# EXPLORATORY SPATIAL DATA ANALYSIS OF PUBLIC FUNDS ALLOCATED TO THE COMMON AGRICULTURAL POLICY IN A EUROPEAN NUTS II REGION

**Óscar Luis Alonso Cienfuegos, University of Cantabria, Spain**

## ABSTRACT

*This article presents the final results of the exploratory spatial data analysis carried out on the variables that measure the amount of public funds allocated by the public administration to the common agricultural policy (cap) in a european nuts ii region (asturias). These variables can be and have been used in econometric models to measure their impact or contribution to the objectives pursued by the cap. The territorial nature of these funds makes it necessary to contrast the possible existence of spatial autocorrelation and / or spatial heterogeneity, which, if confirmed, would make it necessary to propose spatial econometric models that collect them. The exploratory spatial data analysis (esda) is proposed as a previous step to a subsequent confirmatory analysis of estimation of the models.*

**Keywords:** Exploratory Spatial Data Analysis, Spatial Autocorrelation, Spatial Heterogeneity, Common Agricultural Policy.

## INTRODUCTION

When we work with cross-sectional statistical data with a low level of disaggregation, it is necessary to consider the possibility that the required statistical properties are not fulfilled, especially that of the independence of the observations, since there may be spatial autocorrelation between them, or also occur the existence of spatial heterogeneity, depending on the different geographical areas to which the data refer (Arbia, 1989). The economic amounts that finance public policies, in this case of the European Union, must be analyzed to measure and quantify the achievement of the objectives pursued. Policies such as the CAP, with a clear territorial component, advice the management of spatial data, in many cases cross-sectional and with a low level of disaggregation, which usually implies that there is dependence and spatial heterogeneity. To verify this circumstance, a first step would be to carry out an ESDA that describes the spatial distribution (Fisher & Getis, 2010). In this article we will present the results of the AEDE on three variables referring to Asturias, NUTS II region, for the last multi-annual programming period executed and completed, that is, from 2007 to 2013. The variables are, on the one hand, the public funds allocated to the first pillar of the CAP, that is, direct payments to the agricultural sector, co-financed with EAGF funds. On the other hand, we would have the variable that refers to public funds earmarked for the second pillar of the CAP, that is, those co-financed with EAFRD.

A third variable would be the sum total of the two previous pillars. The results will give us a first approximation to the convenience of considering the spatial problem in the estimation of econometric models that include these variables, which are fundamental to analyze the impact of the CAP in the territories of application (Alonso, 2019) in Table 1.

**Table 1**
**DATA AND VARIABLES**

| Variable | Description | Unit | Source |
|---|---|---|---|
| IPDR13.07 | Sum of the total amount of public money destined to payments to final beneficiaries of public aid co-financed by EAFRD within the PDR 2007-2013 of the Government of the Principality of Asturias. | Euros | Consejería de Agroganadería y Recursos Autóctonos. Government of the Principality of Asturias |
| I1PIL13.07 | Sum of the total amount of public money allocated to payments to final beneficiaries of public aid corresponding to the first pillar of the CAP (EAGF financing) of the Government of the Principality of Asturias in the period 2007-2013. | Euros | Consejería de Agroganadería y Recursos Autóctonos. Government of the Principality of Asturias |
| IPAC13.07 | Sum of the total amount of public money allocated to payments to final beneficiaries of public aid corresponding to the first and second pillars of the CAP (EAFRD and EAGF financing) of the Government of the Principality of Asturias in the period 2007-2013. | Euros | Consejería de Agroganadería y Recursos Autóctonos. Government of the Principality of Asturias |

## METHODOLOGY

The spatial unit used is the council, which means using micro-territorial data. The techniques of spatial exploratory analysis provided by the GeoDa program Anselin & Rey, (2014) are applied to the selected variables. Specifically, the frequency histogram, decile map and standard deviation map are studied for univariate analysis. Also, Moran's scatterplot. For the representation of atypical observations that occur locally, box plots (diagram and map), percentile map, cartogram and LISA maps of local spatial dependence are calculated. For statistical contrasts we used Moran's I (Moran, 1948) and the LISA tests based on both Moran's I and Getis & Ord's G Ord & Getis, (1992). A queen-type contiguity matrix is proposed (Alonso, 2019)

## RESULTS

For the variables of public investment co-financed or financed by EAFRD and EAGF (IPDR13.07, I1PIL13.07 and IPAC13.07), the main results of the univariate AEDE reflect the existence of spatial autocorrelation. The western zone, with the councils with more weight in the primary sector, present higher outliers.

In all three cases, the Moran I index is positive, higher than 0.25 for the three variables and much higher than its expected value, which already indicates the possible existence of positive spatial autocorrelation. In addition, it is significant when performing different randomization tests to simulate its distribution. We carry out the contrast eliminating the outliers and the significance according to this criterion remains.

To verify the possible existence of local spatial autocorrelation, the results of the LISA tests, both those based on Moran's I and on Getis and Ord's G are significant in several councils.

In the West a cluster of high values is detected, as well as in areas with significant activity in the primary sector and neighboring councils. Some councils in the center area are also significant, but with low values. This may be indicative of spatial heterogeneity and may suggest parametric instability.

## CONCLUSION

The results of the AEDE, as a previous step to the estimation of econometric models that include the variables of public investment of the CAP, both as a whole and that corresponding to each of the two pillars, have resulted in the possible presence of both autocorrelation spatial as well as spatial heterogeneity, which advises the approach of spatial econometric techniques to estimate models that include these variables, especially in those that are used to measure the impact or performance of these funds in achieving the objectives of the CAP.

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