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An analysis of farm income in Romanian regions using FADN dataset

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Abstract

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In Romania lots of rural regions have suffered of a severe permanent emigration and poverty even if the level of specialization in crops has influenced the development in rural territories. The aim of this paper was to assess by a quantitative approach the role of financial subsides, land capital endowment and costs in the farm net income of Romanian farms since 2007 to 2016 using the dataset of Farm Accountancy Data Network. The mixed model in a multiple regression model has been able to compare all Romanian regions and different type of farming. Findings have pointed as the level of specialization and the financial subsidies allocated by the Common Agricultural Policy have acted on the development of farm net income in all Romanian regions with significant fluctuation among type of farming.

Keywords: rural areas; mixed model; decoupled payments; farming type; common; agricultural policy

Introduction

Since 2007 as a consequence of the second further phases of the European Union enlargement Romania and Bulgaria became two new member states belonging to the European Union. Comparing the financial framework of the previous enlargement in 1995 and in 2004 to the recent one the scenario is radically changed. In fact, due to international agreements and a general economic decline of world's economy there has been a general shrinking of financial subsidies allocated towards the agriculture and budget constraints within of the Common Agricultural Policy (Erjavec et al., 2011; Swinbank & Daugbjerg, 2006). In Romanian rural areas financial supports allocated by the European project Special Accession Programme for Agricultural and Rural Development (SAPARD), and by other initiatives financed by the European Union during the pre-accession phase have partially mitigated the socio-economic and productive imbalances by an improvement in the endowment of infrastructures specifically in rural territories (Galluzzo, 2017) through a synergistic action of private and public initiatives aimed at co-financing the development in rural areas in a perspective of an holistic and integrated path of rural growth (Burja & Burja, 2014; Alexandri & Luca, 2008).

According to a classification of the European farms proposed by the European Union on the basis of the level of income, lots of Romanian farms have been classified in the cluster of semi-subsistence or subsistence farms which have unfortunately self-sustained the permanent rural emigration phenomenon consequence of socio-economic unbalances among rural and urban territories (Hubbard et al., 2014; Burja, 2011; Giurca, 2008; Bradatan, 2014). One of the most crucial bottlenecks in Romanian agricultural fabric is due to the modest endowment of land capital in terms of utilized agricultural areas which, according to the Romanian Statistical Institute, is lower than 5 ha (Mursa & Paraschiv, 2009). This latter feature and issue of Romanian farm does not allow increasing investments in productive infrastructures and in innovative technologies labour and time saving able to act also towards the diversification of on-farm activities (Eurostat, 2013; Burja & Burja, 2010).

Comparing the different NUTS II Romanian areas findings have pointed out as the county of Bucharest-Ilfov has

suffered less than the East and South regions of a socio-economic marginalization and territorial disparities (Surd et al., 2011). According to these authors, this has implied a different impact of the financial supports allocated by the European Union before and after the enlargement in 2007 strengthening the theoretical hypothesis according to which the poorer is the rural areas the more modest is their own development (Galluzzo, 2018a; 2018b; Surd et al., 2011). However, the level of Gross Domestic Product per inhabitant can be assumed as a dummy variable correlated to the mitigation of socio-economic disparities, in getting better also the environmental protection and in strengthening the sustainability of rural territories (Antonescu, 2012; Burja & Burja, 2014; Iorio & Corsale, 2010; Abrham, 2011; Pirvutoiu & Popescu, 2009; Westhoek et al., 2006; Van Berkel & Verburg, 2011; Van der Ploeg, 2010).

Recent quantitative studies have underlined the prominent role of the Common Agricultural Policy in mitigating partially the rural emigration in Italy and in other European states (Galluzzo, 2018a; Van Berkel & Verburg, 2011; Van der Ploeg, 2010; Westhoek et al., 2006).

By contrast, focusing the attention on the level of skills in Romanian agritourism financial subsides allocated by the National Rural Development Programme (NRDP) have stimulated a diversification in farm specialization, in particular in cattle farms, and also a generation turnover in farms with a new generation of farmers endowed by high level of skills able to deal with the new challenges of a globalised and very demanding economy which marginalizes and excludes less competitive farms in rural territories (Galluzzo, 2017).

The key purpose of this research was to assess by a quantitative approach the impact of financial subsidies allocated by the European Union in terms of decoupled payments and direct financial supports allocated by the second pillar of the Common Agricultural Policy throughout the National Rural Development Programme to the farm net income of farmers belonging to the Farm Accountancy Data Network (FADN). In the same time in the model have been assessed the impact of other economic variables such as level of assets in farms, land capital endowment, farming cost correlated to the level of farm's specialization and total farming overheads to the farm net income in Romanian farms. The dataset has been grouped in all different 8 Romanian regions and considering in the further stage if the farming specialization has had impacts to the farmer's net income. The further purpose has been to estimate if the productive specialization in farms has been different in all investigated farms over the time of study since 2007 to 2016.

Material and Methods

The main phase of study has investigated by a multiple regression model the impact of financial subsidies allocated by the Common Agricultural Policy to the growth of agritourism in Romania using a panel approach. Furthermore, by the multiple regression model has been assessed the relationships among the growth of income in farms in terms of farm net income and other typologies of cost and economic variables correlated to the productive specialization of farms such as fertilizers, seeds, crop protection costs, the level of assets, the cost with a link to the fixed investments (assets) and the amount of financial subsidies allocated by the Common Agricultural Policy (CAP). In this case, the analysis has assessed the impact of decoupled subsidies allocated by the first pillar of the CAP and by the second pillar in order to improve the level of investments and diversification in Romanian farms.

The estimation of regressors in the first step of the multiple regression model has used the software Stata 13 and in its algebraic form of matrix, it can be written as (Verbeek, 2006):

$$y = X\beta + \varepsilon, \tag{1}$$

where y is the dependent variable, in this study it is the farm net income, ε is the statistical error and X is a matrix of independent variables; both the statistical errors and the dependent variables are vectors with n-dimensions and X is a matrix of independent variables which has a dimension n x k. β are the coefficients in the multiple regression model.

In analytical terms, the multiple regression model has been corrected for the heteroscedasticity using a random approach to the panel data which can be explained in this way (Verbeek, 2006; Asteriou & Hall, 2011; Baltagi, 2011):

$$y = \alpha_0 + \alpha x_1 + \beta x_2 + \gamma x_3 + \delta x_4 + \eta x_5 + \zeta x_6 + \phi x_7 + \varepsilon_j \tag{2}$$

where y is the farm net income in Romanian farms, α_0 is constant term, x_1, x_2, x_3, x_4, x_5, x_6, x_7 are independent variables such as financial subsidies allocated by the II pillar of the CAP, total decoupled payments, cost of cultivation, total assets, usable agricultural areas, α, β, γ, δ, h, ζ, ϕ are estimated parameters in the model, ε_j is term of random statistic error.

Results and Discussion

Farms belonging to the Farm Accountancy Data Network dataset have pointed out significant fluctuations in terms of land capital endowment (Table 1) corroborating as the vast majority of farms is under the average value of usable agricultural areas assessed in all countries of the European Union and close to 15 ha. In general, a modest land capital endowment has been typical of farms specialised in vegeta-

Table 1. Main descriptive statistics in Romanian farms part of the FADN dataset since 2007 to 2016

Variable	Unit	Observation	Minimum	Maximum	Mean
Usable agricultural areas	ha	980	0.490	236.74	13.183
Total specific cost	€	980	422.00	381855.00	6873.17
Total farming overheads	€	980	518.00	70388.00	3382.75
Farm net income	€	980	14.00	109709.00	7045.27
Assets	€	980	4660.00	3344909.00	57011.42
Total CAP payments	€	980	53.00	93313.00	2852.51
RDP payments	€	980	0.00	22181.00	232.42
Decoupled payments	€	980	33.00	18996.00	1361.94

Source: author's elaboration on data, http://ec.europa.eu/agriculture/rica/database/database_en.cfm

bles and by contrast big farms has been investigated in enterprises specialized in milk and other zootechnical productions which need the highest size of land capital.

The sample of all Romanian farms has pointed out as the dependent variable farm net income has been directly correlated to the variable usable agricultural areas, cost for crops (seed, fertilizer and crop protection) and feeding for animals, total farming overheads, financial subsidies allocated by the second pillar of the CAP and decoupled payments (Table 2). No impacts have had the independent variable assets towards the level of income in Romanian farms.

Table 2. Main finding in the multiple regression model in all Romanian farms part of FADN dataset

Variables	Coefficient	Standard error	p value
Usable agricultural areas	-101.66	33.74	-3.01***
Total specific cost	0.048	0.022	2.03**
Assets	0.004	0.003	1.23
RDP payments	1.516	0.205	< 0.01***
Decoupled payments	1.989	0.282	< 0.01***
Total farming overheads	0.552	0.147	< 0.01***
Constant	2903.23	318.41	< 0.01***

*at 5-10%; **at 5%; ***at 1%

Source: author's elaboration on data, http://ec.europa.eu/agriculture/rica/database/database_en.cfm

Comparing different Romanian regions findings in the multiple regression model estimated by a mixed model have pointed out the best results in the West region and on the contrary the worst research's outcomes have been assessed in South West Oltenia (Table 3). In West region the variables usable agricultural areas, assets, rural development supports and payments allocated by the CAP have had a direct impact on the level of farmer's income. Summing up, decoupled payments have been more intense than the financial aids disbursed by the European Union in the framework of the rural development programme. The higher is the level of assets more intense is the level of farm net income. This has been particularly true in four

Table 3. Main results in different Romanian regions investigated by a multiple regression model

Variables	North-East	South-East	South - Muntenia	South-West Oltenia	West	North-West	Central	Bucharest -Ilfov
Usable agricultural areas	-16.48 (71.01)	-104.83 (128.09)	-150.26 (46.55)***	-88.47 (128.0)	-465.6 (111.93)***	70.28 (90.09)	-87.6 (74.2)	-151.3 (72.56)*
Total specific cost	0.28 (0.11)**	1.01 (0.130)***	-0.018 (0.055)	0.478 (0.538)	-0.37 (0.23)	-0.21 (0.08)**	0.09 (0.03)***	-1.36 (0.62)**
Assets	0.08 (0.03)**	-0.55 (0.03)*	0.040 (0.018)*	0.027 (0.045)	12.47 (5.04)*	0.01 (0.02)	0.07 (0.02)***	0.014 (0.004)***
RDP payments	1.10 (1.30)	0.71 (0.92)	0.673 (1.19)	-2.094 (22.13)	0.0006 (0.010)**	1.03 (0.17)***	1.55 (0.24)***	-
Decoupled payments	0.97 (0.56)	0.87 (0.85)	1.563 (0.421)***	0.86 (1.22)	3.94 (0.77)***	-1.33 (0.89)	1.02 (0.30)***	5.86 (0.96)***
Total farming overheads	-0.31 (0.42)	1.22 (0.77)	0.344 (0.369)	0.25 (0.67)	2.87 (0.883)***	2.12 (0.37)***	0.02 (0.31)	0.07 (0.179)
Constant	640.34 (633.2)	745.37 (1011.7)	1894.95 (703.1)***	2349 (1462)	583.47 (1548.76)	2702.5 (1019)***	1946.6 (984.8)*	5183 (1882.4)***

*at 5-10%; **at 5%; ***at 1%

Source: author's elaboration on data, http://ec.europa.eu/agriculture/rica/database/database_en.cfm

Table 4. Main results in different Romanian type of farming investigating since 2007 to 2016 estimated by a multiple regression model

Variables	COP	Other fields crops	Horticulture	Wine	Fruits orchards	Milk
Usable agricultural areas	26.76 (64.82)	649.59 (173.12)***	-1785.81 (2295.09)	1705.08 (1170.18)	1887.79 (714.17)***	67.47 (184.53)
Total specific cost	-1.15 (0.334)***	-0.35 (0.54)	1.37 (0.58)**	-0.47 (1.18)	-0.73 (0.80)	0.49 (0.29)*
Assets	-0.031 (0.03)	0.02 (0.05)	-0.002 (0.011)	0.019 (0.03)	0.079 (0.02)***	0.09 (0.035)**
RDP payments	-9.09 (5.54)	-6.23 (4.055)	0.40 (3.84)	-2.70 (10.39)	-2.16 (5.88)	1.84 (1.50)
Decoupled payments	4.28 (0.478)***	-0.14 (0.39)	-7.46 (19.93)	-0.32 (6.51)	-1.36 (3.65)	0.75 (1.36)
Total farming overheads	-0.03 (0.22)	0.81 (1.09)	0.72 (0.57)	-2.74 (2.01)	-2.10 (0.92)**	1.29 (0.84)
Constant	1210.09 (1738.00)	1169.10 (1931.25)	3085.04 (2336.6)	2771.17 (2331.62)	-14.19 (1773.49)	1156.76 (721.22)
Variables	Sheep and goats	Cattle	Granivores	Mixed crops	Mixed livestock	Mixed crops and livestock
Usable agricultural areas	-24.48 (91.75)	-87.17 (177.56)	-23.18 (2018.29)	1,203.08 (191.35)***	-92.79 (153.46)	-119.46 (112.25)
Total specific cost	0.41 (0.199)**	0.14 (0.29)	-0.33 (0.095)***	0.74 (0.41)	0.33 (0.26)	-0.015 (0.32)
Assets	0.090 (0.03)***	0.077 (0.029)***	-0.0096 (0.02)	0.044 (0.024)	0.04 (0.01)***	-0.010 (0.015)
RDP payments	1.69 (2.05)	0.99 (0.061)***	0.320 (0.600)	1.40 (1.92)	3.32 (1.26)**	1.48 (0.90)
Decoupled payments	3.20 (0.83)***	3.75 (0.95)***	22.43 (15.28)	-3.22 (1.46)**	-1.46 (0.53)***	1.82 (0.67)***
Total farming overheads	-1.68 (0.96)	-0.75 (0.78)	3.00 (0.63)***	-3.53 (0.45)***	-1.46 (0.53)***	1.34 (0.31)***
Constant	671.04 (1066.66)	-99.50 (700.99)	-1606.34 (3251.95)	1410.47 (831.21)	967.79 (483.94)**	1009.3 (513.09)**

*at 5-10%; **at 5%; ***at 1%

Source: author's elaboration on data, http://ec.europa.eu/agriculture/rica/database/database_en.cfm

out of eight Romanian regions with the exception of farms located in South East region where a growth in assets has implied a contraction in farm net income. It is important to underline the role of land capital endowment in all Romanian regions; in fact, an increase of usable agricultural areas has implied a decrease of farm net income. The explanation of this inverse trade-off is due to a low level of specialization and investments in farms.

Findings have underlined that large size of farms have been predominantly assessed in enterprises specialized in pastures, grass-fed and free-ranging livestock hence, the more modest is the level of income the higher is the level of usable agricultural areas. It is important to highlight the null effect of the financial subsidies allocated by the second pillar of the Common Agricultural Policy in farms located in Bucharest-Ilfov region and by contrast, the positive and the highest direct impact of payments allocated by the second pillar towards farms scattered in the central Romanian region.

In order to assess the impact of specialization in farms using the type of farming proposed by the Farm Accountancy Data Network in all Romanian regions since 2007 to 2016, findings have pointed out significant fluctuations due to the predominant specialization in farms (Table 4).

The best results have been found in the mixed livestock and by contrast the worst ones have been found in wine farms where none independent variables have acted towards the level of farm net income in Romanian farms. The higher has been the level on assets in farms the higher has been the farmer's net income in sheep and goats, milk, fruit and granivores farms; this is explained with the fact that in these farms the level of investments has been in-

tense and aimed at increasing and improving the level of competitiveness of farms particularly after the transition from a centralised economy to an open one.

In general, the role of farm size has been positive in increasing the level of income in Romanian farms specialized in other field crops, fruits and orchards and in mixed crops; drawing some conclusions, an intense land capital endowment has been able to increase the level of farm net income in extensive farms such as fruit farms and mixed crops. Comparing the impact of financial subsidies allocated by the Rural Development Programme and the decoupled payments in different farms clustered in function of their own typology of farming research's outcomes have been different. In farms specialized in cereal, oil and protein (COP) crops direct and more intense has been the impact of decoupled payments to the farms' income; sheep and goats and cattle farms have pointed out a direct link between farm net income and decoupled subsidies. By contrast, in mixed crops and livestock farms the higher are the decoupled subsides the lower is the farm net income; hence, fundamental is the role of financial subsidies allocated by the second pillar of the Common Agricultural Policy in increasing the wealth in farms in terms of farm net income.

Summing up, it is possible to assume as mixed crops and livestock are located in inner areas able to intercept other sources of economic support. In order to corroborate this hypothesis, it is pivotal to focus the attention to mixed livestock and cattle, which are surely located in hilly and mountainous areas, have taken advantage in a direct way of financial supports and aids allocated to these farms in the frame of rural development.

Conclusions

This research has pointed out the role of financial supports in farm net income in Romanian farms part of FADN dataset even if poor regions have underlined the modest level of farm net income and an important role of financial subsidies indirectly allocated by the European Union or decoupled because of their own correlation to the yields in farms.

For the future, it is fundamental to support an increase of infrastructures, in particular in new technologies, and also in arising land capital endowment which are fundamental in getting the level of farmer's income higher and technical efficiency in Romanian farms. All in all, it is noteworthy to reshape the different allocation of financial subsidies disbursed in the second pillar of the Common Agricultural Policy in order to stimulate the innovation and the diversification and productive specialization in Romanian farms.

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