the shares of the balance of subsidies and taxes on investment and operating activities in regard to the income from the family farm in individual EU countries in the years 2004–2017. Detailed data on this subject is available in Appendix B. Slovakia has been the country that has faced the most difficult situation in this respect for years, due to the dominance of large farms mainly dealing with cereal crops and employing hired workers there. In these farms, the cost of hired labor significantly reduces the income generated. The percentage of full-time employees in Slovak agriculture is 55%, while the average in the broader community is about 23% [52]. Even CAP subsidies are not able to compensate for the loss in Slovak agriculture generated over many years, which is confirmed by the results we have of our analyses—see Appendix B. Nevertheless, on average, the situation in the EU has been stable for several years—the share of subsidies in income remains almost unchanged and amounts to 60% (except for the already mentioned year 2009, when it reached 80%). This means that the income of a family farm comprises public support for the most part, without which there would be no economic motivation to undertake agricultural production in many EU countries.

Therefore, the research results confirm that thanks to the support provided through the instruments of agricultural policy, the average agricultural income of farms is approaching the average income from non-agricultural sectors [14,51,52]. However, there is a significant differentiation in the share of subsidies in the income of family farms in individual EU countries (Figure 2), which results from differences in the amount of income achieved by farmers from individual EU countries.

In countries where the ratio of income from a farm without subsidies to non-agricultural income is the lowest, i.e., Scandinavian countries or parts of the Baltic states, the share of subsidies is the highest. The opposite is true in the EU countries where the ratio is the most advantageous, i.e., Italy, the Netherlands, Spain, Romania and Belgium (see Figures 1 and 2). Another important observation is the progressive “dependence” of agricultural income on financial support within the framework of the CAP in some “new” EU countries, such as Poland, but also in Bulgaria and Lithuania, where since the beginning of integration with the EU, the share of subsidies in income has about doubled (Appendix B). Our analyses also confirm the view that farm income support is a determinant of the profitability of agriculture in many EU countries and a condition for reducing the socio-economic deprivation of Europe’s marginalized farming systems, as pointed out by Martino and Muenzel [26] and subsequently also by Czyżewski et al. [3], and Guth et al. [14]. In the next part of the article, we examine whether taking into account the differences in the size of farms’ production results in smaller disproportional values in the disparity of agricultural income of farms with a similar production scale from different EU countries. We also estimated whether the relationships between agricultural and non-agricultural income are similar in regard to farms with different production volumes from the same EU country.

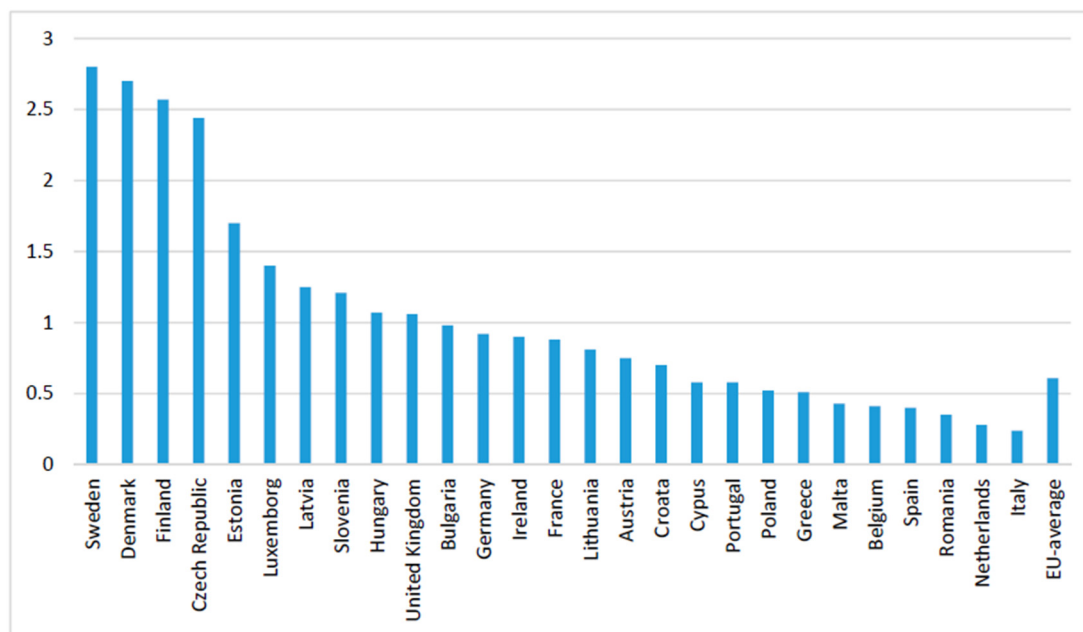


Figure 2. The share of the balance of subsidies and taxes from investment and operating activities in 2004. (for Bulgaria and Romania, the years considered are 2007–2017, for Croatia the years 2013–2017 and due to the loss generated by family farming on average in Slovakia in the period 2004–2017, this country is not included in Figure 2). Source: own elaboration based on FADN data.

4.2. Income of Family Farms with Different Value of Agricultural Production in Relation to Non-Agricultural Incomes in the European Union Countries

First, we performed an analysis of the average percentage ratio of agricultural to non-agricultural income in farm classes differing in their scale of production in individual EU countries (Table 1). Taking into account the scale of production in the comparison of agricultural income to income obtained in non-agricultural sectors allows us to state that in many EU countries, regardless of the economic class of farms, these relations remained at a similar level. This is true for Austria, Belgium, the Czech Republic, Finland, the Netherlands, Germany, Great Britain, Slovenia and Sweden. Regarding these countries, it can therefore be concluded that there are no significant differences in the income deprivation of farms with different production values. In other EU countries, differences between family farms with different production values from the same countries are significant. This is only a partial confirmation of the hypothesis that there are significant differences in the income deprivation of farms with different production values from the same country despite the agricultural income support policy.

The introduction of this approach to the analysis makes it possible to compare the income of farms with a specific production volume to non-agricultural income obtained by units of a comparable size, and led to surprising conclusions. As a result of this approach, described in detail in the methodological part of the article, we found that in many EU countries, such as Estonia, Greece, Spain, Ireland, Portugal, Hungary and Italy, the most favorable relationship between agricultural income to non-agricultural income was found in regard to farms with the smallest production scale (from 2000 EUR to 8000 EUR). It also applied to the average value for the EU. This is in contradiction to the results of many authors' research, in which the differences in the production scale of the compared farms were not taken into account. For example, Stępień et al. [53] indicate that in 2005–2015, the ratio of agricultural to non-agricultural income in the EU was very diversified—ranging from less than 30% in the class of farms with a production volume of 8000–25,000 EUR to over 1500% in the class above 500,000 EUR. Similar conclusions were made by Guth et al. [14] and Kiślewska [54]. When it comes to Polish farms as well, the most favorable situation of farms with the highest production value compared to farms

with a lower value of production, taking into account the impact of agricultural policy, was indicated by Smędzik et. al. [14] and Kata [55]. According to the authors mentioned here, the impact of the CAP on the income parity of the largest farms in terms of production value (500,000 EUR and more) in the EU in relation to non-agricultural sectors was therefore the most favorable, which was not, however, confirmed by the results of our analyses (Table 1). To sum up, our inclusion of the production scale variable of the compared units in the analysis resulted in different conclusions as compared to the conclusions of the authors mentioned above. Those previous conclusions are confirmed in this study only by the case of Lithuanian farms with the largest production scale, where the parity of agricultural income to non-agricultural income is definitely the highest. It amounts to over 85%. It is also by far the highest value in this class of farms in all EU countries. Small farms are of key importance for the functioning of rural areas, because in addition to their purely productive function (providing food), they create a number of both environmental and social public goods [16,31]. Hence their viability is in the interest of the entire society and proper economic conditions are essential for their sustainable development. The results of our research show that the common agricultural policy of the EU successfully implements the objective of income support for small farms with non-production functions. An expression of this is the most favored relationship between agricultural income to non-agricultural income in regard to farms with the smallest production scale compared with the income of farms with a higher production volume in many EU countries.

Including average values of parities for individual EU countries, without taking into account the differences in the diversity of farm production, shows the differences between countries in this respect. They range from over 4% for Sweden to nearly 36% for Lithuania.

In individual classes of farms in terms of production volume, the differences between the EU countries are also large. The parity ranges on the maps present the ratio of agricultural income to non-agricultural farms with a comparable production volume in different EU countries (distribution of Gauss). The presence of the multiple countries in the same color on a map concerning a given class of farms in many EU countries suggests the comparability of agricultural income parities in this group of countries (Figure 3). The largest number of countries with farms belonging to the same range of income parity occurred in the second class, i.e., with a production value of 8000 up to 25,000 EUR. The relative share of countries where farms with a production value of more than 8000 up to 25,000 EUR belonged to the same parity range (6–13.4%) was 42.1% for all of these countries. A similar, although slightly smaller share of countries in the total number of countries with farms of a given class was in the range of farms with the lowest production. It was 41.7%. The third place was occupied by the class of farms with the highest production value (500,000 EUR and more), with the share of countries amounting for 36.8%. Next were farms of other economic classes, i.e., with a production value of 25,000 EUR up to 500,000 EUR. In these classes, the relative shares of countries in the total number of countries with farms belonging to the same parity ranges was the same and amounted to 34.8%. Therefore, it should be stated that the differences between the values of parities of agricultural income to non-agricultural income in the same classes of farms in terms of production volume between the EU countries are large.

This means that differences in the income deprivation of farms with a similar production volume from different EU countries are significant. The results of the research also indirectly confirm the calculations of the European Commission that in the EU, there is almost a 30-fold difference between the highest income per employee (Lombardia in Italy: 66,201 EUR) and the lowest (Jadranska Hrvatska in Croatia: 2249 EUR) [55]. In addition, our research results confirm that the wages of agricultural workers in the EU account for less than half of what workers in all economic sectors collectively earn on average [56]. Based on the research results, we can conclude that this applies to all countries and production classes of farms in the EU. This justifies the need for financial support for agriculture, which is pointed out by the authors of this report. Our research has shown that this support should be provided to all classes of farms and agriculture in all EU countries. However,

significant differences in the income deprivation of farms with a similar production volume from different EU countries also allow us to conclude that this support should be different for different EU countries. The solution to this may be shaping the value of support depending on the needs of agriculture in individual EU countries. This encourages increasing the regional character of the CAP and increasing the possibility of shaping the amount of support for various groups of farms at national levels. In the next stage of the analysis, we determined the impact of the CAP subsidies on the incomes of farms with different scales of production in the EU.

Table 1. Relationship of family farm income per full-time employee of families in various classes of farms by production value to non-farm income (in%, average for 2004–2017).

Country/Class of Farms by Production Value in EUR	2–8 k EUR	8–25 k EUR	25–50 k EUR	50–100 k EUR	100–500 k EUR	Above 500 k EUR	Average for the Country
Austria	x *	9.72	9.27	8.66	7.17	x	8.71
Belgium	x	x	9.08	6.38	7.66	6.04	7.29
Czech Republic	x	14.65	13.94	12.59	14.44	15.83	14.29
Denmark	x	5.55	8.70	8.86	4.75	0.48	5.67
Estonia	27.32	13.34	15.22	20.05	23.56	20.46	20.00
Finland	x	6.00	8.63	8.05	6.95	4.34	6.79
France	x	14.35	7.74	7.60	7.49	6.35	8.71
Greece	30.56	19.29	16.73	15.74	12.64	x	33.64
Spain	33.82	19.24	15.96	14.59	12.51	13.11	18.21
Netherlands	x	x	4.35	5.24	7.30	5.38	5.57
Ireland	18.49	10.32	10.84	11.87	11.94	x	12.69
Lithuania	18.55	16.19	24.03	28.83	41.34	85.80	35.79
Luxembourg	x	x	2.95	6.70	6.29	3.31	4.81
Latvia	21.32	13.02	17.30	21.69	31.37	37.22	23.65
Germany	x	x	5.85	6.97	7.69	6.25	6.69
Poland	10.99	8.13	10.57	12.41	15.40	20.01	12.92
Portugal	22.61	13.42	13.04	13.22	12.32	20.63	15.87
Slovakia	1.50	12.64	9.60	8.16	10.86	21.04	10.63
Slovenia	x	4.13	5.44	5.96	7.39	x	5.73
Sweden	x	3.39	3.62	6.36	6.07	2.29	4.35
Hungary	30.09	24.60	27.85	29.19	30.52	23.11	27.56
United Kingdom	x	10.69	8.21	8.14	9.69	11.42	16.42
Italy	23.45	14.48	13.53	13.67	15.92	22.21	17.21
Average for the EU	34.45	12.27	11.41	12.21	13.53	25.04	14.05

* x means that there is no such class of farms in a given country; Source: own elaboration based on FADN and OECD [43] data.

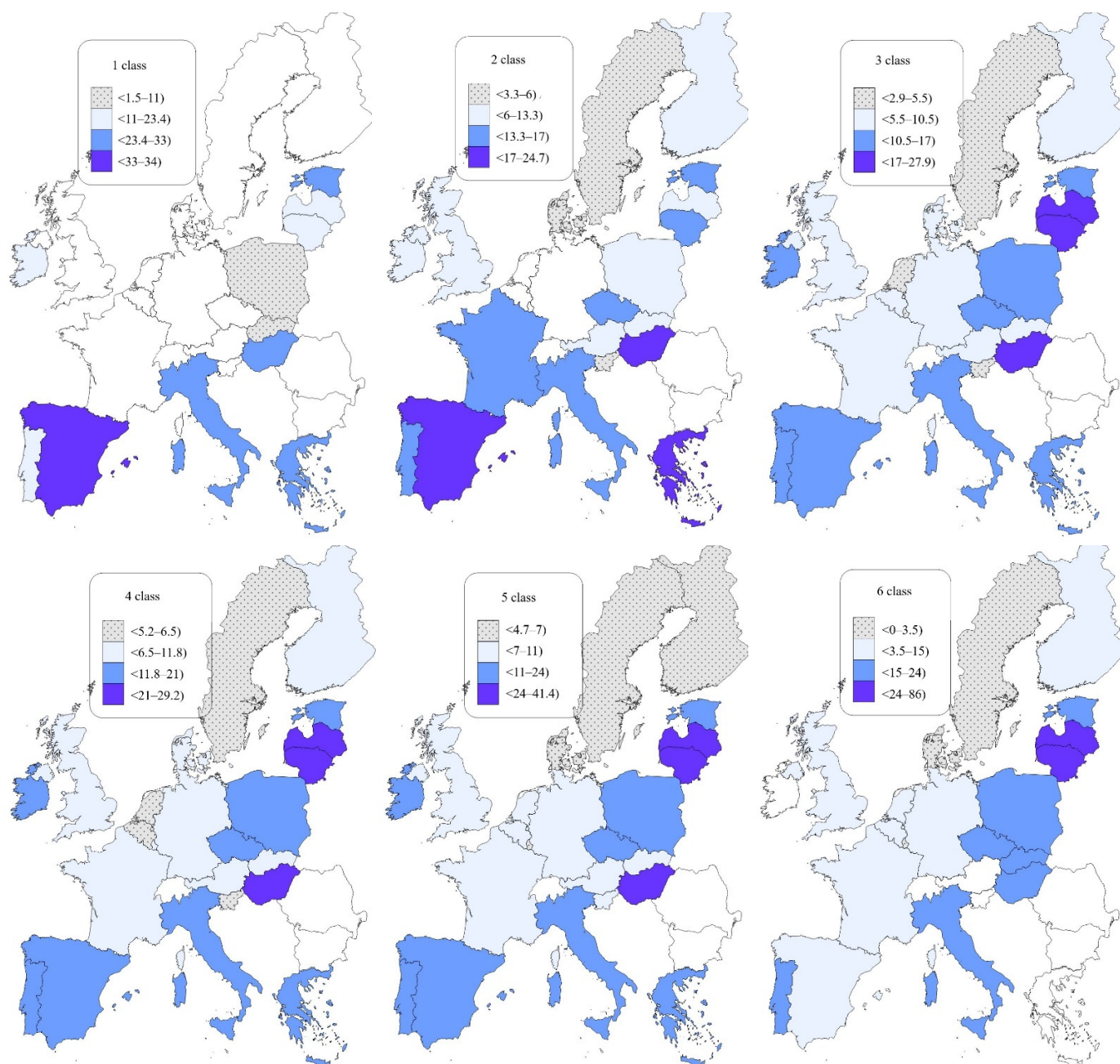


Figure 3. Relation of family farm income per full-time employee of the family in various farm production classes to non-farm income in EU countries (in%, average for 2004–2017); The white color of a country means that it was not possible to calculate the income relationship in that country because there was no such class of farms or because OECD statistics did not provide data on the average salary in that country. Source: own elaboration based on FADN and OECD [43] data.

4.3. Impact of CAP-Subsidies on the Income of Family Farms with Different Value of Agricultural Production in the European Union

For each type of subsidy, a positive impact on the value of income achieved by farms in the EU was expected, which is consistent with the assumptions of the EU agricultural policy, and which was confirmed by the results of the analysis. The influence of other payments turned out to be statistically significant in all classes of farms. These included subsidies for intermediate consumption, investments and additional support. The aggregation of these payments into one value resulted from the fact that not all these types of payments were present in all the EU countries. Nevertheless, the most important conclusion stems from the fact that, irrespective of the farm's production value, this aggregate has a positive

effect on its income. The most favorable impact occurred in the case of farms with a turnover value of over up to 100,000 EUR as evidenced by the relatively highest coefficient of the parameter “other subsidies” in this class of farms. It was the lowest in farms with the highest production (Table 2). A smaller impact, and one that was only statistically significant in three classes of farms, occurred in the case of subsidies for public goods and subsidies for production. The impact was the lowest for decoupled payments, covering area payments or subsidies per farm depending on the country. The results contained in Table 2 show that the support from the CAP had the weakest impact on the income of farms with an average production value (class 3 and 4, i.e., 25,000–100,000 EUR).

Table 2. Impact of CAP subsidies on the income of family farms in the European Union differing in the scale of production (years 2004–2017).

Variable	Below 8 k EUR	8–25 k EUR	25–50 k EUR	50–100 k EUR	100–500 k EUR	Above 500 k EUR
Public goods (X1)	1.571 *** (0.354)	0.829 *** (0.224)	0.596 (0.404)	0.084 (0.277)	0.206 (0.237)	1.127 * (0.605)
Plant and animal production (X2)	1.179 * (0.602)	0.769 ** (0.340)	0.175 (0.412)	0.063 (0.461)	0.646 ** (0.262)	0.220 (0.163)
Decoupled payments (X3)	0.863 (0.509)	0.671 ** (0.285)	0.064 (0.303)	0.246 (0.440)	0.781 ** (0.357)	0.461 (0.264)
Other payments (X4)	0.435 *** (0.111)	0.797 *** (0.164)	0.865 *** (0.093)	0.968 *** (0.126)	0.619 *** (0.213)	0.347 * (0.169)
Constant	235.757 (962.976)	1945.105 (1801.598)	9725.3 *** (2735.457)	20,361 *** (6344.631)	27,563.294 *** (9210.754)	84,754 *** (12,040.31)
Number of observations	117	254	334	345	340	202
Number of countries	9	20	25	25	25	16
R ²	0.484	0.202	0.094	0.114	0.138	0.131

The most favorable impact of the CAP on the income situation occurred in second-class farms (production from 8000 EUR to 25,000 EUR). It was statistically significant in this class of farms in all specified groups of payments. However, this applied to a greater extent to farms with lower production (up to 25,000 EUR) and large farms (class 5), i.e., farms with a production value of more than 100,000 EUR up to 500,000 EUR than farms with an average production value. Guth et. al. [14] showed that the CAP subsidies had the strongest impact on the income of class 5 farms, i.e., from 100,000 up to 500,000 EUR. On the other hand, Smędzik-Ambroży [57] proved that the income of Polish family farms, regardless of the scale of their production, is positively influenced by production and agri-environmental subsidies, area payments and subsidies to less-favored areas. Moreover, the World Bank report [58] shows that the shift from “coupled” towards “decoupled” payments and Pillar II is associated with higher agricultural productivity growth in the EU. Our estimates and the results of research by other authors confirm that the institutional conditions resulting from the EU agricultural policy had a positive effect on agricultural income in the EU. However, this impact differed depending on the farm’s production value. Once again this encourages increasing the regional character of the CAP and increasing the possibility of shaping the amount of support for various groups of farms at national levels. Probably this would enable the reduction of the disparity between agricultural and non-agricultural income across the EU to a greater extent than at present. In such a situation, the value of support could be influenced to a greater extent by the actual needs of farms determined with probably greater effectiveness, because it could occur in a decentralized way.

5. Conclusions

The results of our analyses confirm that the EU displays a favorable trend in the impact of CAP subsidies on the income situation of agriculture in individual countries forming this

grouping. However, the degree of this beneficial impact varies depending on the countries and the production volume of farms. This is evidenced by the different degree of impact of CAP subsidies on the profitability of farms with comparable production from different EU countries and farms differing in their scale of production in each EU country. It can therefore be concluded that the existing solutions of the CAP serve to reduce the disparity of agricultural income in relation to non-agricultural sectors in individual EU countries, but despite this impact, there are still significant differences in the income deprivation of farms with different production values from the same country. These differences also apply to farms with a similar production volume from different EU countries. On the basis of various considerations, it should be assumed that the achievement of the social and economic sustainability of EU agriculture is therefore questionable. This is true both in spatial terms (between different EU countries) and between farms with different production volumes, e.g., due to the diversified distribution of support from the EU's agricultural policy. The unbalanced distribution of income and the uneven impact of subsidies on the income situation of various classes of farms may be a premise for the economic and social unsustainability of agriculture, because, depending on the scale of production, farms benefit to a different extent from the impact of agricultural policy on their income. Therefore, it can be said that in the EU, apart from financial flows between countries, the allocation of funds within countries is also important, but the scope and criteria of this allocation should be adequately shaped at the national level to the needs of the agriculture in a given country. This will allow, in general, for increasing the degree of economic and social sustainability of EU agriculture, as the sum of the effects of the CAP impact on the levels of national economies. This also justifies further research on the relation of agricultural to non-agricultural income in the European Union countries. This will make it possible to determine whether there have been any changes in this respect as compared to previous years. These changes are needed to increase the social and economic sustainability of agriculture in the EU countries.

6. Limitations

The authors realize that perhaps the income of the third or fourth class of economic size farms should have been related to the average income obtained in non-agricultural sectors. With this approach, however, the indicated differences would not change, as the only changes would concern values. The main aim of the analysis was to indicate differences in European agriculture, which are visible when considering the differences in the production volume of farms. This was allowed by the adopted methodological approach. Relating the income of farms with the smallest production scale to the average income obtained in non-agricultural sectors also allowed us to avoid a discussion on whether the income of the second class, third class or perhaps of larger-scale farms should be compared with the average income from non-agricultural sectors.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Ratio of family farm income per family full-time employee (Family Farm Income/FWU) to non-agricultural income in EU countries in 2004–2017.

Country/Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Average
Slovenia	0.13	0.11	0.07	0.17	0.15	0.18	0.15	0.19	0.14	0.15	0.14	0.12	0.12	0.17	0.14
Poland	0.23	0.22	0.28	0.40	0.34	0.26	0.37	0.41	0.38	0.36	0.32	0.24	0.23	0.28	0.31
Denmark	0.18	0.44	0.58	0.08	- *	-	0.28	1.03	1.84	1.86	0.77	0.30	0.22	1.17	0.40
Sweden	0.15	0.33	0.23	0.74	0.83	0.18	0.50	0.53	0.46	0.46	0.29	0.47	0.55	0.60	0.45
Austria	0.42	0.42	0.46	0.59	0.64	0.45	0.47	0.64	0.56	0.51	0.40	0.31	0.35	0.44	0.48
Portugal	0.30	0.29	0.35	0.39	0.47	0.44	0.48	0.51	0.54	0.57	0.61	0.61	0.56	0.62	0.48
Latvia	0.43	0.42	0.53	0.59	0.52	0.37	0.51	0.66	0.60	0.44	0.43	0.45	0.46	0.49	0.49
Lithuania	0.34	0.32	0.32	0.62	0.64	0.65	0.73	0.76	0.70	0.57	0.41	0.43	0.34	0.43	0.52
Greece	0.41	0.47	0.48	0.56	0.54	0.48	0.54	0.59	0.55	0.59	0.62	0.48	0.53	0.60	0.53
Finland	0.50	0.48	0.44	0.72	0.60	0.46	0.70	0.67	0.65	0.54	0.62	0.44	0.33	0.51	0.55
Irleand	0.50	0.51	0.50	0.63	0.57	0.44	0.45	0.65	0.53	0.55	0.68	0.57	0.52	0.70	0.56
Luxembourg	0.56	0.58	0.60	0.81	0.73	0.41	0.40	0.79	0.58	0.69	0.70	0.67	0.45	0.73	0.62
EU-average	0.47	0.49	0.51	0.73	0.58	0.41	0.65	0.82	0.81	0.76	0.71	0.59	0.59	0.74	0.63
Estonia	0.57	0.56	0.43	0.76	0.83	0.61	0.79	1.01	1.06	0.85	0.47	0.44	0.21	0.65	0.66
Slovakia	0.64	0.51	0.01	1.30	0.56	0.09	0.29	1.27	0.91	0.32	1.19	1.06	1.23	1.04	0.74
France	0.64	0.63	0.72	1.01	0.87	0.41	0.93	1.07	1.01	0.69	0.73	0.63	0.46	0.66	0.75
Germany	0.57	0.58	0.64	0.90	0.65	0.59	0.79	0.88	0.96	1.02	0.78	0.56	0.72	0.83	0.75
Spain	0.80	0.64	0.76	0.93	0.88	0.62	0.71	0.72	0.66	0.72	0.66	0.78	0.89	0.94	0.76
Czech Republic	0.61	0.57	0.70	1.02	0.93	0.70	0.73	1.18	1.01	1.10	1.10	0.76	0.69	0.68	0.84
Italy	0.63	0.66	0.67	0.86	0.83	0.88	0.81	0.84	0.86	0.84	1.18	0.94	0.97	0.94	0.85
Belgium	0.72	0.75	0.86	1.01	0.80	0.72	1.03	0.87	1.01	0.94	0.84	0.64	0.80	0.88	0.85
The Netherlands	0.50	0.67	0.81	0.84	0.59	0.40	1.00	0.72	1.12	1.19	0.93	0.91	1.00	1.31	0.86
United Kingdom	0.61	0.72	0.75	1.17	1.16	0.97	1.21	1.54	1.13	1.08	0.87	0.54	0.64	0.89	0.95
Hungary	0.41	0.37	0.46	0.78	0.82	0.59	0.98	1.43	1.41	1.45	1.50	1.27	1.38	1.34	1.01

* dash means negative income, i.e., a loss, and therefore the income relation was not defined. Source: own elaboration based on FADN and OECD [43] data.

Appendix B

Table A2. The share of the balance of subsidies and taxes from investment and operating activities in regard to the income of a family farm in the EU countries in 2004–2017 (for Bulgaria and Romania years 2007–2017 and for Croatia years 2013–2017).

Country/Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Average
Slovakia	-	-	-	-	-	-	-	-	-	-	5.68	5.11	1.87	20.77	-
Sweden	5.45	2.56	3.88	1.39	1.31	6.24	2.20	2.34	2.42	2.44	3.85	1.94	1.66	1.51	2.80
Denmark	3.95	1.67	1.41	12.30	-	-	3.33	1.04	0.56	0.56	1.24	2.57	3.46	0.69	2.70
Finland	2.02	2.20	2.32	1.79	2.43	3.18	2.14	2.31	2.40	3.00	2.59	3.00	3.85	2.69	2.57
Czech Republic	1.33	2.42	2.45	1.65	2.66	6.70	3.39	1.72	1.70	1.76	1.50	2.21	2.41	2.25	2.44
Estonia	0.84	0.85	1.10	0.74	1.52	2.39	1.43	1.24	1.13	1.81	3.48	3.63	-	1.49	1.70
Luxembourg	1.08	1.16	1.21	1.03	1.19	2.10	1.96	1.26	1.54	1.32	1.26	1.43	1.75	1.25	1.40
Latvia	0.91	0.89	1.06	0.96	1.40	2.10	1.44	1.32	0.95	1.35	1.52	1.20	1.33	1.07	1.25
Slovenia	1.04	1.00	1.13	0.77	1.27	1.16	1.26	1.01	1.45	1.59	1.43	1.41	1.32	1.15	1.21
Hungary	1.33	1.79	1.29	1.00	0.88	1.93	1.09	0.79	0.79	0.93	0.84	0.90	0.76	0.72	1.07
United Kingdom	1.44	1.31	1.28	0.91	0.92	1.11	0.83	0.68	0.86	0.94	1.10	1.36	1.23	0.90	1.06
Bulgaria	x	x	x	0.37	0.63	1.31	0.77	0.70	0.76	1.24	1.22	1.26	1.47	1.08	0.98

Table A2. Cont.

Country/Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Average
Germany	0.93	0.93	0.95	0.72	1.12	1.49	0.97	0.91	0.70	0.68	0.85	1.07	0.84	0.72	0.92
Ireland	0.93	0.97	1.02	0.91	1.09	1.39	1.08	0.75	0.89	0.86	0.72	0.65	0.75	0.59	0.90
France	0.92	0.95	0.89	0.68	0.86	1.63	0.70	0.65	0.63	0.92	0.85	0.78	1.08	0.77	0.88
Lithuania	0.54	0.70	0.86	0.50	0.64	1.03	0.82	0.72	0.61	0.81	1.07	0.88	1.29	0.93	0.81
Austria	0.83	0.86	0.82	0.63	0.65	0.97	0.84	0.66	0.67	0.75	0.76	0.74	0.71	0.67	0.75
Croatia	x	x	x	x	x	x	x	x	x	0.69	0.73	0.69	0.71	0.69	0.70
EU average	0.58	0.62	0.62	0.51	0.61	0.82	0.61	0.58	0.56	0.61	0.62	0.63	0.63	0.55	0.61
Cyprus	0.83	0.73	0.61	0.48	0.68	0.72	0.39	0.35	0.64	0.51	0.67	0.60	0.52	0.37	0.58
Portugal	0.68	0.70	0.60	0.55	0.51	0.59	0.55	0.57	0.60	0.58	0.54	0.59	0.52	0.50	0.58
Poland	0.28	0.31	0.43	0.35	0.59	0.75	0.55	0.52	0.49	0.57	0.63	0.62	0.69	0.58	0.52
Greece	0.40	0.38	0.49	0.45	0.53	0.54	0.51	0.54	0.54	0.58	0.52	0.55	0.57	0.50	0.51
Malta	0.42	0.50	0.50	0.51	0.62	0.46	0.57	0.57	0.39	0.31	0.32	0.33	0.25	0.25	0.43
Belgium	0.32	0.32	0.35	0.36	0.50	0.53	0.39	0.46	0.39	0.41	0.46	0.47	0.41	0.35	0.41
Spain	0.28	0.36	0.31	0.25	0.36	0.47	0.49	0.49	0.49	0.47	0.53	0.40	0.35	0.37	0.40
Romania	x	x	x	0.65	0.24	0.44	0.28	0.27	0.31	0.32	0.28	0.31	0.42	0.35	0.35
Netherlands	0.18	0.22	0.25	0.27	0.43	0.65	0.26	0.41	0.26	0.21	0.18	0.25	0.22	0.14	0.28
Italy	0.28	0.29	0.30	0.23	0.22	0.23	0.24	0.24	0.23	0.25	0.21	0.23	0.22	0.23	0.24

dash means negative income with subsidies i.e., a loss, and therefore the share was not defined. Source: own elaboration based on FADN data.

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