IMPACT OF THE COMMON AGRICULTURAL POLICY PAYMENTS TOWARDS ROMANIAN FARMS

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Abstract

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Romanian areas have suffered of an intense out emigration from rural areas. In order to reduce the socio-economic marginalization the European Union by the Common Agricultural Policy (CAP) has supported more initiatives aimed at implementing the diversification in rural areas. The aim of this paper was to assess by a quantitative approach in Romanian farms belonging to the FADN dataset some relationships among the financial subsidies allocated by the CAP and the level of wealth in rural areas. It has used in this research a dual and different methodology of investigation. It has employed in the first phase the multiple regression model and in the further step the Structural Equation Modeling aimed at estimating the cause effect relationships between all investigated variables over the time 2007-2015. Findings have pointed out as the level of wealth in rural areas has been influenced by the financial subsidies allocated by the Common Agricultural Policy and a positive impact has been also assessed focusing the attention on the total CAP payments towards the level of farmer's net income.

Key words: structural equation modelling; multiple regression model; FADN; second pillar; rural development

Introduction

Romanian rural areas have suffered more than urban territories of an intense permanent emigration as a consequence of the collapse of a centralized economy and a transition towards an open economy. Findings published by the Romanian Statistical Institute (Insse) and by other scholars have found as the phenomenon of permanent emigration has been less concentrated in the region of Bucharest-Ilfov and conversely it has been more intense in rural depressed territories, in stayed behind areas close to the border of Moldavia and in rural and agrarian territories close to Bulgaria where highest is the percentage of population at risk of poverty (Galluzzo, 2017a,b).

During the phase of pre-accession in the European Union and also after the enlargement of the EU in 2007 the European Commission has increased its own efforts in order to reduce the worsening of socio-economic conditions in Romanian rural areas allocating specific funds (Galluzzo, 2016; 2017a,b; Cionga et al., 2008). Since the enlargement of the European Union in 2007, the National Rural Development Plans, in terms of payments and financial funds allocated in the second pillar of the CAP, and the first pillar of the Common Agricultural Policy have disbursed payments and financial supports focused in stimulating the diversification in Romanian farms with the purpose to reduce the socio-economic marginalization in rural areas by agritourism, rural tourism and other traditional activities in tightly connection to agricultural and rural traditions able to revitalize the rural contexts (Galluzzo, 2017a,b).

One of the most crucial bottleneck in Romanian agricultural productive fabric is due to the modest size of utilized agricultural areas which is lower than 5 hectares with nefarious consequences both in slackening technical efficiency in farms and also in stimulating rural out emigration (Eurostat, 2013; Galluzzo, 2013; 2010; 2016; Madau et al., 2017; Latruffe et al., 2017; Lund and Hill, 1979; Alvarez and Arias, 2004). Furthermore, the modest plots of agricultural area do not allow some increasing investments in productive infra-

structures and in innovative technologies labour and time saving (Burja and Burja, 2010; Galluzzo, 2013; 2016).

In lots of European countries such as Italy some authors have estimated by a quantitative approach the effect of direct payments allocated by the Common Agricultural Policy which have had a predominant impact towards the level of farm net income in a perspective of reform of this common policy based on a regional scenario of financial supports allocated in the first pillar of the CAP aimed also in reducing gaps among rural territories (Severini and Tantari, 2013a; 2013b).

In Romania the impact of subsidies allocated by the Common Agricultural Policy towards farmers has been very important and highly dependent on the level of farm's specialization and on the size of usable agricultural areas (Cionga et al., 2008). According to these authors, large size farms have benefited the most from payments and aids allocated by the European Union; hence, a uniform standardized typology of CAP and its payments should have different impacts to the European countries (Anders et al., 2004) strengthening the concept according to which a common policy towards farmers has to take into account the specificity, weakness and straightness of different European agricultural and socio-economic imbalances among rural territories.

A different allocation of the budget among European states of financial payments towards farmers does impact different crops and the level of production of commodities (Erjavec et al., 2011); this has corroborated the importance of a different role of financial subsidies allocated by the European Union, which in function of their different purposes should be addressed in function of their aim in supporting rural areas or alternatively in order to support in an indirect way some agricultural productions and a different budget redistribution. It is important to emphasize as the new comer western members states of the European Union, as consequence of the transition from a centralised economy to an open one have had a significant intrinsic dual characteristic in their agrarian sector which implies a specific process of CAP reform (Rizov, 2004) considering the pivotal role in some countries of the non-farm activity in the transition phase (Davis, 2006).

According to the Romanian Statistic Institute, in Romania more than 50% of population live in rural areas and radical transformations occurred in the early 1990s have affected the rural space with direct impact on small farms and the CAP and payments allocated in the first pillar have been pivotal in agricultural production and in farmer's level of income (Hubbard and Hubbard, 2008). This latter aspect has been particularly fundamental for some agricultural enterprises located in poor rural areas which are sensitive to financial payments and to exogenous supports at risk of socio-economic marginalization as a consequence of a lack

of benefit due to a financial and indirect supports and aids allocated by the CAP (Hubbard and Hubbard, 2008).

Aim of the research

The first and most important purpose of this paper was to estimate by a quantitative approach the role and the impact of financial subsidies allocated by the first and second pillar of the Common Agricultural Policy on the farm net income of Romanian farms belonging to the Farm Accountancy Data Network (FADN) dataset since 2007 to 2015.

According to the European Union Commission, the FADN has been established since the late 1960s by the Council Regulation 79 using as thresholds of investigation farms with at least 1 hectare and an economic size expressed as Standard Output, since 2008 as proposed by the European Regulation 1242, equal to 2000 euro. The FADN dataset is an annual survey aimed at investigating the impact of the Common Agricultural Policy decisions and financial payments allocated by the first and second pillar of the CAP in a sample of 78,000 European farmers with a stable and defined threshold of income (Galluzzo, 2017a; European Union, 2017).

Furthermore, a subsequent purpose of this research was to estimate by a quantitative approach if there is a rural index assessed by the Structural Equation Model some cause-effect relationships among financial subsidies allocated by the first and second pillar of the Common Agricultural Policy, farm net income and the level of wealth of rural areas directly correlated to the financial subsidies allocated by the European Union in the National Rural Development Plan (II pillar), decoupled payments and by the payments in the framework of the first pillar of the CAP.

Methodology

The first step of this analysis has used a multiple regression model aimed at estimating by the method of Ordinary Least Square (OLS) in all Romanian farms belonging to the FADN dataset from 2007 to 2015 the main relationships and correlations between the dependent variable level of wealth of farmers in terms of farm net income and others independent variables such as total payments and financial support and aids allocated by the CAP and payments disbursed in the second pillar of the Common Agricultural Policy by the National Rural Development Plan.

The multiple regression model and the significant relationships among independent variables have been estimated using the open source software GRETL. Furthermore, to assess the possible heteroscedasticity of the errors in the model it has utilized White's test on the terms of errors or residuals (Gujarati, 2011; Verbeek, 2006).

The multiple regression model in its algebraic form of the matrix can be written in the following formula (Verbeek, 2006; Asteriou and Hall, 2011):

$$y = \mathbf{X}b + u_i \tag{1}$$

where y and u_i are the vectors with n-dimensional and $\mathbf{X}$ is a matrix with dimension n x k and b is a set of regressors or estimated parameters and u_i is the statistical error obtained using the basic assumptions of the multiple regression model (Verbeek, 2006; Gujarati, 2011; Asteriou and Hall, 2011).

The main assumption in the model of multiple regression model have been: the statistical error u_i has null conditional mean given X_i, that is $E(u_i|X_i) = 0$; (X_i, Y_i), i = 1, ..., n are extracted independently and identically distributed (i.i.d.) from their joined distribution; (X_i, u_i) have finite fourth moments which are not zero and there is no correlation between the regressors and random noise hence, the value between β expected and β estimated is identical (Verbeek, 2006; Gujarati, 2011). The estimators that are assessed by the Ordinary Least Square can be summarized as with i = 1, ..., n:

$$Y_i = \beta_0 + \beta_1 X_i + u_i \tag{2}$$

Y_i is the dependent variable to evaluate the objective function, β_0 is the constant, β_1 is the coefficient estimated by the model, X_i is the independent variable, u_i is the error term

The second stage of this research by the Structural Equation Modeling (SEM), which is predominately used in others field of research such as psychometrics and in behavioural analysis, has investigated by a quantitative approach cause-effect relationships between the investigated variables aimed at obtaining a model able to combine a regression model and a factor analysis (Hox and Bechger, 1998). The software used has been LISREL 9.1 proposed by Joreskog and Sorbom in 2007.

In the SEM there are some theoretical constructs or latent factors which have relationships represented by regression coefficient in the path diagram (Hox and Bechger, 1998; Fox, 2006). According to these authors, there are lots of equations in a matrix able to estimate the main correlations. In this research it has used the confirmatory factor model analysis with 4 observed variables such as financial subsidies allocated by the CAP, financial supports towards farmers allocated by the second pillar of the CAP, decoupled payments and farmer's net income investigated in Romanian farms part of the FADN dataset and one factor defined as rural areas wealth endowment in Romanian farms part of FADN dataset (RAWE) which is a dummy variable of the level of living conditions in rural areas.

The path analysis is strictly correlated to the multiple regression model with the purpose to dismantle the investigation in different level of study hence, the correlations estimate only the direct effects and some of them mediated by the variables in the model in a perspective of the confirmatory factor analysis (Jöreskog, 1969; 1970; Jöreskog and Goldberger, 1975; Jöreskog et al., 1979; Di Franco, 2016). Figure 1 shows in a simply way the path diagram in the confirmatory factor model and the arrows are nexus between observed variables (x_1 and x_2), x is a latent variable and the path coefficients λ_{11} and λ_{21} are the correlations effects on the variables x_1 and x_2 instead δ_1 and δ_2 are the errors (Barbaranelli and Ingoglia, 2013; Di Franco, 2016; Jöreskog et al., 1979).

In the path diagram latent variables are classified in two typologies: exogenous which does not receive any random effects and endogenous able to receive some effects (Di Franco, 2016; Jöreskog et al., 1979). In the equations in Figure 1 errors terms δ_1 and δ_2 are not correlated and the equation can be written as (Jöreskog, 1969; 1970; Jöreskog and Goldberger, 1975; Jöreskog et al., 1979; Di Franco, 2016):

$$x_1 = \xi\lambda_{11} + \delta_1 \tag{3}$$
$$x_2 = \xi\lambda_{21} + \delta_2 \tag{4}$$

Fig. 1. General path diagram in the confirmatory factor model
Source: author's elaboration on Barbaranelli and Ingoglia, 2013; Jöreskog et al., 1979; Di Franco, 2016

Results and Discussion

The main results in the table of correlation of variables have pointed out a direct relationship among the variable financial subsidies allocated by the Common Agricultural Policy and decoupled payments and farm net income (Table 1); hence, the indirect payments disbursed by the first pillar of the Common Agricultural Policy have affected the level of wealth of Romanian farms part of the FADN dataset. Findings have corroborated a direct link between the financial supports paid in the second pillar of the CAP and the total amount of payments disbursed by the European Union towards the primary sector. Furthermore, Less Favored Area (LFA) payments correlate directly to the total amount of financial payments disbursed by the second pillar of the CAP able to reduce partially the socio-economic marginalization in Romanian rural areas. Farm net income is a variable sensitive enough to the variable decoupled payments and no impact the Less Favored Area (LFA) payments have had in improving the level of income in Romanian farms.
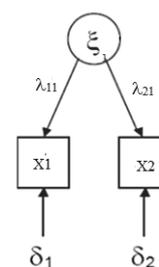
Table 1
Main correlations among variables investigated in the Romanian farms belonging to the FADN dataset since 2007 to 2015

	Financial subsidies allocated by CAP	Total subsidies on crops	Total subsidies on livestock	RDP financial subsidies	Decoupled payments	Other financial subsidies	Less favored area payments	Farm net income
Financial subsidies allocated by CAP	1.00	0.438	0.3375	0.5970*	0.7279*	0.3960	0.3731	0.6314*
Total subsidies on crops	0.438	1.00	0.6047*	0.0977	0.0262	0.1404	0.1496	-0.0534
Total subsidies on livestock	0.3375	0.6047*	1.00	-0.1288	-0.1352	0.0782	0.1227	-0.0371
RDP financial subsidies	0.5970*	0.0977	-0.1288	1.00	0.6643*	-0.0571	0.7374*	0.6766*
Decoupled payments	0.7279*	0.0262	-0.1352	0.6643*	1.00	-0.0809	0.3475	0.7383*
Other financial subsidies	0.3960	0.1496	0.0782	-0.0571	-0.0809	1.00	-0.1858	-0.0845
Less favored area payments	0.3731	0.1496	0.1227	0.7374*	0.3475	-0.1858	1.00	0.2715
Farm net income	0.6314*	-0.0534	-0.0371	0.6766*	0.7383	-0.0845	0.2715	1.00

* significance at 5%
Author's elaboration on data FADN on the website http://ec.europa.eu/agriculture/rica/database/database_en.cfm

The value of financial subsidies allocated to Romanian farms has pointed out a significative drop of payments comparing the seven-year time 2007-2013 of implementation of European CAP to the next two year time 2014-2015, part of the seven-year time of the CAP programme 2014-2020 (Table 2).

Focusing the attention on the main results in the Romanian FADN dataset, the value of farm net income is decreased over the time and modest has been the level of direct payments allocated in favour of disadvantaged rural areas. In general, the impact of financial subsidies paid by the second pillar of the Common Agricultural Policy has been very modest and their incidence is close to 5% of the total amount allocated by the CAP during the time of investigation 2007-2015.

The best results both in terms of farm net income and also in terms of financial subsidies allocated by the Common Agricultural Policy have been found in the region of Bucharest-Ilfov (Table 3). The poorest level of income and payment allocated by the CAP assessed in average value has been pointed out in the north-east region with a significant incidence of decoupled payments on the total amount of financial supports disbursed by the European Union compared to other Romanian regions.

The multiple regression model fits partially well because the values of R_2 and adjusted R_2 have been equal to 0.55 and 0.53 able to explain more than 50% of the variance, without heteroscedasticity and errors distributed in a normal way. Outcomes have pointed out as the dependent variable farm's net income correlates directly and predomi-

Table 2
Main results in Romanian farms belonging to the FADN dataset since 2007 to 2015

Year	Subsidies allocated by CAP	Subsidies on crops	Subsidies on livestock	RDP subsidies	Decoupled payments	Farm net income	LFA payment
2007	2.119	50	1.068	0	402	3.027	0
2008	1.501	70	296	13	518	5.706	6
2009	1.725	54	226	20	782	3.623	9
2010	1.538	12	118	52	818	4.890	17
2011	1.693	1	95	187	1022	5.763	23
2012	1.794	8	82	189	1105	5.250	19
2013	1.900	2	62	313	1281	5.525	0
2014	1.468	4	136	57	1207	4.990	19
2015	912	3	105	16	682	3.548	7
Average	1.628	23	243	94	869	4.702	11

Author's elaboration on data FADN on the website http://ec.europa.eu/agriculture/rica/database/database_en.cfm

Table 3
Main findings in Romanian farms belonging to the FADN dataset since 2007 to 2015 stratified in different region

Region	Subsidies allocated by CAP	Subsidies on crops	Subsidies on livestock	RDP subsidies	Decoupled payments	Farm net income	LFA payment
North-East	1.006	4	86	59	646	3.366	2
South-East	2.286	7	222	89	1.278	5.669	7
South-Muntenia	1.716	8	224	36	970	3.606	0
South-West-Oltenia	983	3	72	6	593	3.830	1
West	2.069	14	206	100	1.271	6.389	24
North-West	1.670	24	360	235	739	5.339	16
Centre	2.333	29	737	194	978	4.918	53
Bucuresti-Ilfov	3.470	824	153	0	1.219	17.419	0

Author's elaboration on data FADN on the website http://ec.europa.eu/agriculture/rica/database/database_en.cfm

nately with the independent variable total amount of financial subsidies allocated by the CAP and with the variable financial payments disbursed by the second pillar of the Common Agricultural Policy or rather by the Rural Development Plan (Table 4). Summing up the higher is the level of financial supports the higher is the level of income in Romanian farms hence, fundamental is the role of the European Union in implementing the efficiency and the level of income for farmers.

The Cronbach's value in the dataset has been not so stirring with a value equal to 0.60 with the variable payments allocated by the Rural Development Plan that has pointed out the highest value equal to 0.72.

Findings of the Structural Equation Model have pointed out as the model converges after 50 iterations with a good level of fit by a not significant value of chi square equal to 2.121 and a p-value close to 0.346. Other indexes of fit have corroborated the adequacy of the model; in fact, the RMSA has been under 0.10 which has had a value equal to 0.03 with a p-value of the Test of Close Fit RMSEA above 5% equal to 0.41. The value of average variance extracted (AVE) which measures the level of variance captured by a construct in the model compared to the level due to measurement errors, has been barely above the optimal threshold equal to 0.50 even if the value of Composite Reliability

(CR) was good equal to 0.79 which is above the optimal threshold equal to 0.6. Other values of fit index such as Comparative fit index (CFI) and Tucker-Lewis index (TLI) have been acceptable; the CFI has been equal to 0.98 larger than 0.95 estimated by other authors in other topics of research (Cangur and Ercan, 2015). The size of residuals expressed in terms of standardized root mean square residual (SRMR) have been equal to 0.03 lower than 0.05 which implies as the model fits good.

Financial subsidies allocated by the CAP, decoupled payments, specific subsidies allocated by the second pillar of the Rural Development Plan and the farmer's net income have acted directly on the level of wealth endowment in Romanian rural areas (RAWE) dummy variable of the socio-economic living conditions in rural territories. Focusing the attention on the level of p-value the value has been lower than 0.01 with t-values equal to 4.64, 4.52 and 4.13 respectively for the factor total subsidies allocated by the CAP, total subsidies for rural development and decoupled payments (Figure 2). Findings have pointed out as there are some direct correlations and impacts of payments and financial subsidies allocated by the first and second pillar of the CAP towards the level of wealth in Romanian rural areas corroborating outcomes assessed in the previous paragraphs by the multiple regression model.

Table 4
Findings in the multiple regression model, dependent variable is farm net income

Independent variable	Coefficient	St. error	T value	p value	significance
Constant	4.16	0.80	5.17	5.06 e^{-06}	***
Financial subsidies allocated by CAP	0.55	0.11	4.78	1.89 e^{-05}	***
RDP financial subsidies	0.05	0.23	2.49	0.016	**

*** at 1%; ** at 5%
Author's elaboration on data FADN on the website http://ec.europa.eu/agriculture/rica/database/database_en.cfm
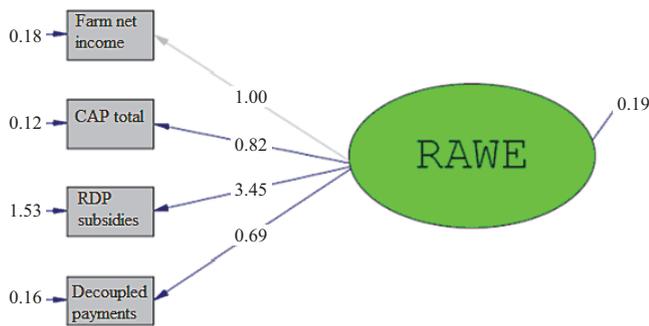
Fig. 2. Analysis of the wealth in rural areas (RAWE) by the structural equation model in Romanian farms belonging to the FADN dataset
Author's elaboration on data FADN on the website
http://ec.europa.eu/agriculture/rica/database/database_en.cfm

Conclusion

The impact of financial subsidies allocated by the Common Agricultural Policy has been very positive towards farms and this has been important after the pre-accession phase of the Romania in the European Union where the financial subsidies allocated by the SAPARD have been pivotal in getting better the agricultural infrastructures in this nation.

It is also important underlined as for the next future the role of an improvement in infrastructures in order to reduce the socio-economic marginalization in rural areas and socio-economic divide among rural and urban territories even if the impact of payments to the disadvantaged rural areas have been very poor.

Findings have also corroborated the positive role of financial subsidies allocated for the rural development compared to the total amount of financial subsidies allocated by the Common Agricultural Policy. Summing up, this research has underlined as farm net income has impacted positively towards the rural areas wealth endowment as well as the financial subsidies allocated by the European Union in favour of rural areas have corroborated their own direct effects of financial supports allocated by the EU in improving the level of income in Romanian farms and consequently the level of wealth and living conditions in the Romanian countryside.

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