



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Productive specialization in Romanian farms using Moran's Index

NICOLA GALLUZZO

ASGEAR (Association of economic and geographical studies of rural areas)

Rieti, Italy

asgear@libero.it



Paper prepared for poster at the 149th EAAE Seminar

‘Structural change in agri-food chains: new relations between farm sector, food industry and retail sector’

Rennes, FR, October 27-28, 2016

Copyright 2016 by [Nicola Galluzzo]. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.

Abstract. *As a consequence of communism regime collapse, Romania has changed in a quickly and intense way the transformation of its socio-economic and productive fabric in order to become a new member of the European Union. The growth of Romanian Gross Domestic Product has acted on the increase of food consumption, on the implementation of agri-food sector and on the level of farmer's income even if one of the main negative bottleneck is the out migration from the countryside.*

Our research focuses on the evolution since 2000 to 2014 in Romanian territorial specialization aimed at estimating by a quantitative approach main nexus between growth of Gross Domestic Product and increase of agricultural production, in terms of agricultural GDP, with positive impacts on the agri-food chain. The Moran's index has been a pivotal quantitative approach in order to estimate the spatial autocorrelation in all Romanian administrative provinces or counties between the variable Gross Domestic Product and the level of agrarian GDP and rural out migration. Findings have pointed out a dichotomy between the north and south Romanian regions as a consequence of the productive specialization, in general characterised by a high level of cropping specialization and by a poor farm size which is not able to create a consolidated agri-food supply chain.

Keywords: *Gross Domestic Product, territorial specialization, farmer income, farm size, Gross Domestic Product.*

JEL code: Q12, R11

1.Introduction

Aftermath the fall of Berlin's wall, there has been a significant transition from a communist agrarian productivist model of production to a post communist one, which has implied some positive impacts to small scale farms influencing also decision processes of policy makers in order to face with this socio and economic transformation (Kostov and Lingard, 2002).

The transition in an newly economic model of production was particularly severe in some rural areas, far away from the traditional urbanized areas, as a consequence of a poor level of investments in innovation both in terms of agrarian capital and also as new technologies (Jordan, 2009). This author has argued as in declining rural areas of Romania there has been a growth of out migration towards rich urban territories as a consequence of a significant change in the productive model and due to poor opportunities for farmers in implementing the level of efficiency and investments. A negative consequence was an increase of disparities between central and peripheral areas expanding the core-periphery dichotomy due to different level of income and economic growth (Benedek, 2015).

Romanian countryside is characterized by lots of small rural villages at risk of socio-economic marginalization consequence of out migration which is also a negative prerogative typical of many European rural areas (Galluzzo, 2014) and more than 70% of farms has an agricultural surface close to 1 hectare (Giurca, 2008). The main downside of small dimension in farms has been an expansion of rural poverty with the consequence to foster the marginalization of Romanian rural space. Farms with small utilized agricultural areas, according to the latest data published by Eurostat, are predominately scattered in rural territories with small villages at risks of rural out migration (Festuccia, 2013). Assessing the allocation of financial subsidies paid by the Common Agricultural Policy, some scholars have argued that these latter have had a different impact on farm efficiency in several European countries (Zhu and Lansink, 2010) and in particular in favor of the new comers states belonging to the European Union aimed at reducing territorial and socio-economic disparities.

The National Rural Development Plan, both in seven year time 2007-2013 and also in the further period of time 2014-2020, is a good opportunity to reduce the out migration from the countryside throughout an integrated economic development in rural territories which should necessary use economic compensations, by the financial subsidies allocated in the second pillar of the Common Agricultural Policy, acknowledging needs and an arising economic growth of Romanian rural people (Chiritescu, 2011).

In general, the aim of the European Union and national authorities is to implement the level of competitiveness of nations specifically towards new comers states of the EU even if in Romania some socio-economic disparities among counties and regions are so common (Fig. 1) and they tend to arise over the time with a poor impact of financial subsidies allocated by the European Union in improving the level of Gross Domestic Product (Chilian et al., 2014; Bouayad-Agha et al., 2013). Poor level of Gross Domestic Product, with a nexus to the highest levels of out migration from rural territories, have been pointed out in lots of Romanian counties marked out by not significant competitiveness and innovation (Pauna et al., 2015).

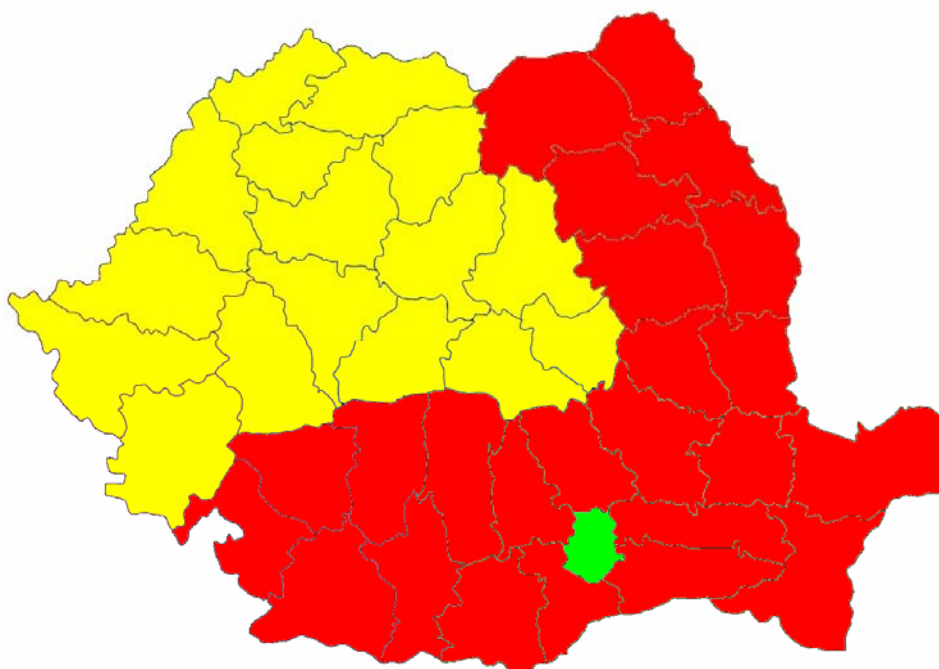


Fig. 1- Economic growth and its performance in Romania. Green is a region with the best performances, yellow are regions with intermediate growth and red ones are poor regions in stagnation (*Source: our elaboration on data www.insse.ro/cms/en TEMPO time series and Chilian et al., 2014*)

2. Aim of the research

The objective of this paper was to investigate over 14 years, via a quantitative approach, the spatial autocorrelation between the arising levels of Gross Domestic Product (GDP) in every Romanian counties and the growth of agricultural productions in terms of agrarian GDP and rural out-migration from the countryside.

The main question of the research is: does the growth of GDP correlate to the agricultural production such as agrarian GDP, territorial productive specialization and out migration from Romanian countryside?

3. Methodology

The Moran's index is a quantitative methods aimed at assessing the spatial autocorrelation between two or more variables (Moran, 1950). Several Romanian scholars have investigated by a quantitative approach territorial imbalances, focusing their attention on the GDP, innovation-competitiveness and unemployment, both over the time and also comparing Romania to other European ones using also the Moran's index (Mare and Pop, 2011; Pauna et al., 2015; Chilian et al., 2014; Lincaru et al., 2014). Lots of these studies have addressed their attention on territorial statistical units of investigation such as NUTS 2 and NUTS 3.

The main purpose of spatial autocorrelation is to define a territorial cluster with similar values of assessed parameters (Anselin and Ray, 1991; Moran, 1950) hence, if values of parameters are spatially located they assume a positive value due to a direct and positive autocorrelation. By contrast, uneven values imply a spatial negative autocorrelation. In mathematical term the index proposed by Moran in 1950 can be written as:

$$I = \frac{N \sum_i \sum_j W_{i,j} (X_i - \bar{X})(X_j - \bar{X})}{(\sum_i \sum_j W_{i,j}) \sum_i (X_i - \bar{X})^2}$$

N is the number of geographical areas

X_i is the value of X variable in the i area

X_j is the value of X variable in the j area

W_{ij} is a weigh in connection to the distance between i - j areas

$(X_i - \bar{X})$ and $(X_j - \bar{X})$ are the standard deviation from the average value in investigated variables.

In general, W_{ij} is a matrix of weights like a binary matrix i,j where one uses weights inversely proportional to the spatial distance between the area i and the area j when i is different from j . According to Moran 1950, W_{ij} is an adjacent matrix if the i area is on the border to j area assuming a value close to 1 otherwise the value is 0.

The index proposed by Moran assumes a value from -1 to 1; the value equal to ± 1 implies a spatial clustering and a positive or negative spatial autocorrelation; a value of the index close to 0 implies the presence of a spatial pattern due to a random effect.

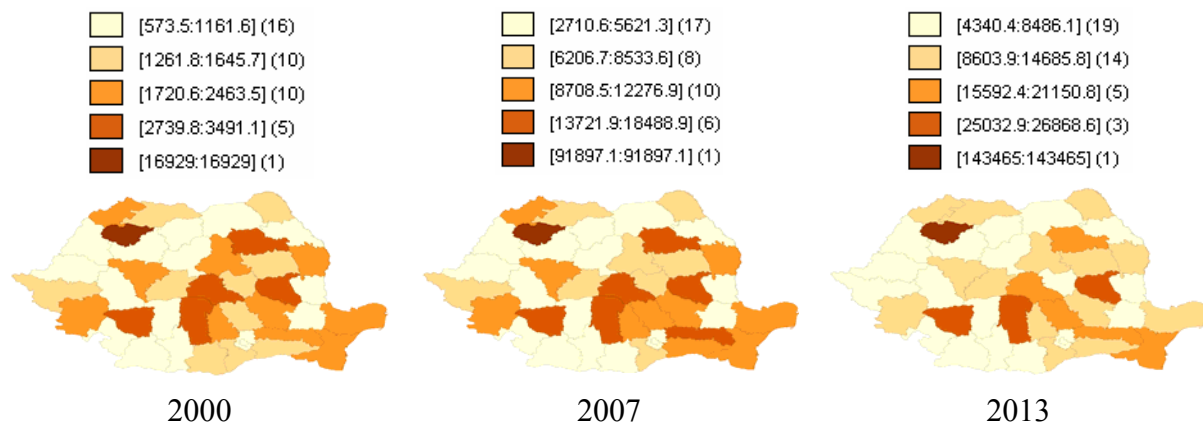


Fig 2- Evolution over the time of GDP in Romanian counties (*Source: our elaboration on data www.insse.ro/cms/en/TEMPO time series*)

Usually the Moran's index has a nexus to the Moran's scatterplot which is a graph able to link the x normalised variable to the spatial lag of the analysed and normalized

variable (Wx); in this case the Moran's index is an angular coefficient of two variables put in relation in the Moran's scatterplot able to point out the main linear relationships in assessed variables (Moran, 1950; Anselin and Ray, 1991). If the angular coefficient is 0 dots are dispersed in all quadrants which imply no correlation; otherwise it is possible highlighting different typologies of correlation excluding in some cases outliers as well.

In this paper all data have been assessed using the software Geodata in order to assess the Moran's index.

4. Results and discussion

Findings of the GDP growth in all Romanian counties have pointed out an increase of poor areas located in rural territories where significant high has been the out migration from the countryside (Fig. 2).

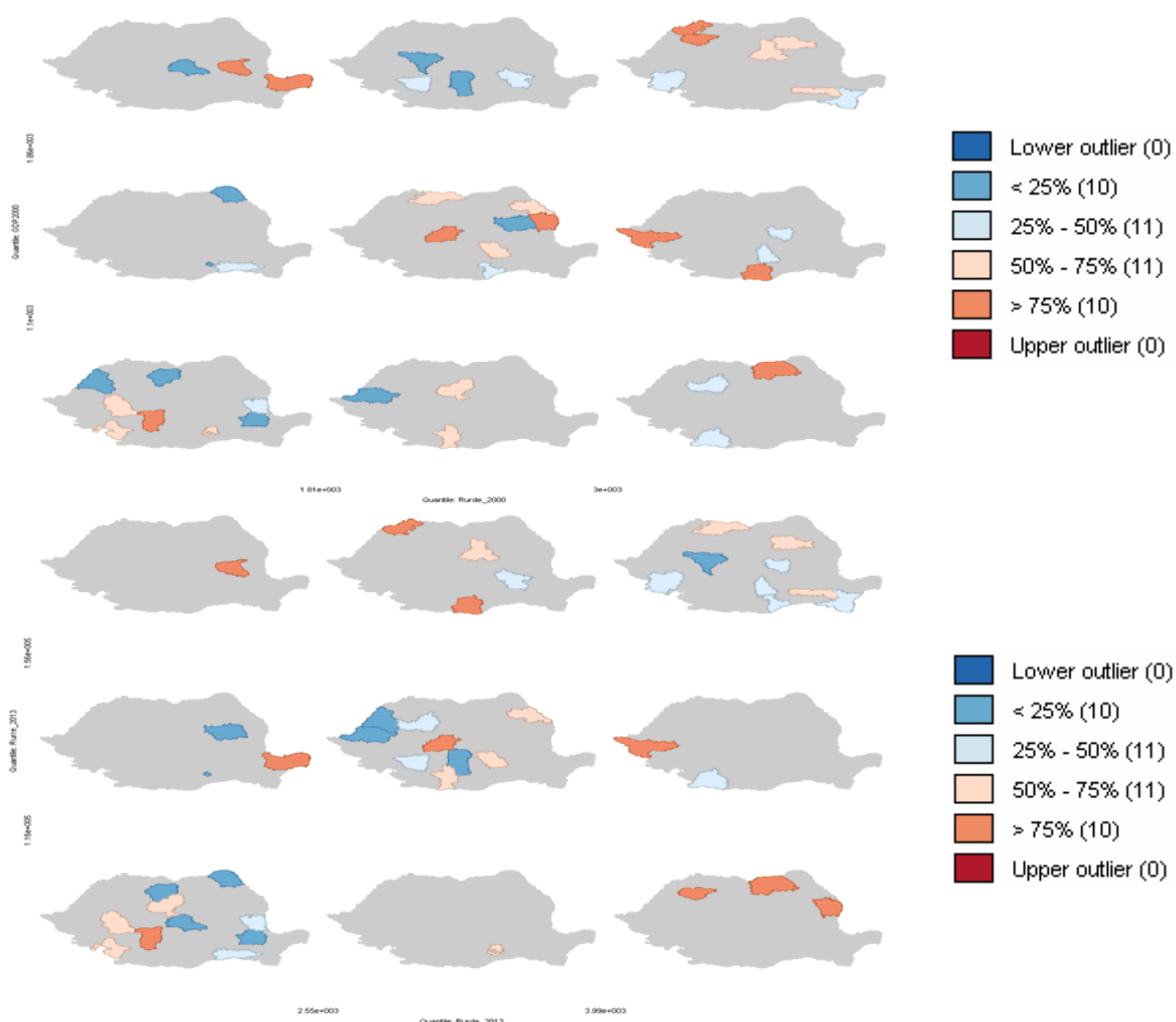
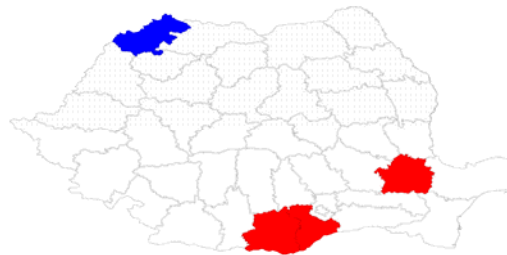


Fig 3- Main relationships among rural depopulation and financial subsidies allocated by the II pillar of the CAP in Romanian counties (*Source: our elaboration on data www.insse.ro/cms/en TEMPO time series*)

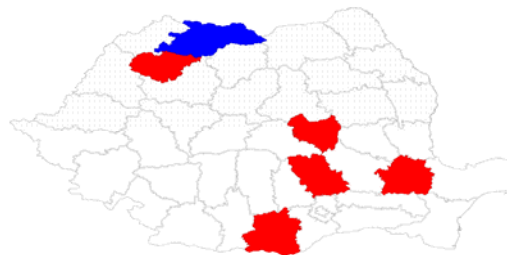
The European Union by the financial subsidies allocated by the Common Agricultural Policy has tried to reduce the out migration from the Romanian countryside; main results in this paper have pointed out as higher is the emigration from the countryside more intensive has been the allocation of financial subsidies finalised in reducing and lessening the rural

depopulation (Fig. 3). In general, the counties located close to the border of other states member of the European Union have highlighted the highest level of rural depopulation.

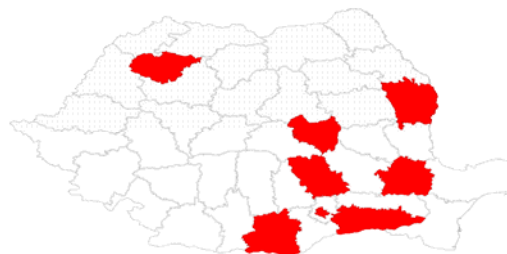
Considering the evolution in the variable Gross Domestic Product made by the primary sector in three different year time of analysis such as 2000, 2007 and 2013, findings have pointed out an increase from 3 to 8 Romanian counties, scattered predominately in Transylvania, Muntenia e Moldova, characterized by a significant incidence of agricultural activities and agrarian GDP (Fig. 4). In these counties the role and function of farmers is pivotal in producing ag-commodities and traditional food.



2000



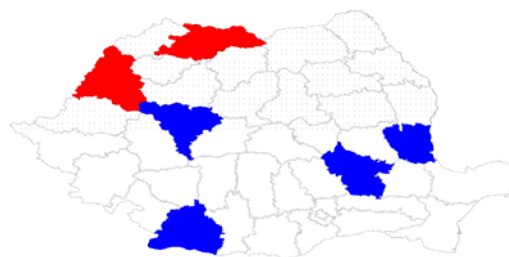
2007



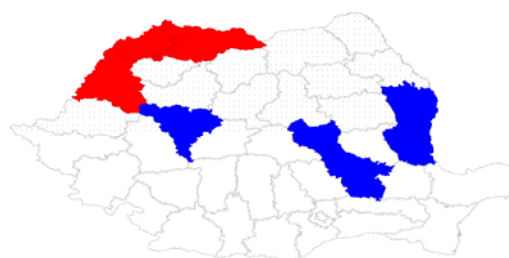
2013

Fig 4- Evolution and incidence of Gross Domestic Product produced in the primary sector. In red are regions with the highest value in blue the lowest one. (Source: our elaboration on data www.insse.ro/cms/en/TEMPO time series)

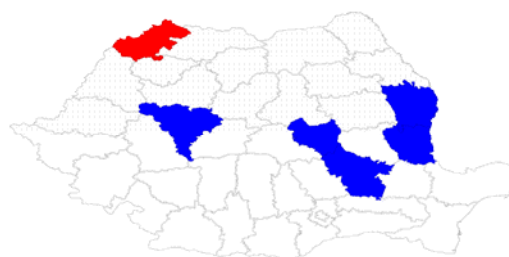
Summing up, findings have pointed out an increase of Romanian counties with a significant incidence of the agrarian GDP in 2013 compared to previous years of investigation. In fact, in Maramures region there has been a strengthen of agricultural productions with a drop of involved counties but more specialized in ag-commodities production.



2000



2007



2013

Fig 5- Evolution of out migration from the Romanian countryside. In red are located regions with the highest value in blue the lowest one. (Source: our elaboration on data www.insse.ro/cms/en TEMPO time series)

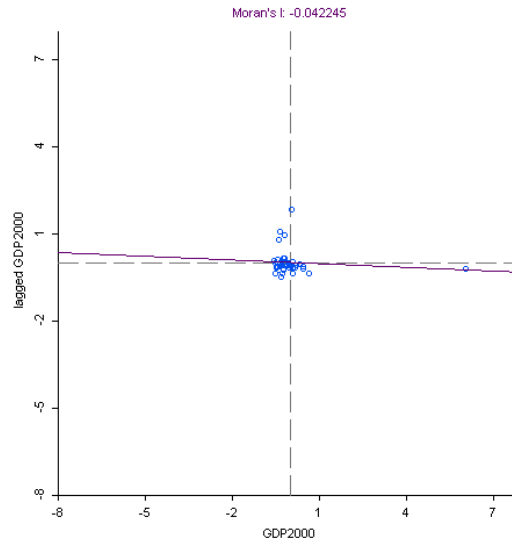


Fig 6- Spatial autocorrelation in the variable GDP in the primary sector in 2000. (Source: our elaboration on data www.insse.ro/cms/en TEMPO time series)

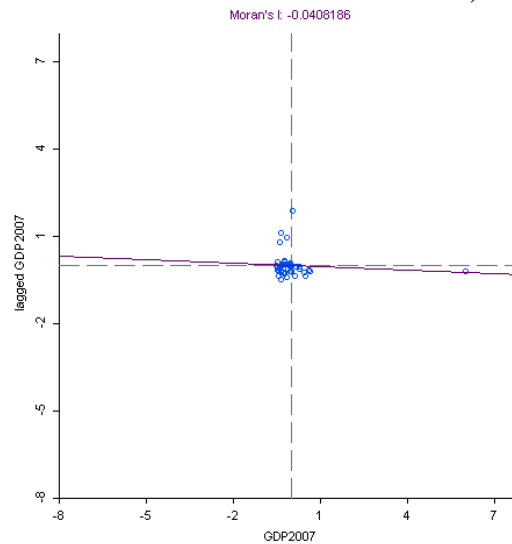


Fig 7- Spatial autocorrelation in the variable GDP in the primary sector in 2007. (Source: our elaboration on data www.insse.ro/cms/en TEMPO time series)

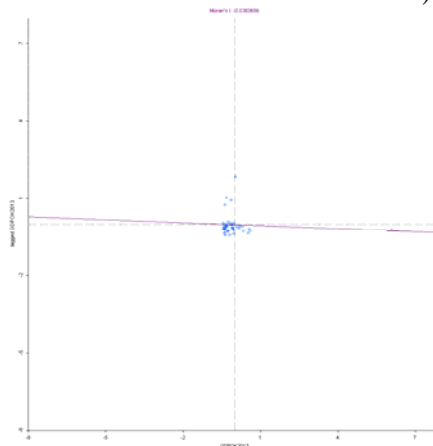


Fig 8- Spatial autocorrelation in the variable GDP in the primary sector in 2013. (Source: our elaboration on data www.insse.ro/cms/en TEMPO time series)

In the time of observation, results about the rural out migration have highlighted a consolidation of this negative aspect which has involved the counties with the highest level of incidence of agrarian GDP (Fig. 5). In particular Romanian counties in the region of Maramures have shown the highest level of out migration corroborating the efforts of the European Union in contrasting the out migration from the countryside by the allocation of specific financial subsidies paid by the Common Agricultural Policy. This is particularly true analyzing the emigration in 2007 when Romania become a member of the European Union and the highest value have been highlighted where the counties have been characterized by significant level of rural out migration.

Spatial analysis in 2000 of the variable GDP in the primary sector has pointed out a negative spatial autocorrelation with statistic's value equal to -0.118 higher than $E[I]$ equal to -0.0244; hence, results in 2000 have been statistically significant (Fig. 6). Spatial analysis in 2007 assessing the variable GDP in the primary sector has pointed out a negative spatial autocorrelation with statistic's value equal to -0.163 which is higher than $E[I]$ equal to -0.0244; hence, results in 2007 have been statistically significant (Fig. 7). Finally, spatial analysis in 2013 investigating the variable agrarian Gross Domestic Product has pointed out also a negative spatial autocorrelation with a statistic's value equal to -0.201 higher than $E[I]$ equal to -0.0244; hence, results in 2013 have been statistically significant (Fig. 8).

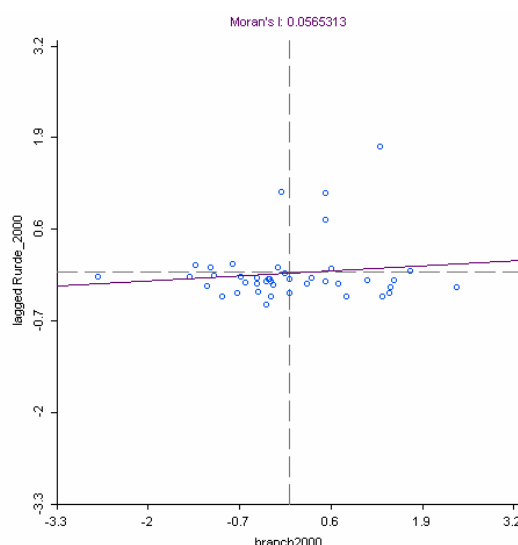


Fig 9- Spatial autocorrelation between the variable GDP in the primary sector and rural emigration in 2000. (Source: our elaboration on data www.insse.ro/cms/en TEMPO time series)

Spatial bivariate Moran's index analysis in 2000 considering the variables GDP in the primary sector and rural depopulation has pointed out a positive spatial autocorrelation with statistic's value equal to 0.056 higher than $E[I]$ equal to -0.0244; hence, results in 2000 have been statistically significant (Fig. 9).

Focusing the attention on the assessing of spatial bivariate Moran's index analysis in 2007 considering in the model the variables GDP in the primary sector and rural depopulation findings have pointed out a negative spatial autocorrelation with statistic's value equal to -0.119 higher than $E[I]$ equal to -0.0244; hence, results in 2007 have been statistically significant (Fig. 10).

Spatial bivariate Moran's index analysis in 2013 considering the variables Gross Domestic Product in the primary sector and rural depopulation has pointed out a positive spatial autocorrelation with statistic's value equal to 0.062 higher than $E[I]$ equal to -0.0244; hence, results in 2013 have been statistically significant (Fig. 11).

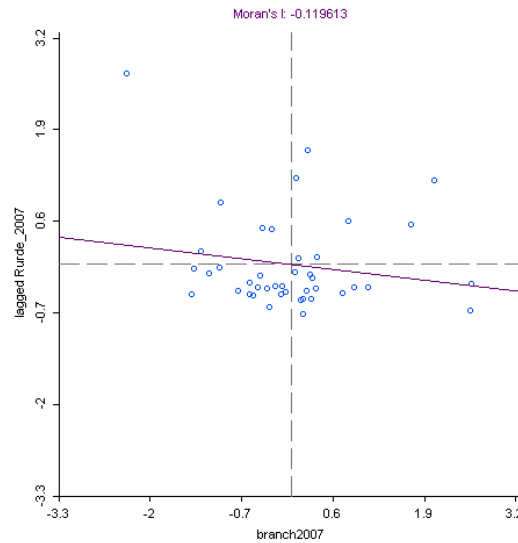


Fig 10- Spatial autocorrelation in the variable GDP in the primary sector and rural migration in 2007. (Source: our elaboration on data www.insse.ro/cms/en TEMPO time series)

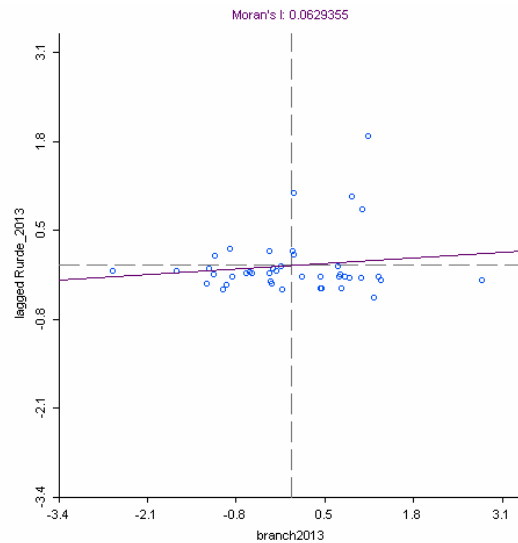


Fig 11- Spatial autocorrelation in the variable GDP in the primary sector and rural out migration in 2013. (Source: our elaboration on data www.insse.ro/cms/en TEMPO time series)

Spatial bivariate Moran's index analysis in 2000 considering the variables GDP in the primary sector and the total Gross Domestic Product in Romanian counties has pointed out a positive spatial autocorrelation with statistic's value equal to 0.082 higher than $E[I]$ equal to -0.0244; hence, results in 2000 have been statistically significant (Fig. 12).

Spatial bivariate Moran's index analysis in 2007 considering the variables GDP produced in the primary sector and the total Gross Domestic Product in Romanian counties

has pointed out a positive spatial autocorrelation with statistic's value equal to 0.0758 higher than $E[I]$ equal to -0.0244; hence, results in 2007 have been statistically significant (Fig. 13). Spatial bivariate Moran's index analysis in 2013 considering the variables GDP in the primary sector and the total Gross Domestic Product in Romanian counties has highlighted a negative spatial autocorrelation with statistic's value equal to -0.044 higher than $E[I]$ equal to -0.0244; hence, main results in 2013 have been statistically significant (Fig. 14).

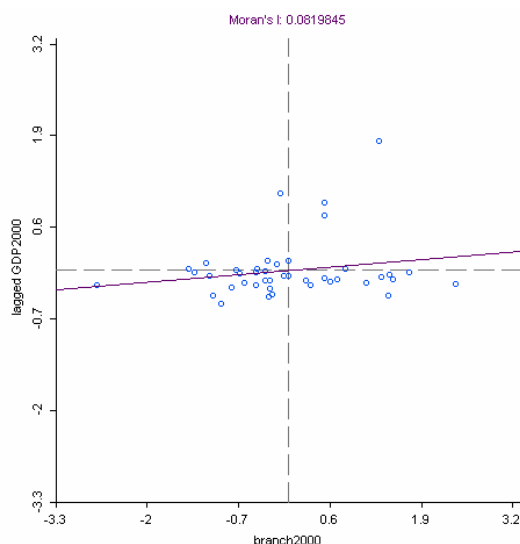


Fig 12- Spatial autocorrelation in the variable GDP in the primary sector and GDP in Romanian counties in 2000. (Source: our elaboration on data www.insse.ro/cms/en TEMPO time series)

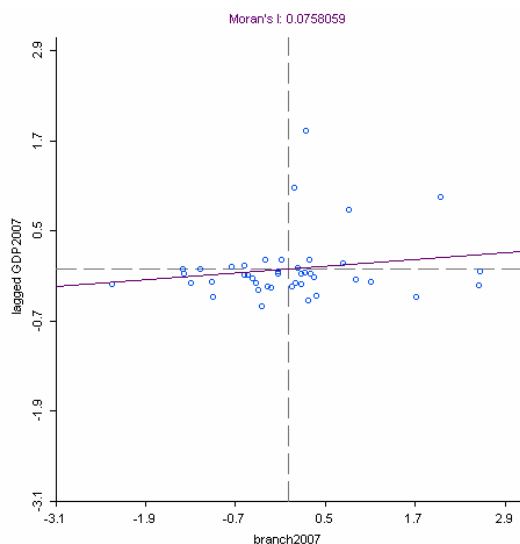


Fig 13- Spatial autocorrelation in the variable GDP in the primary sector and GDP in Romanian counties in 2007. (Source: our elaboration on data www.insse.ro/cms/en TEMPO time series)

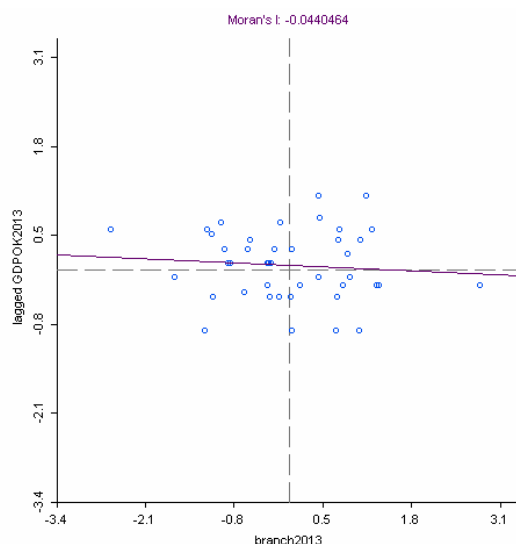


Fig 14- Spatial autocorrelation in the variable GDP in the primary sector and GDP in Romanian counties in 2013. (*Source: our elaboration on data www.insse.ro/cms/en TEMPO time series*)

5. Conclusions and final remarks

The Moran's index has been an useful method in order to estimate the evolution and the main correlations among GDP, Gross Domestic Product in the primary sector and the variable rural depopulation in Romanian countryside. Findings have pointed out a drop in emigration from the countryside as a consequence of improvement in socio-economic conditions due to financial supports allocated by the European Union. For the future, Romanian farms are developing a predominant role in the supply chain even if lots of ag-commodities are addressed predominately to the domestic market and local consumption. Summing up, financial aids and measures towards rural development financed by the Common Agricultural Policy have to implement an agricultural and rural diversification in the countryside even if more than 90% of Romanian farms are characterized by poor size in terms of agricultural areas; hence, the National Rural Development Plan should implement actions aimed at promoting diversification and an implementation of technical and economic efficiency in Romanian farms.

References

- Anselin, L. and Rey S. (1991). Properties of tests for spatial dependence in linear regression models. *Geographical Analysis*, **23**, 112–131.
- Benedek, J. (2015). Spatial differentiation and core-periphery structures in Romania. *Eastern Journal of European Studies*, **6(1)**: 49-61.
- Bouayad-Agha, S., Turpin, N., and Védrine, L. (2013). Fostering the development of European regions: a spatial dynamic panel data analysis of the impact of cohesion policy. *Regional Studies*, **47(9)**, 1573-1593.
- Chilian, M.N., Simionescu, M., and Iordan, M., (2014). Determinants Of Regional Competitiveness In Romania-A Panel Data Approach. *Management Strategies Journal*, **26(4)**, 13-20.
- Chiritescu, V. (2011). Sustainable Rural Development in Romania-Needs and Priority Objectives. *Agricultural Economics and Rural Development*, **1(1)**, 147-160.

- Festuccia, A. (2013). Italia e Romania la metà delle aziende agricole UE, *Pianeta PSR*, 17., viewed 30 March 2016, <http://www.pianetapsr.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/764>.
- Galluzzo N. (2014). The evolution of Italian farms and the role of subsidies paid by the European Union for rural development. *Romanian Review of Regional Studies*, **10(1)**, 79-88.
- Giurca D (2008). Semi-Subsistence Farming–Prospects for the Small Romanian Farmer to Choose between a “Way of Living” or Efficiency. *Agricultural Economics and Rural Development*, **5(3-4)**, 215-230.
- Jordan P. (2009). Development of rural space in post-communist southeast Europe after 1989: A comparative analysis. *Revija Za Geografijo*, **4**: 89-102.
- Kostov P. and Lingard J. (2002). Subsistence farming in transitional economies: lessons from Bulgaria. *Journal of Rural Studies*, **18(1)**: 83-94.
- Lincaru, C., Ciucă, V., and Atanasiu, D. (2014). The tendency identification of overall clustering of registered unemployment at territorial administrative unit level-UAT2 in Romania, article presented at Conference “Conferința Internațională Perspective Europene Ale Pieței Muncii Inovare, Competențe, Performanță”, organized by: Institute For Economic Forecasting-Ipe in network INCE-Institutul National de Cercetări Economice “Costin C.
- Mare, C., and Pop, L.N. (2011). Patterns of price convergence in Romania and the European Union. *Revista economica*, **5(2)**: 433-441.
- Moran, P.A.P. (1950). Notes on Continuous Stochastic Phenomena. *Biometrika*, **37**, 17–33.
- Pauna, C.B., Iordan, M., and Chilian, M.N. (2015). Competitiveness And Innovation In The Romanian Regions–How Much Progress During The Post-Accession Period?. *The USV Annals of Economics and Public Administration*, **15[1(21)]**, 133-141.
- Zhu X., Lansink A.O. (2010). Impact of CAP Subsidies on Technical Efficiency of Crop Farms in Germany, the Netherlands and Sweden. *Journal of Agricultural Economics*, **61**: 545-564.