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The Influence of the European Union's Common Agricultural Policy on the Socio-Economic Sustainability of Farms (the Case of Poland)

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Abstract: Sustainable development plays an important role in shaping conditions for economic growth, social development and care for the natural environment. The issue was also noticed at the level of the European Union, which is expressed among others by creating sectoral policies, including the Common Agricultural Policy. The aim of the article is to determine the influence of the Common Agricultural Policy on the level of socio-economic sustainability of farms in Poland. The authors formulate a hypothesis that the existing solutions serve the achievement of economic sustainability, determined by the agricultural to non-agricultural income ratio, but they do not provide sustainability of farms in terms of the social element understood as taking income disparities into consideration. In the article, panel regression and the ratio of income from representative FADN farms to average annual gross salary per employee in Poland in the years 2004–2017 were used. It was found that thanks to the support from the Common Agricultural Policy, the average income of farms comes close to the average income of the non-agricultural sector. However, the influence of the subsidies on changes in economic sustainability was uneven in various economic size classes of farms—the strongest farms benefited the most, which means that social sustainability in terms of equal distribution of income was not achieved.

Keywords: socio-economic sustainability; agriculture; public policies; Common Agricultural Policy

1. Introduction

The idea of socio-economic sustainability (or sustainable economic and social development) is very broad and depending on the adopted concept, various characteristics describing this state are listed in the literature. The bases of the definition of sustainable development were formulated in the final report of the World Commission on Environment and Development appointed by the UN, also called the Brundtland report. At the time, it was pointed out that sustainable development is an idea of development that meets the needs of the present without compromising the ability of future generations to meet their own needs [1]. Several years later in 1992, during the UN Conference on Environment and Development in Rio de Janeiro "Earth Summit", a broad concept of sustainable development was adopted [2]. It assumed properly structured relationships between economic growth, environmental protection, and the social sphere [3]. Here, a significant role was attributed to activities aimed at increasing social cohesion, including limiting income disparities, providing equal opportunities and counteracting marginalization, access to employment, education, and healthcare.

The concept of sustainable development-oriented at economic growth and solving social and environmental issues became an element of the EU's 1997 Treaty of Amsterdam, and four years later, the European Council adopted conclusions to the document entitled "A Sustainable Europe for a Better World: A European Strategy for Sustainable Development", the so-called Gothenburg Strategy, proposed by the European Commission, which became the basis for creating the first EU strategy of sustainable development (EU SDS) [4]. The contemporary vision of this idea, implemented within the framework of the Europe 2020 Strategy, includes the following interconnected priorities [5]:

- Smart growth, based on knowledge and innovation,
- Inclusive growth, fostering a high-employment economy delivering social and territorial cohesion,
- Sustainable growth, promoting a more resource-efficient, greener and more competitive economy.

It is important that the benefits of economic growth are equally distributed across the European Union, including its outermost regions. Apart from the strategies listed above, the concept of sustainable development is also present in other EU documents and initiatives, as well as sector policies. One of the examples is the Common Agricultural Policy (CAP). One of its main objectives is to ensure a fair standard of living for the agricultural community [6], among others through stable income and improving the conditions of functioning in rural areas by creating infrastructure, enterprise, services, etc. while respecting the natural environment. In the literature is accented that the achievement of sustainable development of EU agriculture is supported by reforms of the Common Agricultural Policy after the year 2000 [7,8]. This statement was decided to verify on the example of the agricultural sector in Poland.

Therefore, the purpose of the article is to determine the influence of the Common Agricultural Policy on the level of socio-economic sustainability of farms in Poland. We concentrate here on only two aspects of sustainability because environmental sustainability is the subject of a separate study. In this study, we formulate a hypothesis that the existing CAP solutions serve the achievement of economic sustainability, determined by the agricultural to non-agricultural income ratio, while they do not provide sustainability of farms in terms of the social element taking income disparities into consideration. To put it differently, thanks to the support, the average agricultural income of farms comes closer to the average non-agricultural income, while within the agricultural sector the distribution of this support is uneven. This leads to increased disparities in the income of small, medium-sized, and large farms. It is worth adding here that the impact of the Common Agricultural Policy on the sustainability of farms with different types of production in Poland and other EU countries has been a subject to many other studies present in the literature e.g., Smędzik-Ambroży [9] and Guth and Smędzik-Ambroży [10]. The publication uses critical analysis of source literature, meta-analysis, methods of inductive reasoning, and selected methods of quantitative analysis—regression and panel analysis. The subjective scope includes farms that belong to the FADN system, and the timeframe—the years 2004–2017. Analysis using similar research methods should be also carried out in relation to agriculture in other EU countries. This will determine whether the instruments of the Common Agricultural Policy also increase economic and social sustainability in other EU countries, which is a strategic goal in the EU common agricultural policy. Comparative analysis of research results would allow verification of the statement that the sustainable development of EU agriculture is supported by the Common Agricultural Policy subsidies.

2. Literature Review

Agriculture generates too weak internal forces to trigger a growth process and maintain in a state of dynamic equilibrium. Therefore, the development of the agricultural sector requires external impulses. Repeating after Hayami and Ruttan [11] agricultural policy plays this role in this sector. According to many authors, the institutional conditions created by politics are crucial in creating conditions for sustainable agriculture development [12]. The policy implemented thanks to the institutions involves setting goals and desired directions of development, which then, through specific instruments of this

policy, allow achieving the desired result. In the European Union, by the institution of the Common Agricultural Policy and its instruments, agricultural development is created in a socially desirable direction. Thus, the study refers to the trend of institutional economics. In addition, as the purpose of the paper was: to determine the influence of the Common Agricultural Policy on the level of socio-economic sustainability of farms in Poland, the considerations in the article refer to the economics of development, especially the economics of sustainable development. The economics of sustainable development has a much wider area of interest than just market aspects of the economy. It also deals with relations between the economy and the natural environment, relations between the economy and the social sphere, the institutional conditions of the economy, society and the environment, as well as economic, social and natural processes. One should notice the contradiction between classical and sustainable economics. According to mainstream classical economics, the producer and consumer strive to maximize utility without taking into account environmental and social restrictions. Additional factors become apparent in the economics of sustainable development. According to the economics of sustainable development, the criterion of maximizing utility must also take into account social requirements and the depletion of natural resources and other limitations of the natural environment. Therefore, the contradiction between the microeconomic understanding of rationality from the neoclassical economics point of view and macroeconomic rationality represented in the economics of sustainable development is emphasized.

When describing the selected indicators of sustainable development, as mentioned before, the authors' attention will be focused on the economic and social elements, leaving aside the issues of measuring environmental sustainability. Hence, it may be said that the primary and most frequently used measures of the economic effect are the quantitative indicators of the increase in output produced or indicators of the quantitative increase in consumption (i.e., output sold). On the macroeconomic level, they take on the form of gross domestic product (alternatively gross national product or national income) [13]. On the microeconomic scale, economists use the amount of income per person within a household, the number of the holding's expenses, less often the wage level. Among other measures of economic order, the employment and professional activity indicators, workforce productivity, fixed asset capital intensity, and energy intensity indicators, investment level, outlays on research and development activity are the most commonly used in the literature [14,15].

Since welfare is influenced by numerous measurable and non-measurable factors, determining the quality of life (e.g., life expectancy, health status, housing conditions, education and culture, human rights), a catalog of measures taking these elements into consideration was created. Many of them refer to the issue of fair distribution of wealth and measuring the equality of income distribution. The Gini coefficient based on the Lorenz curve is usually used. It is a measure of the concentration (inequality) of income distribution in the group under study [16]. Based on the Gini coefficient, A. Sen developed a measure of welfare, taking into consideration the level and distribution of income per capita. It turns out that a high level of income per capita is not tantamount to a high level of socio-economic development. Countries with lower income, but that have put emphasis on its egalitarian distribution, and countries with a high level of income per capita, but with considerable disparities in its distribution, may be considered as having the same level of prosperity [17]. Another example is the Index of Sustainable Economic Welfare (ISEW) developed by H.E. Daly and J.B. Cobb in 1989. In the case of this measure, individual expenses on consumption adjusted for losses resulting from uneven distribution of income are the point of departure [18]. Apart from the issue of inequalities in income distribution, from the social perspective, sustainable development is measured with the use of the following elements: access to the labor market including the level of unemployment, access to education, the quality of public health, demographic changes as for instance the rate of natural increase, migration rate, public safety, and sustainable consumption patterns [14,15].

A special set of socio-economic sustainability indicators was developed for the assessment of the functioning of farms. It was preceded by a literature review, which was reflected in the final selection of variables in the study. The production results as the amount of revenue, income or production costs

and the indices of cost-effectiveness, liquidity, stability, and productivity based on them [18] are usually the criterion of economic assessment. An additional criterion, namely "autonomy", was proposed by H. Bossel [19,20]. That autonomy (freedom) may be perceived as becoming independent of purchasing investments from outside, which means that farms are less susceptible to any fluctuations in the prices of means of production. Autonomy may also be assessed in terms of the level of debt or the impact of subsidies on economic performance. Finally, autonomy may be connected with the possibility to diversify the income—the higher it is, the greater the autonomy. However, income cannot be diversified through the diversification of agricultural production or by generating non-agricultural income. The economic dimension can also be equated with the concept of the viability of a farm, i.e., the ability to last in changeable market conditions for a long period of time and the capacity of a farm to be transferred to a successor [21]. It requires a sufficiently high agricultural income, both in nominal terms and in relation to non-agricultural income. Argilés defines farm viability as an ability to remunerate agricultural working time put in by family members over a long period at a comparable wage to alternative sources [22]. Hennessy et al. [23] define an economically viable farm as one having the capacity to remunerate unpaid family labor at the average agricultural wage. A comparison of agricultural to non-agricultural incomes is also suggested by Vrolijk et al. [24].

The selection of data on social sustainability was particularly difficult. Compared to measuring environmental and economic sustainability, research in this area is still limited. The measurement of social indicators is challenging as they are often qualitative and may, therefore, be considered subjective. The social aspect of sustainability concerns the assessment of the way of life of the members of a farm and includes education, working conditions (including working time), and the quality of life understood as the degree of social inclusion or exclusion [25]. Van Cauwenbergh expands this list by health status, gender equality, and access to services and infrastructure in the countryside. In a broader context, the quality of life in rural areas (taking into consideration the cultural heritage, traditions, and aesthetic values), access to employment and eco-friendly services and healthy food [26] can also be mentioned. These elements are derived from the level of wealth of the farm. Therefore, in the macroeconomic dimension, it can be assumed that the higher the income of all farms and the more even their income distribution, the higher the level of social sustainability. This approach is used by, inter alia, Gaviglio et al. [27] while assessing the case study of the South Milan Agricultural Park, Italy. Hence, among the variables describing social sustainability, the authors mention equality in terms of labor factor payment. At the same time, the importance of the Common Agricultural Policy mechanisms for creating the economic performances of farms is emphasized. Fair distribution of welfare and even distribution of income are also widely used to assess socio-economic development. Examples of such measures are given by Peacock et al. [16] and Sen [17], indicating that a high average level of income per capita is not synonymous with a high level of socio-economic development.

3. Methods and Materials

In the first stage of the research, we assessed the influence of CAP subsidies on the ratio of income from a representative FADN farm per person working full-time in the family (FWU) to non-agricultural income in Poland in the years 2004–2017. In the first variant, income from a representative FADN farm included EU CAP subsidies, understood as subsidies for operational activity and the balance of subsidies and taxes for investment activity. The latter version did not include the value of these subsidies. Analyzed FADN farms, depending on the year, represented from 725,570 to 735,200 farms located in Poland. The exact numbers of analyzed farms in each of the years 2004–2017 presents Tables A1 and A2 in the Appendix A. The sample of analyzed farms was not characterized by stability in each year of the analysis. However, the main reason of the study was not, to determine the trends over time, but to make a comparative analysis of the impact of the Common Agricultural Policy on the socio-economic sustainability of farms of different sizes in each of the years 2004–2017, as well as to show a relation of agricultural to non-agricultural incomes in the analyzed period. Therefore, changes in the number of farms analyzed had a limited impact on the results of the analysis. As the

income from non-agricultural sectors, the average annual gross salary per employee in PLN, in the individual years of the research period was adopted. It was assumed that the increase in the ratio of income of a representative FADN farm per person working full-time in the family to non-agricultural income in Poland in each year of the 2004–2017 period causes an increase in the economic sustainability of agriculture in Poland, as it reflects the improvement of the income situation of this sector compared to other sectors. The comparison of the ratio of income from a representative FADN farm with subsidies from the Common Agricultural Policy and after their subtraction to non-agricultural income in Poland made it possible to make conclusions about the influence of CAP subsidies on the economic sustainability of agriculture in Poland in 2004–2017. Next, 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 economic sustainability of agriculture in Poland in 2004–2017. The purpose of this analysis was to determine whether all specified groups of subsidies of the CAP had a statistically significant impact on the income of Polish farms and whether the direction of this impact was positive. The authors are aware that determining whether these subsidies contributed to the diversification of markets, diversification of crops planted, improved machinery is justifiable and needed, however, it requires detailed surveys, which is the direction of future research of the authors. In these analyses, however, publicly available FADN data was used that did not contain information on this topic. Since the data analyzed was combined cross-sectional data (for economic size classes) and data concerning the time series (2004–2017), we studied the dependence of net farm income per family work unit (FWU) on various groups of subsidies, with the use of panel regression model. After the analysis of the scatter plot, it was decided to use the power model, in view of which the logarithm of both sides of the equation was taken and the function of the dependent variable y was obtained:

$$lnY = \ln(X1) + \ln(X2) + \ln(X3) + \ln(X) \quad (1)$$

$$lnY_{it} = \alpha \ln X1_{it} + \beta \ln X2_{it} + \delta \ln(1+t)_{it} + \gamma \ln R_{it} + b_{it} \quad (2)$$

where: Y_{it}—net farm income/FWU in economic size classes i and years t. $X1_{it}$—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). $X2_{it}$—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). $X3_{it}$—the value of single area payments (SAP) per FWU. $X4_{it}$—the value of subsidies for investments per FWU.

The authors constructed ordinary regression models using the classical least squares method (CLSM). Due to the need to reject the hypothesis of using this approach (based on the Breusch-Pagan test), we estimated the fixed effects (FE) panel model. The assessment to determine which of the models is the right one (FE or RE—fixed-effects or random-effects model) was carried out based on the Hausman and Welch tests. The final model was estimated with the use of HAC standard errors. The collinearity of the variables was assessed based on variance inflation factors (VIF). Only one of the variables (single area payments/FWU) slightly exceeded the critical value VIF = 10, and so we decided to draw conclusions based on the estimated model. At the end of this part of the research, we also used the division of FADN farms according to economic classes expressed in the values of the farm's standard output in EUR, in order to answer the question of whether these classes differ from each other in terms of the impact of CAP support on their economic sustainability.

The choice of panel regression model resulted from earlier analyzes of this type and used previously in similar studies. For example, Czyżewski et al. [28] used it to assess the impact of selected CAP support programs on-farm productivity and their social sustainability by EU-28 regions in 2007–2012. The impact of EU agricultural policy on the level of agricultural sustainability in EU countries is the subject of an advanced FLINT research project [29]. The authors of the project implement a set of panel data using the FADN database. FLINT provides a significant contribution to the field of

policy assessment relevant to the CAP by showing the feasibility of collecting farm-level sustainability data and illustrating the added value of these data in a number of cases. In turn, Polcyn et al. [30] address the question of whether CAP payments for public goods are a desirable systemic solution that serve to reduce market failures related to such factors as food prices flexibility and, as a consequence, agricultural income instability. In the study, panel regression analysis was performed on three sets: the EU-15 countries, the EU-12 countries, and—within Poland—subsectors of farms from six standard output classes and covered the years 2004–2012. Similarly, the impact of CAP instruments on the level and variability of farm income is the subject of Severini's [31] and Phimister's research [32]. The first case study includes a database of a constant sample of Italian farms during the decade 2003–2012. In the second case, farms in Scotland are analyzed in the years 1988–2000.

The last step of research concerns a comparative analysis of the impact of CAP subsidies on the economic sustainability of Polish farms of various economic strength, which is determined by the output of farm in EUR (SO EUR) in the years 2005–2017 compared to 2004. The year 2004 was adopted as the reference period. We also used two variants in the comparisons. In the first one, the farm income included, as before, the value of subsidies from the EU's agricultural policy, and in the second one, it was reduced by this value. Representative holdings were again divided into six classes according to the value of their standard output. Next, we compared the changes in the ratio of farm income per person working full-time in the family in these two variants to non-agricultural income in Poland (average annual gross salary per employee in PLN) in the individual years of the 2005–2017 period compared to this ratio as of 2004. It was assumed that a similar impact of CAP subsidies on the ratio of agricultural income to non-agricultural income compared to this ratio in 2004 in various economic classes of holdings shows that none of these classes were privileged in terms of the impact of subsidies on the economic sustainability. This would, at the same time, suggests the improvement in the social sustainability of Polish agriculture itself (since one of the elements of social sustainability is equal distribution of income within the group under study). Thus, the asymmetric influence of subsidies on the economic sustainability of various classes of holdings in 2005–2017 compared to 2004 means that farms in Poland are not socially sustainable, as the benefits of the positive impact of the EU's agricultural policy support are seized by these classes of producers for whom—thanks to CAP subsidies—there is the biggest difference between the ratio of agricultural to non-agricultural income in the variant with subsidies and the same ratio in the variant without subsidies. The temporal scope of the research included the years 2004–2017, the spatial scope—Poland, and the subjective scope—representative FADN farms (representing ca. 730,000 holdings in the individual years of the research period).

4. Results and Discussion

4.1. Agricultural Income Against the Non-Agricultural Income

Before we move to the discussion of the research results, the structure of the EU funds intended for farms is worth considering. Man can point out two purposes of such funds—competitiveness and cohesion. The first one puts emphasis on a high and growing standard of living, creating employment, with the lowest possible unemployment level [33]. The second one, in turn, concerns three dimensions: economic, social, spatial and means decreasing disparities in the level of economic development between rich and poor areas, but it can also refer to individual social groups. It seems that supporting both competitiveness and cohesion should lead to the income gap becoming smaller. In fact, as far as the funds allotted to supporting cohesion in all probability contribute to decreasing disparities on many planes, also the economic one, the aid funds aimed at improving competitiveness do not contribute to the creation of income in a clear unambiguous manner. Supporting competitiveness may cause an increase in financing mainly those farms which are larger in terms of area, have greater development opportunities, and can provide their own contribution to co-funding projects, which results explicitly from the purpose of supporting competitiveness—achieving a high level of productivity [34]. What is

it like in practice? How do various types of subsidies impact the general increase in the wealth of farms and the diversity of the level of income within the group under study? Let us recall that through the agricultural to non-agricultural income ratio, the level of economic sustainability will be examined, and determining the disparities in this relationship for various economic classes of farms will serve to define social sustainability.

In the years 2004–2017, taking CAP subsidies into account caused the agricultural income to constitute on average 63% of the average income in non-agricultural sectors in Poland. Not including this support in the value of agricultural income made the percentage over half as low, coming to only 24% (see Table 1).

Table 1. Ratio of agricultural income of FADN farms to non-agricultural income in Poland in the years 2004–2017 (in percent).

Agricultural Income to Non-Agricultural Income (Percentage)	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Average
Without subsidies	47	33	31	46	19	8	27	31	29	21	13	12	7	17	24
With subsidies	70	56	66	80	58	54	73	76	72	61	54	49	51	55	63

Source: own elaboration based on FADN data.

Thanks to the support, the average income of FADN farms in Poland came closer to the value of the average income of non-agricultural sectors, which certainly had a positive influence on the economic sustainability of agriculture in Poland. In the years 2004–2017 this increase was as much as 39%. The cited research results are confirmed by analyses conducted by A. Baer-Nawrocka [35], according to which providing CAP instruments for agriculture had a decisive influence on the increase in income in EU-12 countries. The countries included in the group were characterized by a large increase in the total value of subsidies, and the largest increase was recorded in Poland. The author estimated that the share of total subsidies in the income of farms in Poland in 2004–2007 came to as much as 45.8%, and in 2008–2011, it reached an even higher level—52.3%. Also, the results of the analysis of Sapa and Smędzik-Ambroży [36] showed a definitely higher positive impact of this EU agricultural policy on the income situation of agriculture in the case of countries that joined the EU in 2004 than in the EU-15. Similar conclusions were formulated by Drygas [37] and Sobczyński [32]. According to them, as a result of direct support, many countries recorded a decrease in the disparities between the income of farmers and income obtained in other occupational groups. In turn Smędzik-Ambroży [9], on the basis of long-term analyzes (2004–2014) showed that in Poland the location has an impact on the economic sustainability of a farm, measured by the ratio of its income to average wages in the national economy. The opposite was when it comes to the environmental sustainability of FADN farms, from clusters of regions differing in agricultural resource conditions in the scale of Poland. It was definitely the highest in the cluster of regions with unfavorable agricultural resource conditions and the lowest in the group of voivodships with favorable agricultural resource conditions in the country In addition, this author stated that in relation to previous years, the economic sustainability of agriculture in Poland increased in years 2004–2014 [33].

The results of the analyzes carried out reflect the view that the CAP is essential in reducing income deprivation of the agricultural sector. This deprivation is an immanent feature of the market mechanism and results from the peculiarities of agriculture. Agriculture is characterized by seasonality, the scale of risk and uncertainty resulting from weather conditions, variable work intensity and cyclicality of production which have destabilizing effects both on agricultural income and profitability of agricultural production [36,38]. This is also confirmed by the results of studies of other authors in which, on the example of various groups, it was shown that agricultural policy is of key importance for reducing agricultural deprivation [39–42]. Thanks to the CAP, this is also reflected in the EU, which is confirmed by the results of our analyzes.

4.2. Impact of the Common Agricultural Policy on the Level of Sustainability of Farms

Another stage of the research was to estimate—with the use of panel analysis—which CAP programs have a statistically significant influence on farm income (see Table 2). It was found that the fixed effects model is the right one, which means that there are significant statistical differences between the influence of individual groups of subsidies on farm income per FWU in various economic size classes. The model was well-matched: the inclusion of individual economic size groups caused the LSDV R^2 value to be 0.96. It was constant in time (but differed in space), and in the case of "within R^2", it was 0.44. It should be recalled that we have analyzed a stack of time series (2004–2017 for each economic size group), and so "within R^2" attributed the changeability of farm income per FWU to the explanatory variables, which also changed over time. However, in the model, their changeability over time turned out not to be statistically significant. Three out of four subsidies groups used as explanatory variables in the model were statistically significant (their p values did not exceed 0.1, except for single area payments for which $p = 0.168$).

Table 2. Impact of individual groups of subsidies on farm income in the years 2004–2017 in light of panel regression (fixed effects, robust errors).

	Coefficient	**Stand Error**	**t-Student**	***p*-Value**	
Constant	8.761076	0.2409701	36.36	0.000	***
Ln of subsidy for public goods per FWU	0.1806758	0.674729	2.68	0.044	***
Ln of subsidy for production per FWU	−0.0679262	0.0303427	−2.24	0.075	*
Ln of SAP per FWU	−0.0826356	0.0513489	−1.61	0.168	
Ln of subsidy for investments per FWU	0.0792031	0.0209124	3.79	0.013	***

Note: R-sq within = 0.4324. min = 10. between = 0.9560. avg = 12.5. overall = 0.4446. max = 13. *** means significance at the level of $p < 0.01$; ** means significance at the level of $p < 0.05$; * indicates significance at $p < 0.10$; lack of star in the cell means that the variable was not significant. Source: own elaboration based on FADN data.

It appears from the model that the highest significance for explaining gross farm income per FWU had the investment subsidies and subsidies for public goods. It could have been caused by their diversity within the group under study (including agri-environment payments, payments for areas with natural handicaps, payments for eco-friendly farms, payments for afforestation).

The negative coefficient of subsidies for production per FWU was a surprise. After data analysis, it was observed, however, that this was the result of the considerable share of fines for exceeded production limits, which is why these subsidies did not contribute significantly to the generation of income in relatively large-scale farms (with larger income per FWU). In accordance with the model, increasing the single area payment by 1% leads, in Polish farms, to a decrease in farm income/FWU by 0.08%, but this variable turned out to be statistically insignificant, which is in line with the results of Marks-Bielska and Babuchowska [43], who revealed that direct subsidies were not considered by farmers as significant financial support for their farms. These trends (though not the values of impact) were also confirmed in Gołasa's [44] conclusions from the study of the influence of selected instruments of the Common Agricultural Policy on the shaping of farm income in Poland.

The results of the analyzes also confirm the results of the Smędzik-Ambroży [9] and Smędzik-Ambroży and Guth [45,46] studies. They showed that in Poland there is a visible positive impact of the value of agri-environmental payments on the economic sustainability of FADN farms. At this point, it is worth recalling that in this study, agri-environmental subsidies were an element of subsidies for public goods. It is also worth adding that these authors also showed that the higher the value of these payments, the greater the environmental sustainability of the farm. In other words, the favorable impact of agri-environmental payments on natural capital results in achieving both economic benefits and an increase in farm income. This was also confirmed by the results of this study. In addition,

Czyżewski et al. [47,48] showed that agri-environmental payments stimulate farm productivity in EU countries.

4.3. Social Sustainability in the Agricultural Sector

When it comes to the division of holdings into economic classes which are measured by standard output in EUR (SO EUR), thanks to CAP subsidies, in 2004–2017 there was an increase in the agricultural to non-agricultural income ratio in each such class, yet the influence varied. This influence started at 16 percentage points in the smallest farms and to 1577 percentage points in the largest farms. What was distinctive was that the larger the output of a farm, determining its inclusion in a given economic class, the higher the positive influence of CAP subsidies on the economic sustainability of that farm. The asymmetry in this respect was considerable, which is reflected in the differences in the impact of CAP subsidies on the agricultural to non-agricultural income ratio in both the smallest and the largest farms groups (see Table 3). Therefore, it may be said that thanks to the support, the average farm income came closer to the average income in non-agricultural sectors, but the distribution of support was very uneven among the farms, to the advantage of the larger holdings. This led to increased income disparities between small, medium-sized, and large farms in Poland.

Table 3. Agricultural to non-agricultural income ratio for various economic size classes (SO) of FADN farms in Poland—average values for 2004–2017 (percentage).

Agricultural Income to Non-Agricultural Income Ratio 2004–2017 (Percentage)	Up to SO EUR 8 k	SO EUR 8–25 k	SO EUR 25–50 k	SO EUR 50–100 k	SO EUR 100–500 k	Above SO EUR 500 k
Without subsidies	6.04	13.81	44.73	131.60	486.37	−417.60
With subsidies	22.26[1]	43.10	94.69	211,93	657.98	1159.87
Increase of the ratio through CAP support in percentage points	16.23	29.30	50.26	80.33	171.60	1577.46

Source: own elaboration based on FADN data. [1] The number is close to the result of the research of Goraj [49]. According to the author relation of the income with subsidies for the smallest farms (per FWU) to non-agricultural income amounted to 22% in 2004.

Thus, the research hypothesis adopted at the beginning has been confirmed. It is also consistent with the conclusions from the research by Bereżnicka [45], according to which the differences in the amount of income between various farm groups are large, but the amounts are influenced not only by the levels of subsidies but also by the largest farms which have resources at their disposal making it possible to achieve high production levels. The author also showed that in the case of very large holdings, there is a strong unidirectional interdependence between the amount of income and subsidies. Graca-Gelert [34] pointed out, in turn, that from 2005–2010, direct subsidies deepened income disparities, while structural pensions contributed to limiting income inequalities in Poland since 2007.

However, because direct subsidies constitute the largest part of the support for farms, the increase in income disparities was generally noticeable. Szarfenberg [50] also points to a steady increase in income disparities, which results from the system of calculating subsidies: larger holdings receive higher subsidies, while smaller ones receive minor amounts. The fact that there is an asymmetry in terms of the distribution of benefits from farm support within the framework of the EU's agricultural policy in Polish agriculture is reflected in the calculation results presented in Table 3. The aim of further analysis is to determine whether that asymmetry also occurred in terms of the influence of CAP subsidies on the economic sustainability of individual FADN farm classes in the years 2004–2017.

Figure 1 presents the influence of CAP subsidies and subventions on changes in the economic sustainability of FADN farms in Poland measured by the ratio of their income to the income in non-agricultural sectors from 2005–2017 compared to this ratio in 2004 (2004 = 100). It is clear that this influence was uneven in various farm classes, which is most distinctly reflected in the comparison of the income situation of the smallest farms and those belonging to the largest economic class. In the case of the smallest farms, we can see the increase of their economic sustainability measured by the ratio of their income per FWU with subsides to non-agricultural income, on average by 7.86% in 2005–2017 compared to the 2004 year. In the variant without subsidies, there was a decrease of economic sustainability in the smallest farms average by 0.5% in the period 2005–2017 compared to the 2004 year.

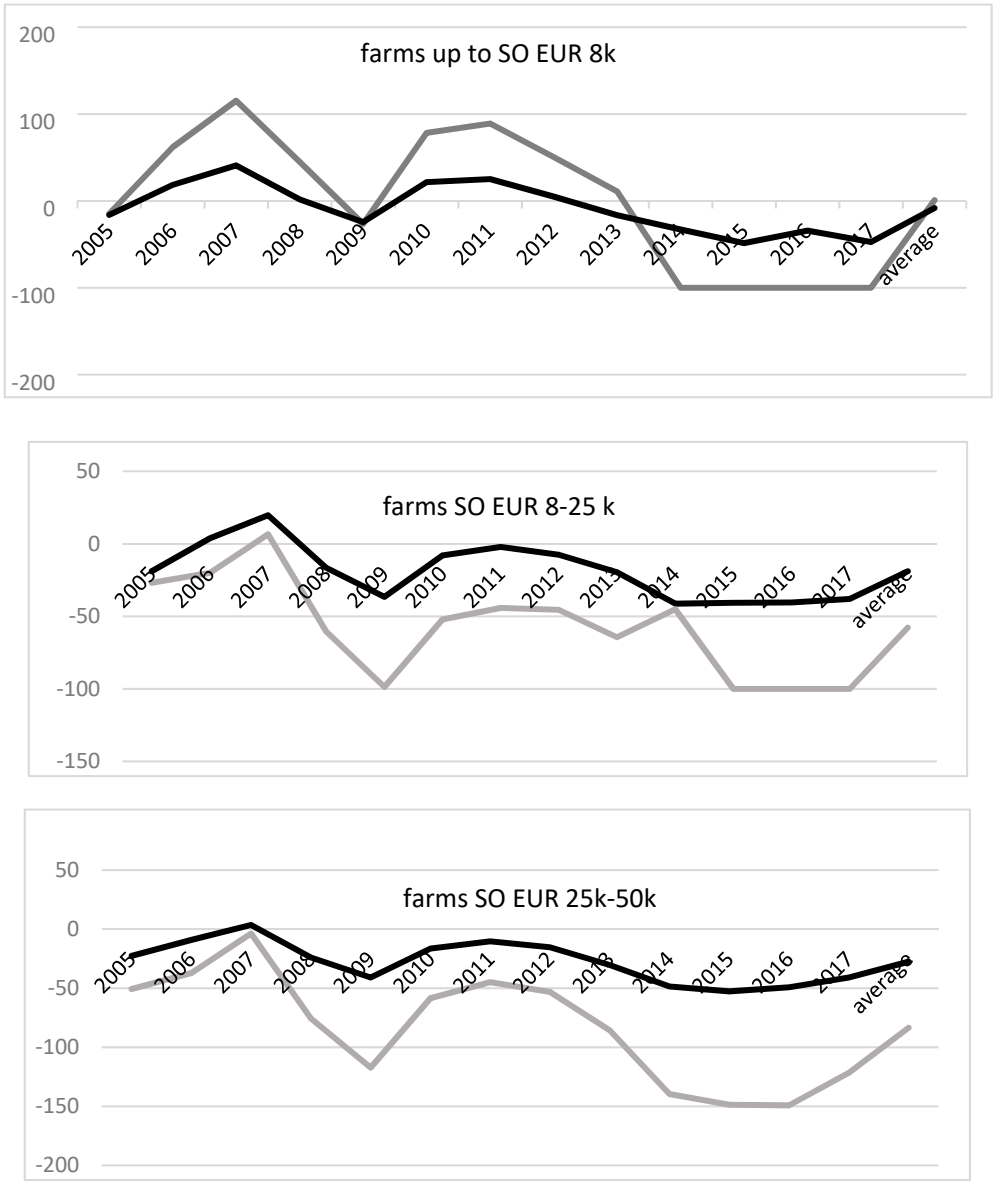

Figure 1. *Cont.*

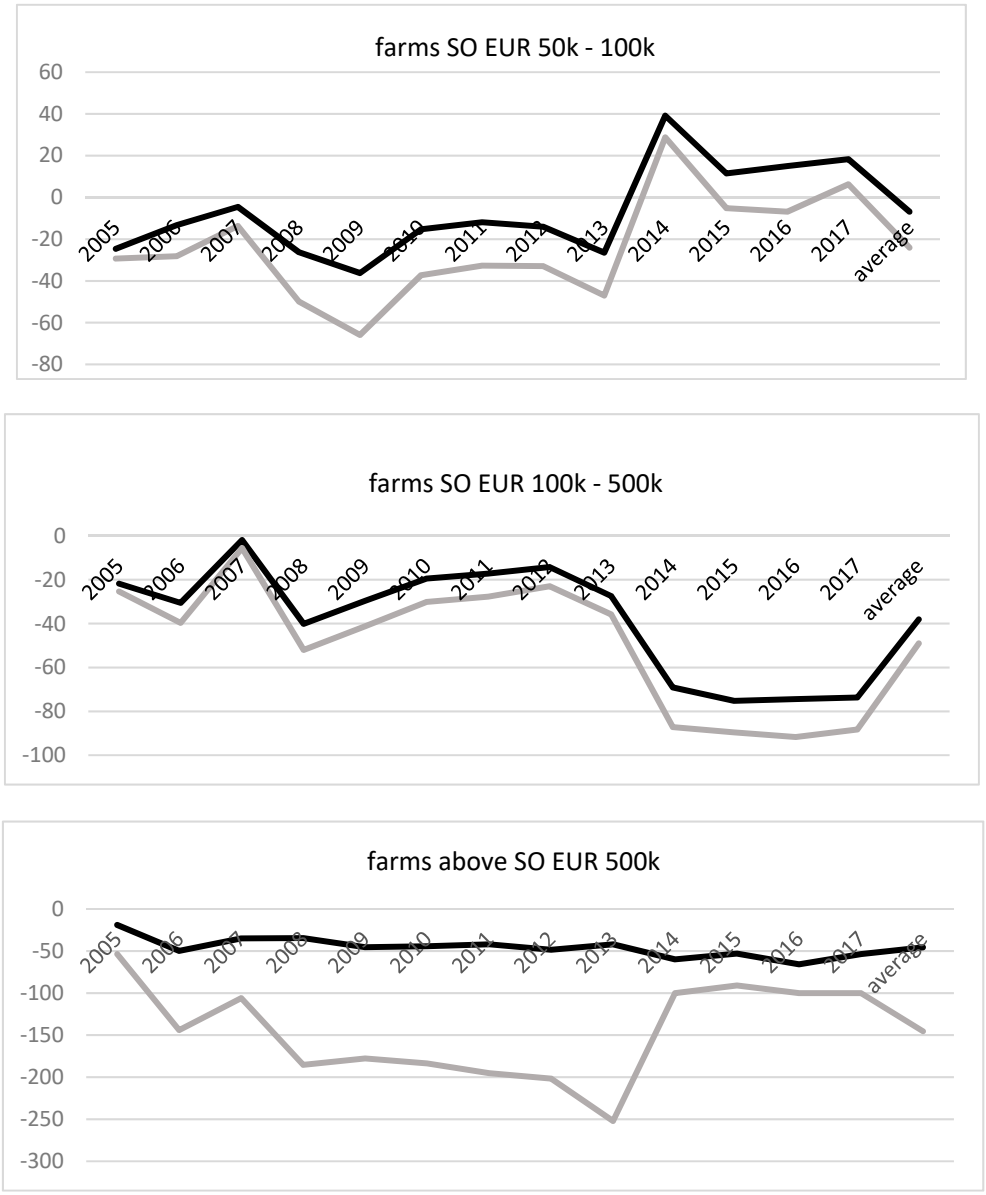

Figure 1. Change in the agricultural to non-agricultural income ratio in various economic classes of FADN farms in 2005–2017, for 2004 = 100 (percentage). Source: own elaboration based on FADN data.

In the other economic classes of farms, regardless of the variant adopted, the level of economic sustainability in the years 2005–2017 decreased (2004 was the reference year), however, the subsidies significantly limited the decrease of the disadvantageous ratio of agricultural income to non-agricultural income (cf. Figure 1). Not including subsidies when calculating the agricultural to non-agricultural income ratio in the years 2005–2017 (for 2004 = 100) resulted in the decrease of this ratio on average by 44%, and in the case of the largest farms—as much as 128%. Including the value of subsidies in income reduced the above-mentioned decrease on average to the level of 15%, and in the largest farms—to 35%. Thus, the largest holdings "gained" 93 percentage points from the support (meaning that the ratio of their income to non-agricultural income decreased by 93 percentage points fewer) and they were the primary beneficiaries of CAP funds. For the other economic classes, thus calculated ranges fluctuated from 10 percentage points in the group of SO EUR 100,000–500,000 to 40 percentage points in the group of SO EUR 8000–25,000. The level of diversification of support can also be shown by determining the share of subsidies in agricultural income (including the subsidies) of the farms under study. Clearly, the highest average share of support for the years 2004–2017 was recorded in the case of

the largest holdings. Also, the increase of this share in the period under analysis was the highest for this economic class (Table 4).

Table 4. Share of CAP subsidies in agricultural income in the 2004–2017 period for various economic size groups (SO) of FADN farms in Poland.

Specification	Up to SO EUR 8 k	SO EUR 8–25 k	SO EUR 25–50 k	SO EUR 50–100 k	SO EUR 100–500 k	Above SO EUR 500 k
Average share of subsidies in agricultural income 2004–2017	88.22%	67.21%	43.61%	14.90%	29.47%	108.82%

Source: own elaboration based on FADN data.

The group of farms with the economic size of SO EUR to 8000 EUR came second, followed by the SO EUR 8000–25,000 and SO EUR 25,000–50,000 group of farms.

5. Conclusions

Thanks to the support of the Common Agricultural Policy, the average income of FADN farms comes closer to the average income of the non-agricultural sector. The analyses in the article determined that subsidies for production, subsidies for public goods and investment support turned out to be significant for the shaping of agricultural income. The biggest positive impact on agricultural income was observed in the case of subsidies for public goods, which included: set-aside payments, agri-environmental payments, support for less-favored areas and other subsidies within the framework of rural area support programs. The lack of impact of the single area payments (SAP) on the economic situation of agriculture in Poland is interesting and contradicts the general view that these payments have a significant impact on the sustainable development of the agricultural sector. Further studies should determine whether in other EU countries the impact of various CAP instruments on agricultural income is the same as in the case of Poland. The information in this field will enable shaping the CAP that would contribute to the sustainable development of the agricultural sector in the whole EU. This will also allow a holistic assessment of the existing CAP instruments in achieving the EU's goal of sustainable agriculture. The research conducted in the article may be of some use to fill a gap in the existing literature on how to measure social sustainability in agriculture. Compared to measuring environmental and economic sustainability, research in this area is still limited. The measurement of social indicators is challenging as they are often qualitative. The research uses quantitative data assuming that the higher the income of all farms and the more even their distribution, the higher the level of social sustainability. By using this approach to measure social sustainability in agriculture, it has been proven that in each economic class of farms, there was an increase in the agricultural to non-agricultural income ratio thanks to the EU's agricultural policy support, but the result was the weakest in terms of the smallest farms. As the economic strength of the farm increased, the impact of CAP payments on farm's incomes was more pronounced. Thus, the results of the analysis prove that the impact of CAP subsidies on changes in economic sustainability was uneven in various farm economic classes. The strongest holdings benefited the most, and the smallest farms benefited the least. To sum up, it should be noted that the research confirmed the adopted hypothesis that Common Agricultural Policy subsidies improve the general level of economic sustainability of the agricultural sector, but in their present shape, they are not a sufficient instrument serving the social sustainability of farms.

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Appendix A

Table A1. Number of farms covered by the analysis in each of the years of the period 2004–2011.

Year	2004	2005	2006	2007	2008	2009	2010	2011
number of farms	733,860	733,240	735,200	735,100	735,110	725,670	727,660	725,570

Source: own elaboration based on FADN data.

Table A2. The number of farms covered by the analysis in each of the years of the period 2012–2017.

Year	2012	2013	2014	2015	2016	2017
number of farms	738,170	705,440	734,950	735,170	737,890	738,540

Source: own elaboration based on FADN data.

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