THE IMPACT OF EU COMMON AGRICULTURAL POLICY ON SOCIO-ECONOMIC SITUATION IN AGRICULTURE: CURRENT SITUATION AND FUTURE CHALLENGES

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Abstract

The human resources plays a crucial role in meeting new requirements for greening the economy, which affects European union agriculture sector. The aim of this article is to investigate the effects of direct payments and rural development measures of the EU's Common Agricultural Policy (CAP) on the socio-economic situation which was measured through the Farm Net Value Added expressed per agricultural work unit (FNV/AWU). The database of European Union Farm Accountancy Data Network, years 2009-2018 were examined through a multiple regression analysis. The defined hypothesis analysed the impact of subsidies on socio-economic situation. The results of the analysis confirmed the statistical significance of direct payments and the impact of rural development measures were also significant with negative impact on dependent variable. If the volume of direct payments increased by 1 EUR, dependent variable FNV/AWU would increased by 0.5481 EUR. The second part of the analysis dealt with the hierarchical clustering across EU Member States and defined 2 clusters with 12 and 16 members. Cluster analysis revealed large differences in the application of the CAP through the system of subsidies.

Key words: EU subsidies, human resources, regression analysis, dendrogram

JEL Code: Q14, Q18, J43

Introduction

The EU Common Agricultural Policy aims to promote agriculture throughout the EU by increasing farmers' incomes and supporting the provision of public goods such as the environment. It is divided into two pillars. First pillar includes both direct payments to farmers and market management measures. Second pillar focuses on improving the structural and environmental performance of agriculture and on promoting local/rural development. Second pillar requires Member State co-financing. The EU has recognised that making development policy in isolation is not sufficient. The impact of the CAP on agricultural and rural jobs, as so

far reported by different evaluations performed across Europe, is mixed. The schemes and measures implemented through the first and second pillars of the CAP have produced diverse, sometimes opposite effects on the farming labour force, depending on the nature and scale of the investments, the use of the payments by farm managers, the farming systems in place locally as well as other influencing factors such as synergistic or competing sectoral, fiscal, social and environmental policies stemming from different governance levels. The upcoming CAP programming period, and in particular the types of first pillar schemes as well as the objectives of second pillar measures, will be key in supporting change in a shrinking farming sector over the years to come.

1   Literature review

Economic theory suggests that, when policymakers intervene in markets to provide additional resources or improve economic conditions for a particular sector, the sector is likely to attract and retain more resources than it would have without the policy. In this regard the CAP, operating with objectives to stabilize prices and/or to support farm incomes, may have encouraged the retention of labour in farming which might otherwise have left the sector.

The impacts of the CAP is often analysed by researchers. The authors focus on certain agricultural sectors and certain countries providing considerable inputs on further amendments of the policy schemes. The positive effects of the CAP stem mainly from impacts on the wider rural employment and on rural economies and may involve the creation of alternative job opportunities for the farmer, the reduction in the number of farm exits due to CAP support that can benefit the wider rural economy, the sustaining of incomes in the local economy and the labour migration to other sectors in the regional economy (Manos et al., 2013; Latruffe et al., 2013).

When assessing the importance of agriculture to local development, especially in rural areas, bidirectional interactions must be considered: on the one hand, agriculture can transform rural areas by having an impact on landscape or by developing one of its functions which is food production. It also creates jobs, not only in the agricultural sector itself but also in its business and institutional environment (Poczta et al., 2012; Mantino, 2017).

There are two main approaches in the literature that explain the causes of changes in the supply and demand of labour in the overall economy or at a sectoral level: household models and job creation and destruction models. (Dries and Ciaian, 2012) studied job creation and destruction in EU agriculture. The authors disaggregated gross employment patterns and net

job flows into detailed intra-sectoral labour adjustment dynamics based on a unique EU-wide farm level panel dataset for 1990–2005. They found that: job creation and destruction rates in EU agriculture are comparable to other sectors; there is some evidence of ongoing substitution of family labour for hired labour; there are important differences in job creation and destruction rates between different Member States; these differences can be attributed to structural differences across countries, sectors and farm types; time variation of job reallocation fluctuates countercyclically; and idiosyncratic effects are the main driver of time variance in job reallocation.

Interestingly, while the arguments of opponents and supporters of agricultural subsidies are used to support different policy conclusions, they both assume that subsidies increase agricultural employment. However, empirical evidence on this assumption is actually quite mixed. Some studies find a positive impact of subsidies on agricultural employment, but others find no or mixed impacts and yet others find a negative impact. (Garrone et al., 2019) investigated the relationship between EU agricultural subsidies and the outflow of labor from agriculture. The results identified that CAP subsidies reduce the outflow of labor from agriculture, but the effect was almost entirely due to decoupled first pillar payments. Coupled first pillar payments had no impact on reducing labor outflow from agriculture. The impact of second pillar was mixed. Estimated prediction that an increase of 10 percent of the CAP budget would prevent an extra 16,000 people from leaving the EU agriculture sector each year.

The economic sustainability can be seen in terms of the income gap between agricultural and non-agricultural sectors. Many scientists have stressed the importance of increasing employment in rural areas supported by the Common Agricultural Policy, which may be a remedy for social exclusion, depopulation of these areas and the income gap (Guth et al., 2020). Results show that due to the CAP's support the average income of farms has approached the average non-agricultural income, but distribution of this support favored the largest farms, increasing disparities within the sector.

Assessments of the CAP's contribution to the Sustainable Development Goals are few; however, the existing consensus suggests that the CAP's potential can only be realized with significant reallocation of funding among CAP objectives, as well as substantially improving monitoring and evaluation (Scown et al., 2020).

Verification the role of investment in human resources and, consequently, in services for the agricultural development for the dynamics of rural development, trade and international cooperation of agribusiness was analysed through the econometric model to explain the relationship between the rural GDP and a set of economic variables and of network-education-

social dummy variable. The results show that farmers may act as engines for economic development when they are trained on the basis of the needs and requirements related to innovation and research, and they are assisted through new models of organization of agricultural services (Conto et al., 2012).

2   Methodology

The main research question was addressed to investigate, using a quantitative approach, the effects of direct payments and rural development measures of the EU's Common Agricultural Policy on the socio-economic situation measured through the Farm Net Value Added expressed per agricultural work unit (FNV/AWU) based on Farm Accountancy Data Network (FADN), 2009-2018 dataset. Multiple regression analysis was selected as the most suitable method.

Agriculture in EU varies across Member States. Although multifunctional rural development is in progress, agriculture continues to be an important part of the economy which is decisive for the standards of living and for socio-economic development at local level. Hence, agriculture affects economic development while having a considerable impact on natural and environmental conditions. As Common Agricultural Policy unified approach is important to create appropriate number of groups. As additional research method was selected cluster analysis. The cluster analysis objective is to find out which objects are similar or dissimilar to each other, based on the Ward's Hierarchical Agglomerative Clustering Method. Ward's is the only one among the agglomerative clustering methods that is based on a classical sum-of-squares criterion, producing groups that minimize within-group dispersion at each binary fusion. In addition, Ward's method is interesting because it looks for clusters in multivariate Euclidean space.

Agricultural income is income generated as a result of agricultural production, and it is the purpose of farming. In the case of agricultural income, it is necessary to distinguish between (1) income generated as a result of agricultural production (value added) and (2) income of agricultural households, as the latter may have, besides income from agricultural production, other income sources (agricultural and non-agricultural) (Chmielewska, 2018).

2.1   Multiple regression analysis and description of variables

Researchers have used this multiple regression analysis as a powerful tool because it allows to model statistically the relationship between dependent variable and a set of independent variables.

The multiple regression equation is as follows:

$$\hat{Y} = b_0 + b_1X_1 + b_2X_2 + \cdots b_pX_p + \varepsilon_t \qquad (1)$$

where $\hat{Y}$ is the dependent variable, X_1 through X_p are p distinct independent variables, b_0 is the value of Y when all of the independent variables (X_1 through X_p) are equal to zero, and b_1 through b_p are the estimated regression coefficients. Each regression coefficient represents the change in Y relative to a one unit change in the respective independent variable and ε_t is random component.

Selected variables:

- dependent variable= Farm Net Value Added expressed per agricultural work unit (FNV/AWU)
- independent variables= utilised agricultural area (UAA); total output/ total input (OUTINP); direct subsidies (DIR) – first pillar; subsidies on investments (SUBONINV); rural development measures (RD) – second pillar; wages and social security charges (WAGES); inventories (INVEN); net investment defined as gross investment – depreciation (NINV); total liabilities defined as value at closing valuation of long, medium or short- term loans still to be repaid (LIAB); average value of working capital (AFARMCAP)
- b_0 through b_{10}= regression coefficients
- ε_t = random component

Using these variables, the following model of socio-economic situation was defined as:

$$\frac{FNV}{AWU} = b_0 + b_1\,UAA + b_2\,OUTINP + b_3\,DIR + b_4 SUBONINV + b_5\,RD + b_6\,WAGES +$$
$$b_7\,INVEN + b_8\,NINV + b_9\,LIAB + b_{10}\,AFARMCAP + \varepsilon_t \qquad (2)$$

The article defined hypothesis:

H1: Socio-economic situation was dependent on direct subsidies and rural development measures.

The next part of the analysis was clustering based on the Ward's Hierarchical Agglomerative Clustering Method. In this method, in the first stage of clustering, each statistical object – country is considered as individual cluster and subsequently, these objects are grouped to superior cluster, which are grouped again based on the distance between them while the objects with the smallest distance between are grouped together.

3   Results

The impact of the CAP on agricultural and rural jobs, as so far reported by different evaluations performed across Europe, is mixed. The schemes and measures implemented through the first and second pillars of the CAP have produced diverse, sometimes opposite effects on the farming labour force.

3.1   Multiple regression analysis

The first step of analysis was to verify the statistical significance of individual variables. The model of socio-economic situation had the character of linear model. In this case, the statistical significance of each variable was tested via the summary command. As non-significant variables were identified: utilised agricultural area (UAA); total output/ total input (OUTINP); subsidies on investments (SUBONINV); inventories (INVEN); net investment (NINV); total liabilities (LIAB). Then, the statistically significant model was subsequently tested.

Table (1) contains the multiple regression analysis results.

Tab. 1: Multiple regression analysis results

	Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	6262.9311	2497.4780	2.5080	0.0127	*
WAGES	-0.7129	0.1512	-4.7140	3.84e-06	***
AFARMCAP	0.0798	0.0081	9.8470	< 2e-16	***
DIR	0.5481	0.1883	2.9100	0.0039	**
RD	-0.9099	0.2482	-3.6660	0.0003	***
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1					
autocorrelation: Durbin-Watson test p-value>α					
heteroscedasticity: studentized Breusch-Pagan test p-value>α					
multicollinearity: vif command < 10 for all variables					

Source: author's own elaboration from R-program

If we looked at F-statistic we would see that p-value < α (2.2e-16<0.05), socio-economic model was statistically significant. The statistical significance was also confirmed by the reset test where: p-value>α (0.3691>0.05). According to the coefficient of determination R^2 is stated that the socio-economic model explained 87.3% of the total variability. In this case, 87.3% correctly explained the explanatory variable FNV/AWU and the rest 12.7% was a random component. The first statistically significant determinant was wages. The coefficient belonging to this determinant was -0.7129 that represented a negative impact on socio-economic situation. If wages would be 1 EUR higher FNV/AWU would decreased by 0.7129 EUR, with a

probability of 99 %. The coefficient belonging to average value of working capital was 0.0798 that represented a positive impact on socio-economic situation. If the volume of average value of working capital would be 1 EUR higher dependent variable FNV/AWU would increase by 0.0798 EUR with a probability of 99%. The results of the analysis confirmed the statistical significance of direct payments and the impact of rural development measures were also significant with negative impact on dependent variable. If the volume of direct payments increased by 1 EUR, dependent variable FNV/AWU would increased by 0.5481 EUR. A wide range of existing instruments under the second pillar of the Common Agricultural Policy has been simplified to focus on promoting competitiveness, innovation, knowledge-based agriculture, young farmers at the start of business, sustainable management of natural resources and balanced territorial development.

3.2 Hierarchical agglomerative cluster analysis

Hierarchical clustering is used to determine the optimal number of clusters. This optimal number of clusters can be determined thanks to the dendrogram. For this, we usually look at the largest difference of heights.

Fig. 1: Dendrogram of EU agriculture
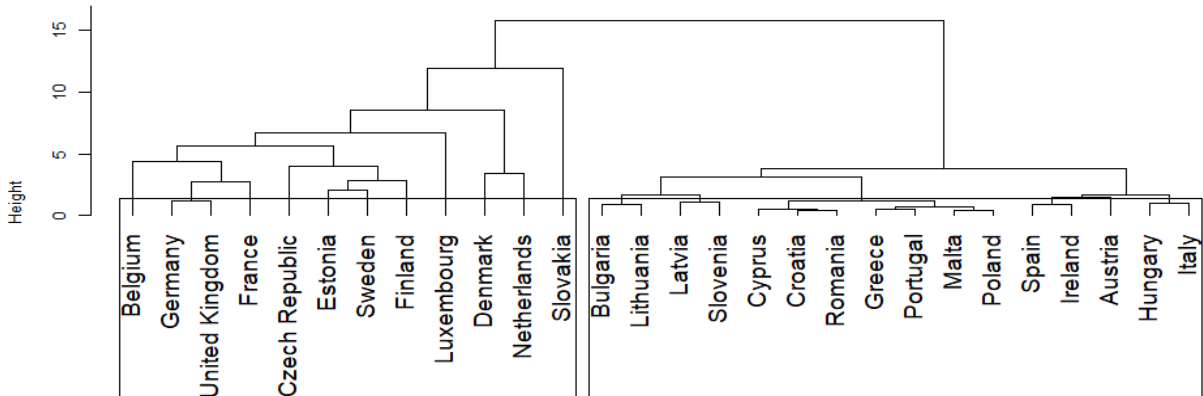
Source: author's own elaboration from R-program

Cluster 1 had 12 members. Cluster 1 represented more stable countries and mainly old members of EU like Germany, France, United Kingdom, Luxembourg, Belgium. On the other hand, second cluster had 16 members mainly new and less stable, characterised by lower values of socio-economic indicators. Average value of farm net value added expressed per agricultural work unit (FNV/AWU) in cluster 1 was 38 444 EUR, on the other hand cluster 2 reached only

33 % of cluster 1. Average wages in cluster 2 reached only 9 % of cluster 1. As Common Agricultural Policy unified approach is important to create appropriate number of groups with specific characteristics. Through the system of EU subsidies is influenced the socio-economic situation of agricultural entities operates on its territory. According to cluster analysis results it can be stated that the socio-economic situation of defined clusters is very differently. Table (2) and table (3) provide descriptive statistics characteristics of identified clusters.

Tab. 2: Cluster 1 descriptive statistics

Cluster 1	FNV/AWU	WAGES	AFARMCAP	DIR	RD
Mean	38444	32191	557166	34194	12213
Standard Error	6092	9882	76157	7274	3324
Median	34826	18822	456040	25833	8115
Standard Deviation	21104	34234	263814	25199	11515
Minimum	13355	7089	212286	16512	1667
Maximum	80235	127863	958427	107427	38850

Source: author's own elaboration

Tab. 3: Cluster 2 descriptive statistics

Cluster 2	FNV/AWU	WAGES	AFARMCAP	DIR	RD
Mean	12949	3286	122277	7288	2362
Standard Error	1897	590	19435	1166	556
Median	9267	2227	101070	6025	1643
Standard Deviation	7589	2358	77741	4664	2225
Minimum	4580	466	29632	1833	109
Maximum	27480	8252	356061	18968	9028

Source: author's own elaboration

Reallocation of CAP funding from first pillar to second pillar and among instruments is therefore needed to increase the likelihood of the policy promoting multiple sustainable development goals while simultaneously fulfilling its own objectives, as opposed to its current focus on a single objective: ensuring farm income. The details of the post-2020 CAP are currently being wrangled with the Member States. Cluster analysis revealed large differences in the identified clusters in terms of the application of the Common Agricultural Policy. As the second pillar of the Common Agricultural Policy, the EU's rural development policy is designed to support rural areas of the Union and meet the wide range of economic, environmental and societal challenges of the 21st century, it is important to strength the position by financing the national agricultural needs.

Conclusion

Results of the analysis pointed to the statistically significant determinants of socio-economic situation and by multiple regression analysis of the European Union agriculture sectore was quantified impact of independent variables on the dependent variable, which was measured through the Farm Net Value Added expressed per agricultural work unit (FNV/AWU). The analysis was produced according harmonised database of EU FADN, years 2009-2018. It consists of an annual survey carried out by the Member States of the European Union. The results of the analysis confirmed the statistical significance of direct payments and the impact of rural development measures were also significant with negative impact on dependent variable. If the volume of direct payments increased by 1 EUR, dependent variable FNV/AWU would increased by 0.5481 EUR. Next part of the analysis was hierarchical cluster analysis. According the Ward's Hierarchical Agglomerative Clustering Method were defined 2 clusters. Cluster 1 represented more stable countries and mainly old members of EU. Second cluster had 16 members mainly new and less stable. Average value of FNV/AWU in cluster 1 was 38 444 EUR, on the other hand cluster 2 reached only 33 % of cluster 1.

The future CAP after 2020 is planned to have specific objectives to ensure viable farm income and to promote jobs and growth in rural areas. In the current CAP, decoupled support under first pillar provides income support and stability to farming businesses, so may encourage the retention of farm labour. Second pillar includes aid for agricultural investment to improve its productivity and profitability. Streamlining the two pillars of the CAP at the territorial level so as to achieve a common vision and clear objectives with regard to farming employment and better integrating and coordinating the CAP goals and tools with EU social policies.

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