

## **ANALYSIS OF FINANCIAL SUBSIDIES ALLOCATED BY THE COMMON AGRICULTURAL POLICY TO EUROPEAN FARMS IN REDUCING ECONOMIC-TERRITORIAL INEQUALITIES BY INDEXES OF CONCENTRATION**

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**ABSTRACT.** – **Analysis of Financial Subsidies Allocated by the Common Agricultural Policy in European Farms in Reducing Economic-Territorial Inequalities by Indexes of Concentration.** As a consequence of the European Union (EU) enlargement in 2004 there has been a reshaping of funds allocated by the EU both in favour of an endogenous rural development, part of Pillar 2 of the Common Agricultural Policy (CAP), and also in terms of direct payments towards ag-commodities financed by Pillar 1 of the CAP. The European Commission, in order to evaluate the impact, role and function of the CAP, has set up an annual survey on a sample of European farms belonging to the Farm Accountancy Data Network (FADN). By using the FADN dataset for the period 2004-2012 in 25 EU Member States, this paper has assessed by indexes of concentration whether funds allocated by Pillars 1 and 2 of the CAP have reduced economic disparities in some EU Member States. Findings have shown that there has been a drop of inequality distribution in terms of financial subsidies in European farms allocated to strengthen the rural development. Focusing the attention on financial supports to disadvantaged rural areas, territorial disparities appear quite diversified among EU Member States.

**Keywords:** *Gini Index, Rural Development Plan, Farm Accountancy Data Network, Sen poverty index.*

### **1. INTRODUCTION**

Many scholars in agricultural policy have pinpointed that in general big farms have received financial agricultural payments and subsidies disproportionately compared to small farms, generating situations of disequilibrium that have impacted on levels of investment, productivity and economic efficiency of farms

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(Mishra *et al.*, 2009; Galluzzo, 2013; 2015). These authors have argued that financial supports allocated by a central administration have reduced inequalities in terms of agricultural income improving economic and technical efficiency of farms. In contrast, other scholars have pointed out a negative impact of financial subsidies to small farmers, generating a distorted effect in term of efficiency and productivity, which has incited policy makers into doing significant changes in Agricultural Policy (Ciaian and Swinnen, 2006; Ciaian *et al.*, 2014; Rizov *et al.*, 2013). Previous studies using a quantitative approach based on the Gini Index have demonstrated, before the enforcement of Agenda 2000 and also as a result of the MacSharry reform, a greater impact of direct payments paid by Pillar 1 of the Common Agricultural Policy (CAP) on the gross agricultural revenue and on the farmer's net income with several positive effects on the income distribution (Keeney, 2000; Frawley and Keeney, 2000). By contrast, other scholars have argued the new challenges that the Common Agricultural Policy have to bring about, due to WTO constraints, in order to reduce income supports and the negative impact of CAP subsidies have had towards farm efficiency in few European countries, even if financial decoupled aids have acted positively in reducing over production in many European farms (Swinbank, 2008; Zhu and Lansink, 2010; Rude, 2008).

Von Witze and Noleppa (2007) have pointed out that direct payments allocated by the CAP in Germany have had an unequal distribution hence some limitations in allocation of subsidies did not have any effects on smaller farms. Although the vast majority of the population does not know deeply the role and importance of contributions paid by the EU in agriculture, Von Witze and Noleppa (2007) have demonstrated the importance of subsidies in favour of disadvantaged rural areas or Less Favoured Areas (LFA) in causing a fair development in the primary sector by the multifunctionality in agriculture. A shift of payments from the Pillar 1 to the Pillar 2 of the CAP, planned on a regional basis rather than on a historical basis, could have a greater impact on reducing farm income imbalances (Severini and Tantari, 2014). Recent studies have shown, through a quantitative methodology, that financial aids allocated by Pillar 2 have had a better effect towards urban areas (Camaioni *et al.*, 2013). In contrast, other authors have investigated as there is a weak nexus between financial supports provided by the CAP to rural areas development (Shucksmith *et al.*, 2005, Crescenzi and Rodriguez-Pose, 2011).

The purpose of this study has been addressed mainly to assess the role and function of subsidies allocated by Pillars 1 and 2 in limiting imbalances between rural areas in several European Union (EU) Member States; in particular, the paper has investigated the role of financial subsidies allocated by the Pillar 2 as a factor in reducing territorial imbalances, because of in literature this aspect

has not been particularly investigated. In fact, many scholars have predominately focused their attention on the role of subsidies provided by Pillar 1 of the CAP in reducing farm income inequalities and income distribution (El Benni and Finger, 2012; Severini and Tantari, 2014) rather than investigating Pillar 2, whose funds allocated by the EU should be addressed to strengthening agri-environmental payments and supporting disadvantaged rural areas by LFA aids. (Shucksmith *et al.*, 2005).

El Benni and Finger (2013) have assessed via FADN dataset in the medium term the elasticity of the Gini Index and the income inequalities in farms, focusing their research on the impact of direct payments allocated to farmers by national governments. The analysis of farm income inequalities using the Gini Index elasticity had already highlighted in several agricultural countries that direct payments had a pivotal role in reducing the disparities between farms (El Benni *et al.*, 2012). Schmid *et al.* (2006) carried out a study in Germany on the role of financial subsidies allocated by the Pillar 2 as less favoured areas aids in reducing income inequality. Other scholars have investigated the role of agri-environment subsidies in reducing income imbalances in farms (Von Witzke and Noleppa, 2007). In Germany, quantitative studies with the application of the Gini Index have shown that the CAP has been an important tool in reducing territorial and economic imbalances, particularly after the reunification of these two states (Depperman *et al.*, 2013). In contrast, researches carried out in Europe by Knigma and Oskam (1987) and by Von Witzke (1979) and in the U.S. by Mishara *et al.* (2009) have argued as direct payments in supporting farmers had a limited effect in reducing imbalances in farms.

## 2. AIM OF THE RESEARCH

The European Agricultural Fund for Rural Development has highlighted in the period 2007-2013 a considerable heterogeneity in its own distribution of financial funds among European rural areas in terms of aid distributed to each annual work unit. This has strengthened the hypothesis that there is a directionality north-south in disbursed financial aids allocated by the CAP (Camaioni *et al.*, 2013).

The European Commission, in order to evaluate the impact, role and function of the CAP, has set up an annual survey in a sample of European farms belonging to the Farm Accountancy Data Network (FADN). This latter is an annual survey which covers approximately 80,000 farms and about 5,000,000 farmers located in the EU, able to cover 90 per cent of usable agricultural area

(UAA) representing approximately 90 per cent of the total European agricultural production (European Commission, 2014).

The main question in this paper was to assess whether financial contributions and aids paid by the Pillar 1 and by the Pillar 2 of the Common Agricultural Policy have lessened economic and territorial disparities, focusing also the analysis on specific measures financed by the Pillar 2 such as Less Favoured Areas payments. By using the FADN dataset over the period 2004-2012 in 25 EU Member States, the purpose of this analysis has been focused in assessing by a quantitative approach if funds allocated by Pillars 1 and 2 have reduced farmer's income disparities in EU Member States and in European farms. In order to investigate economic-territorial disparities we have used some indexes of concentration aimed at estimating territorial inequalities, such as the Gini Index, the poverty index elaborated by Sen in 1976 and the entropy index.

### 3. MATERIALS AND METHODS

The quantitative analysis in this paper has defined an indicator able to estimate the concentration by the Gini Index, which by its own nature assumes values between 0 (equal distribution) and 1 in the case of maximum distribution and imbalance in two investigated variables such as distribution of funds disbursed by the CAP (Pillars 1, 2 and financial supports in favour of disadvantaged rural areas) and farm net income. In mathematical terms the Gini Index can be defined as (Farris, 2001):

$$G = \left[ 1 - \sum_{i=1}^{N-1} (p_i - p_{i-1})(q_i + q_{i-1}) \right]$$

In order to assess the impact of a 1 per cent of financial subsidies fluctuations disbursed by the CAP and the sensitivity of farm net income one has used the elasticity (Severini and Tanteri, 2014; Pyatt *et al.*, 1980).

The Sen Index has been calculated using the following formulation (Sen, 1976):

$$S = HCR * [IGR + (1 - IGR) * Gp]$$

where IGR (Income Gap Ratio) is a measure of average deviation percentage, Gp is the Gini Index of the calculated values of financial contributions allocated by Pillar 2 in terms of average value. HCR (Capable Headcount Ratio) is able to assess the proportion of people whose value of the financial aids paid is lower or equal to the minimum established threshold. This index has the advantage of taking into account fluctuations occurring in the transfer of funds between Member States.

In order to compare different EU Member States assessing the allocation over time of funds disbursed by the CAP, another index of concentration, estimated in terms of Index of Entropy proposed by Theil in 1967 has been used:

$$T = \left[ \sum_i \frac{A_i}{A} \lg N_i \frac{A}{A_i} \right]$$

In this case the T index assumes the minimum value zero (maximum entropy) when all units have the same mode. The Entropy Index of Theil has the advantage of being a standardised index and it decreases for increasing changes in all analysed variables.

#### 4. RESULTS AND DISCUSSION

Denmark and Slovakia have pointed out the highest values of Gini Index in terms of Farm Net Income assessed as an average assessed in different years (Table 1). In term of elasticity the highest values have been detected in Greece and Italy which are two Member States more sensitive than the Czech Republic in terms of fluctuations of farmer's income. Focusing the attention on the average value of financial subsidies allocated by the Pillar 1, United Kingdom, Germany and Ireland have shown the highest values of Gini Index compared to other EU States such as Portugal and Finland which have recorded steady values in terms of financial subsidies allocated by Pillar 1 (Table 1).

For other sources of financial support provided by Pillar 2, Cyprus and Malta as well as several Eastern EU Member States have highlighted a greater stability over time in terms of total contributions allocated exclusively by the Pillar 2; on the contrary, Finland and Spain have shown a totally different situation. With regard to the financial contributions disbursed by the CAP in favour of disadvantaged rural areas, findings have pointed out as the Netherlands and Hungary have had a stability over the time of the analysis while Luxembourg, Portugal and Austria have highlighted a significant variability considering the variable financial aids paid in favour of stayed behind rural areas by the LFA subsidies (Table 1). The financial supports to disadvantaged rural areas have highlighted in two Member States of the European Union, such as the Netherlands and Hungary, the highest Gini Index of the variable LFA aids, corroborating some conclusions proposed by Shucksmith *et al.* in 2005, according to which the larger is the agricultural areas the higher are the financial support allocated by LFA payments. Summing up, findings of Gini Index assessed on the total subsidies paid by the Pillars 1 and 2 of the CAP have highlighted in Denmark and Greece values higher than in Portugal and Austria (Table 1). Findings have also pointed

out a shifting of subsidies paid by the Pillar 2 from a geographical direction north-south, as analysed by Camaioni *et al.* in 2013, to an east-west direction with the consequence of emphasising a new geographical dichotomy east-west nations instead of north-south states in terms of allocation and the incidence of contributions paid by the CAP.

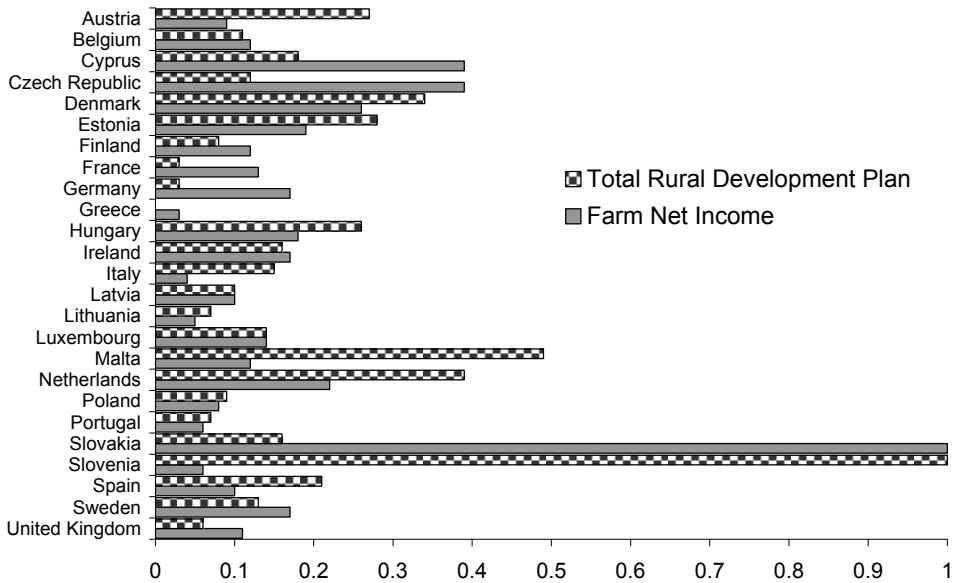
**Table 1.**

**Average results in the Gini Index and elasticity in all investigated European Union Member States assessed using the FADN dataset**

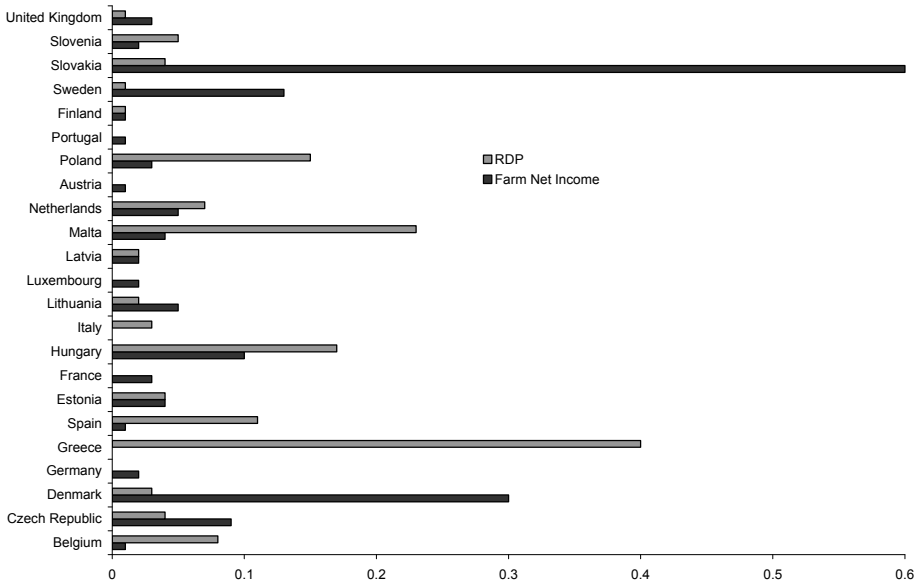
(Source: [http://ec.europa.eu/agriculture/ricaprod/database/database\\_en.cfm](http://ec.europa.eu/agriculture/ricaprod/database/database_en.cfm))

	Farm Net Income		Subsidies CAP Pillar 1		Subsidies CAP Pillar 2		Less Favoured Areas (LFA) payments		Total CAP subsidies	
Country	Gini	Elasticity	Gini	Elasticity	Gini	Elasticity	Gini	Elasticity	Gini	Elasticity
Austria	0.075	0.403	0.426	0.277	0.353	0.018	0.018	-0.038	0.086	0.421
Belgium	0.087	0.134	0.230	0.078	0.233	0.019	0.116	0.002	0.113	0.037
Cyprus	0.151	0.987	0.402	0.938	0.748	0.558	0.227	0.087	0.153	0.571
Czech Rep.	0.268	0.281	0.581	0.176	0.527	0.027	0.060	0.034	0.129	-0.012
Denmark	0.474	0.416	0.713	0.073	0.352	0.003	0.243	< 0.0002	0.427	0.059
Estonia	0.172	0.020	0.358	0.064	0.377	0.095	0.100	-0.012	0.151	-0.041
Finland	0.089	0.090	0.148	0.166	0.177	0.037	0.057	-0.074	0.049	-0.379
France	0.158	0.316	0.420	0.377	0.228	0.018	0.045	-0.008	0.241	0.276
Germany	0.141	0.287	0.852	0.224	0.248	0.001	0.040	-0.008	0.231	0.177
Greece	0.048	-0.646	0.505	-0.002	0.501	0.000	0.273	-0.006	0.378	-0.001
Hungary	0.285	0.350	0.327	0.074	0.526	0.065	0.502	0.004	0.148	-0.026
Ireland	0.080	-0.076	0.945	0.257	0.666	0.014	0.045	-0.035	0.110	-0.006
Italy	0.037	-0.582	0.577	0.952	0.344	0.349	0.211	0.246	0.207	1.800
Lithuania	0.184	-0.127	0.289	0.016	0.410	0.040	0.091	-0.033	0.111	-0.167
Latvia	0.119	0.032	0.239	0.147	0.361	0.196	0.048	-0.043	0.113	0.017
Luxemburg	0.132	0.242	0.160	0.155	0.732	0.173	0.023	-0.068	0.090	0.068
Malta	0.178	0.129	0.410	0.310	0.743	0.050	0.078	-0.024	0.329	0.438
Netherlands	0.194	0.202	0.619	0.109	0.207	0.007	0.916	< 0.0001	0.177	0.041
Poland	0.144	0.123	0.656	0.026	0.238	0.077	0.201	0.010	0.187	0.117
Portugal	0.097	0.426	0.138	0.060	0.700	0.021	0.078	0.019	0.060	-0.054
Slovenia	0.126	0.177	0.522	0.274	0.621	0.092	0.023	-0.066	0.096	0.028
Spain	0.073	-0.096	0.321	0.286	0.187	0.011	0.173	0.021	0.189	0.207
Swedish	0.310	0.405	0.464	0.154	0.464	0.007	0.134	0.008	0.096	-0.071
Slovakia	0.651	0.448	0.399	0.127	0.534	0.094	0.094	-0.068	0.178	0.026
United Kingdom	0.151	0.302	0.959	0.187	0.324	0.020	0.129	0.009	0.182	0.077

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**Figure 1.** Main results in the Sen Poverty Index in different analysed European countries  
 (Source: [http://ec.europa.eu/agriculture/ricaprod/database/database\\_en.cfm](http://ec.europa.eu/agriculture/ricaprod/database/database_en.cfm))



**Figure 2.** Main results in the Entropy Index considering different variables  
 (Source: [http://ec.europa.eu/agriculture/ricaprod/database/database\\_en.cfm](http://ec.europa.eu/agriculture/ricaprod/database/database_en.cfm))

The main results of the Sen poverty index, calculated as an average value in the eight year time 2004-2012, have pointed out as the major territorial discrepancies has affected the variable farmer's net income (Fig. 1). Findings have pointed out also significant differences in the variable total amount of aids paid by the Rural Development Plan in the 'new' EU Member States such as Slovenia and Malta. For the future, the main priority for policy-makers is to implement financial supports allocated by the National Rural Development Plan, whose purpose is to stabilise farmer's net income by investments able to increase economic efficiency by multifunctionality and diversification in farm activities.

The analysis of the Entropy Index, assessed as an average value in the eight year time 2004-2012, has pointed an uneven distribution among European Countries corroborating the hypothesis of a spatial and geographical dichotomy among different clusters of European States, as argued in previous studies (Camaioni *et al.*, 2003). In fact, findings in United Kingdom, Austria and Germany compared to the newcomer states have highlighted the lowest values of variability in investigated variables such as payments allocated by the Rural Development Plan and Farmer's Net Income (Fig. 2).

The analysis of Gini Index, in terms of average value in all EU Member States, has shown that the farm net income is placed at 35.4 per cent with a situation of inequity in the distribution of farmer's profits (Table 2); analysing the allocation of less favoured areas supports the average value of Gini Index is equal to 71.3 per cent which has implied a fairly unbalanced distribution of financial supports among Member States.

**Table 2.**

**Main results in the Gini and Sen Index in all investigated European countries**

(Source: [http://ec.europa.eu/agriculture/ricaprod/database/database\\_en.cfm](http://ec.europa.eu/agriculture/ricaprod/database/database_en.cfm))

Variable	Gini Index	Sen Index
Farm net income	0.354	0.260
Total asset in farms	0.478	0.230
Less favoured areas support (LFA)	0.713	0.110
CAP Pillar I subsidies	0.649	0.160
CAP Pillar II subsidies	0.606	0.190



Comparing the results of this study to those of previously published researches, it has emerged that the Gini Index of Pillar 1 is very close to the values identified in other countries such as Canada but lower than results found in the United States (Moreddu, 2011). Comparing our results of the Gini Index on financial subsidies allocated by the Pillars 1 and 2 to findings of other scholars in France (Boulanger, 2011) and Italy over the period 2003-2007 (Severini and Tantari, 2014), it emerges that our values for Italy (0.24) and France (0.27) are lower than those previously estimated (0.52 and 0.95). All this corroborates the theoretical hypothesis, according to which, the effect of the admission of New Member States to the EU has implied a reshaping and a redistribution of financial resources within Member States and among different financial measures of rural development, aimed at limiting economic and spatial inequalities in different rural areas. The average value of the Gini Index assessed in all Member States has been in line with findings from non-EU countries (El Benni *et al.*, 2012; Mishra *et al.*, 2009).

Findings in terms of Gini Index assessed in the variable financial subsidies allocated by the Pillars 1 and 2 have corroborated previous conclusions and studies which have assigned to the CAP a positive role in generating territorial cohesion and in reducing social and economic imbalances (Shucksmith *et al.*, 2005). Nevertheless, the average value of the Gini Index, considering the total payments disbursed by the CAP equal to 0.45, has pointed out an attenuated effect of the CAP payments in reducing socio-economic and territorial disparities compared to other researches carried out both in other European countries and also in outside the European Union (Boulanger, 2010; El Benni *et al.*, 2012; 2013; Moreddu, 2011).

## 5. CONCLUSIONS

In the current programming period (2014-2020) the EU has addressed its efforts to the specific objective of reducing regional disparities, especially acting on Pillar 1, through a mixed system of financial supports and aids, with the aim of satisfying needs and priorities in all European countries aimed at strengthening an homogeneous and steady rural development. New EU Member States, led by Greece, appear to require a greater growth of EU funds aimed at supporting productive diversification. This analysis has pointed out, in fact, a shifting to east of contributions paid by the EU in favour of disadvantaged rural areas.

Summing up, the size of farm and farmer's profitability have demonstrated their close nexus as well as the importance of the financial contributions allocated by the CAP by Pillar 2 in order to reduce regional imbalances; therefore, it would be desirable as auspicated by the European Commission encouraging agricultural

activities by an exogenous financial support allocated by the European Investment Bank throughout specific contributions, necessary to increase farm size in terms of land capital. All this would stimulate investments and an efficient use of other innovative financial tools useful in increasing technical and economic efficiency through a rise of agricultural land and a more level of investments in terms of capital and technology.

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