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# A QUANTITATIVE ASSESSMENT OF THE RURALITY AND AN EFFICIENCY ANALYSIS OF EMIGRATION IN ROMANIA

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**Abstract:** In Romania, as in many other Eastern European countries, the early 1990s were marked by a significant emigration from the countryside as a consequence of the transition from a centralised economy to an open one and due to key changes in the political framework. The permanent emigration has predominantly been concentrated in rural areas where multiple socio-economic variables such as GDP per capita, unemployment, and public financial subsidies aimed at supporting people at risk of severe deprivation and poverty have all had a direct effect on rural depopulation. The rurality is a complex theoretical construct comprising many items and variables and is, therefore, difficult to define in a concise manner. The aim of this paper is to assess the evolution of emigration in Romania between 2001 and 2016 through a quantitative approach, estimating an index of rurality for the same period composed of a set of socio-economic variables having a direct or indirect nexus to it. In the first phase of research, a matrix of correlation and a multiple regression model has been used in order to estimate the direct links among all investigated variables. Following the quantitative methodology, in the second phase Partial Least Square Structural Equation Modelling (PLS-SEM) has been used in order to assess the main cause-effect relationships among a few selected endogenous variables and a set of socio-economic items. Furthermore, using a non-parametric Data Envelopment Analysis (DEA) output-oriented model, this research has assessed the efficiency in terms of permanent emigration from Romania estimated as an output to minimise and not as an output to maximise, as investigated by traditional efficiency approaches. In terms of efficiency, financial subsidies allocated by national authorities and the level of per capita Gross Domestic Product have acted directly on the level of emigration. The index of rurality in 2016 has been influenced in particular by the pluriactivity in farms in terms of agritourism, the dimension of farms in terms of land capital endowment, and the level of GDP per capita.

**Keywords:** Partial Least Square Structural Equation Modelling, Agritourism, Data Envelopment Analysis, Rural Areas.  
(JEL Classification: Q10; Q18)

## INTRODUCTION

Following the collapse of the Soviet bloc, many formerly communist states that, since the first and second enlargements in 2004 and 2007 respectively, now belong to the European Union, suffered from significant outward emigration, predominantly from rural territories characterised by great socio-economic unbalances compared to urban areas (GALLUZZO, 2016a; 2016b; 2016c). The flow of emigration from Romania to other countries has largely been oriented along an East-West axis, rather than a South-North one, or vice versa, as occurred in other European countries such as Italy in the last century, with a notable incidence of whole family groups involved in the emigration phenomenon (BRADATAN, 2014). Focusing analysis on the destination countries, the greatest flows of emigrants have

been to Italy, Spain, Germany, and other close neighbours. The permanent emigration has affected Romanian regions differently, and has particularly affected rural areas where the level of infrastructure serving the villages is very low and where there are many scattered farms with poor land capital endowment. These farms are largely categorised as semi-subsistence or subsistence according to the system of classification proposed by the European Union, and most aren't able to produce a level of farm income above 1 ESU (European size-unit), which is an economic measurement of the size of farms equating to 0.1,200 (GALLUZZO, 2017a; 2017c; 2016a; 2016b; HUBBARD et al. 2014; BURJA, 2011; GIURCA, 2008). According to these authors, semi-subsistence or subsistence farms are predominately only able to satisfy their own contingent needs and are not market oriented.

Completely different is the issue of temporary emigration,

which is sensitive to various parameters such as the context, the village of origin, and other socio-economic variables and expectations that are able to drive the emigration, even if scholars have found that the recent increase specifically in female emigration has notably been met with public strategies tailored to the social protection of several Romanian rural territories (SANDU, 2005a; 2005b; 2007; PIPERNO, 2012). In general, comparing different Romanian NUTS II counties, the district of Bucharest-Ilfov emerges as having suffered less socio-economic marginalisation and territorial disparities than Eastern and Southern regions (SURD et al., 2011). This implies a different impact of the financial supports allocated by the European Union before and after the enlargement in 2007, corroborating the hypothesis according to which the poorer a rural area is, the more modest its development will be (GALLUZZO, 2017a; 2017b; 2018a; 2018b; SURD et al., 2011). Therefore, the focus of the National Rural Development Plan on stimulating measures of diversification in farming through agritourism, rural tourism, and the EU's LEADER initiatives, which is financed under the second pillar of the Common Agricultural Policy, represents a good opportunity for rural areas to reduce the socio-economic marginalisation suffered in many deprived contexts, even if the level of GDP per capita remains one of the most significant factors in the mitigation of socio-economic disparities and improving the environmental protection and sustainability of rural territories (BURJA & BURJA, 2014; GALLUZZO, 2017a; 2017c; IORIO & CORSALE, 2010; ABRHAM, 2011).

In a perspective of the convergence of socio-economic development, Romanian rural areas have completely changed their development targets in an effort to reduce territorial disparities and inefficiency which are more pronounced within Romanian counties and regions, particularly rural ones, than in other new EU member states which joined in the enlargement of 2004 and which, in contrast, have seen a growth in their average GDP (ABRHAM, 2011; LEFTER & CONSTANTIN, 2009). According to these latter scholars, the level of GDP per capita has corroborated its own role in the economic growth of Romanian rural areas and in reducing the permanent emigration from the countryside.

The key purpose of this research was to assess through a quantitative approach which socio-economic variables have had the biggest effect on the permanent emigration from Romanian regions. Furthermore, using a quantitative methodology, direct correlations have been estimated among certain socio-economic variables such as GDP in the primary sector, social protection subsidies, dimensions of agricultural areas, rate of unemployment, expenses in research, total subsidies allocated by public administrations for social support, population growth, the spread of agritourism, life expectancy, and permanent emigration from Romania. The investigation was focussed on the period from 2001 to 2016, and has utilised data taken from the TEMPO time series dataset published by the Romanian National Institute of Statistics on its own website.

There were two main questions of the study. Firstly, have socio-economic variables and public policies aimed at

mitigating socio-economic marginalisation influenced the phenomenon of permanent emigration in Romania? Secondly, is it possible to estimate an index of rurality using three endogenous variables such as social, income, and welfare factors? The last phase of this research has also assessed the output inefficiency in Romanian counties in terms of permanent emigration in order to evaluate which inputs have been fundamental in reducing it (GALLUZZO, 2018d).

## THEORETICAL BACKGROUND AND HYPOTHESES

The literature review has highlighted many quantitative studies that have assessed the impact of financial subsidies to Romanian farmers (GALLUZZO, 2016a; 2016b; 2018b; 2018c); in the framework of multivariate analysis, some scholars have defined a quantitative estimator able to evaluate the rurality by investigating in depth how public supports allocated under the Common Agricultural Policy have acted in the framework of multifunctionality (GALLUZZO, 2018b; FINCO et al., 2005). In contrast, it is not so common to find the use of a quantitative approach based on the PLS-SEM in studies carried out in the primary sector aimed at estimating the rurality and identifying which items have acted on the rurality construct.

From the literature, it is not easy to propose a unique and holistic theoretical definition of rurality (CLOKE, 2006; WOODS, 2010), even if several researchers have investigated the rurality and a specific index directly correlated to it in depth using a quantitative approach (KENDALL, 1975; CLOKE, 1977; CLOKE & EDWARDS, 1986; PRIETO-LARA & OCAÑA-RIOLA, 2010; OCAÑA-RIOLA & SÁNCHEZ-CANTALEJO, 2005), due to specific research targets that in some cases have not been able to capture the direct or indirect correlations among variables and the cause-effect relationships (CLOKE, 1977; CLOKE & EDWARDS, 1986; PRIETO-LARA & OCAÑA-RIOLA, 2010; OCAÑA-RIOLA & SÁNCHEZ-CANTALEJO, 2005).

## METHODOLOGY

The core objective of this research was to assess which socio-economic variables acted on the permanent emigration from Romania from 2001 to 2017, with the aim, also, of defining an index of rurality on the basis of different items directly or indirectly correlated to the rurality. The last part of this research has assessed the minimisation of output, made by the permanent emigration in a non-parametric output-oriented efficiency approach, which runs contrary to other studies whose aim is to maximise the output (GALLUZZO, 2018d).

In order to assess the main correlations and relationships between emigration and certain socio-economic and agricultural variables, a multiple regression model has been used in the first phase of quantitative assessment, and, with the aim of estimating the index of rurality and cause-effect relationships among items and endogenous variables, Partial Least Square Structural Equation Modelling (PLS-SEM) has been used in the second phase.

The assessment of regressors in the multiple regression model is represented in algebraic form (VERBEEK, 2006) as:

$$Y = X\beta + \epsilon_i \quad (1)$$

where  $i = 1, \dots, n$ ,  $Y$  is the dependent variable and  $\epsilon$  is the statistical error (VERBEEK, 2006; ASTERIOU & HALL, 2011; BALTAGI, 2011). In the expression above, in the multiple regression model  $Y$  and  $\epsilon_i$  are vectors with  $n$ -dimensional,  $X$  is a matrix of independent variables with a dimension  $n \times k$  and  $\beta$  is a set of estimated parameters able to explain their own impact on the emigration in Romanian counties from 2001 to 2016 (VERBEEK, 2006; ASTERIOU & HALL, 2011; BALTAGI, 2011). The estimation of all parameters in the multiple regression model has been made using the GRETL opensource software. In the multiple regression model, the basic assumptions were (VERBEEK, 2006; GALLUZZO, 2017a; 2017b): the statistical error  $\epsilon_i$  has null conditional mean given  $X_i$ , that is  $E(\epsilon_i | X_i) = 0$ ;  $(X_i, Y_i)$ ,  $i = 1, \dots, n$  are extracted independently and identically distributed (i.i.d.) from their joined distribution;  $(X_i, \epsilon_i)$  have finite fourth moments which are not zero.

In this paper, the weighted least squares (WLS) approach has been used in the multiple regression model on account of a non-equal variance among variables assessed in the multiple regression approach; hence, a more efficient estimator has been obtained by a down weighting of the squared residuals in all observations which have pointed out large variances (KOENKAR & BASSET, 1982; GREENE, 1993).

In the second stage of the analysis, the assessment of the cause-effect model in a pattern of rural development growth has utilised Structural Equation Modelling (SEM) modified following some specifications proposed in the Partial Last Square Structural Equation Modelling (PLS-SEM) which fits well to the features of the analysis and its own purpose (GALLUZZO, 2018c; HAIR et al., 2016). In fact, the non-parametric PLS-SEM model is based on several non-restrictive underlying assumptions, is suitable for estimating a modest sample size of farms, and, moreover, there are no exact and a priori model specifications in the estimated model (HULLAND, 1999; HAIR et al., 2016; AWANG et al., 2015). Considering the limited number of socio-economic variables being assessed in a small sample of data, as is the context of this research, the Partial Last Square Structural Equation Modelling fits well to the predictive purpose investigated in this paper (VINZI et al., 2010; HAIR et al., 2016). This research has used the Smart-PLS version 3.2.7 software under student licence (RINGLE et al., 2005).

The Structural Equation Modelling describes the causality among latent variables through

an iterative methodology aimed at estimating the internal and external correlations and values in latent variables (HOYLE, 1995; HULLAND, 1999; HAIR et al., 2016; VINZI et al., 2010). According to these latter authors, the partial estimation has different blocks of variables which alternates simple regressions and multiple regressions. In the PLS-SEM, it is possible to estimate two different submodels: an inner model made up of certain interactions between the dependent and independent variables, and the outer model comprising various main relationships between latent variables and their factors or indicators (HOYLE, 1995; WONG, 2013; GALLUZZO, 2018c). As described in the theoretical approach, the Structural Equation Model variables in the model have been stratified into exogenous variables, which have path arrows pointing outwards, and endogenous variables, which have one or more arrows pointing towards them (HOYLE, 1995; HULLAND, 1999; HAIR et al., 2016; VINZI et al., 2010; WANG et al., 2015).

In order to estimate the efficiency in terms of minimising the produced output, being the permanent emigration, a non-parametric approach as proposed in the DEA (Data Envelopment Analysis) method has been used in an output-oriented model. The main purpose of the DEA is to assess a hypothetical function of production, with the distance from the frontier of this function being the index of inefficiency or efficiency (BIELIK & RAJCANIOVA, 2004).

For the purposes of this paper, in contrast to traditional literature, the higher the distance from the optimal function of efficiency, the lower will be the output, or rather the permanent emigration, with positive impacts on Romanian counties (GALLUZZO, 2018d). The efficiency has been estimated through a non-parametric model applied to specific assumptions of a variable return to scale (VRS) and of a constant return to scale (CRS) in an output-oriented model (FARRELL, 1957; BATTESE, 1992; COELLI, 1996) using DEAP 2.1 software.

*Table 1. Descriptive statistics in all investigated Romanian counties from 2001 to 2016. (ro/shop/?lang=en)*

Variable	Unit	Minimum	Maximum	Mean	Std. deviation
Emigrated people	n°.	15.00	6,043.00	308.49	490.26
Agricultural GDP	Millions of lei	14,803.00	22,864,356.00	3,451,868.43	3,924,931.01
GDP per capita	lei	1,006.00	178,659.00	10,805.50	17,801.16
Social protection financial supports	Millions of lei	58,049.00	293,956,285.00	32,855,187.97	34,489,287.32
Agricultural area	ha	3,052.00	702,262.00	349,791,12.00	121770,564.00
Unemployed people	n°.	1,962.00	36,921.00	12,939.52	6,528.17
Expenses in research	Millions of lei	0.00	4,645,678.00	86,304.42	313,948.41
Public subsidies	Millions of lei	7.00	1,004,465.00	30,053.87	79,885.49
Population growth	n°.	-7,289.00	2,740.00	-1,099.64	1,212.52
Agritourism	n°.	0.00	352.00	31.52	50.82
Life expectancy	Years	67	78	73.089	1.906

*Source: author's own elaboration on data from the TEMPO timeline series available on the website <http://statistici.insse.ro/>.*

## RESULTS AND DISCUSSION

Main descriptive statistics in 672 observations reveal that more than 300 people have permanently emigrated every year from each Romanian county and over the same period there has been a significant drop in population growth (Tab. 1). On the other side, agriculture and the financial supports allocated under national and local authorities aimed at social protection have both had a notable impact in mitigating the overall incidence of outward emigration.

*Table 2. Main correlations among all investigated variables. In bold value with a significance at 1%*

	Emigrated people	Agricultural GDP	GDP per capita	Social protection financial supports	Agricultural area	Unemployed people	Expenses in research	Public subsidies	Population growth	Agritourism	Life expectancy
Emigrated people	1	-0.083	0.814	0.460	-0.216	0.207	0.521	0.125	-0.075	0.053	0.319
Agricultural GDP	<b>-0.083</b>	1	-0.215	-0.483	0.223	0.269	-0.022	0.615	-0.003	-0.145	-0.531
GDP per capita	0.814	-0.215	1	0.613	-0.282	0.173	0.509	-0.044	-0.093	0.039	0.447
Social protection financial supports	0.460	-0.483	0.613	1	-0.170	0.212	0.134	-0.351	-0.043	0.148	0.486
Agricultural area	-0.216	0.223	-0.282	-0.170	1	0.069	-0.368	-0.064	-0.142	-0.099	-0.167
Unemployed people	0.207	0.269	0.173	0.212	0.069	1	0.211	0.265	-0.188	0.006	-0.067
Expenses in research	0.521	-0.022	0.509	0.134	-0.368	0.211	1	0.562	-0.227	-0.042	0.125
Public subsidies	0.125	0.615	-0.044	-0.351	-0.064	0.265	0.562	1	-0.157	-0.097	-0.354
Population growth	-0.075	-0.003	-0.093	-0.043	-0.142	-0.188	-0.227	-0.157	1	0.226	0.016
Agritourism	0.053	-0.145	0.039	0.148	-0.099	0.006	-0.042	-0.097	0.226	1	0.322
Life expectancy	0.319	-0.531	0.447	0.486	-0.167	-0.067	0.125	-0.354	0.016	0.322	1

*Source: author's own elaboration on data from the TEMPO timeline series available on the website <http://statistici.insse.ro/shop/?lang=en>*

Research outcomes in the matrix of correlation have underlined a direct link between the variables emigrated people and GDP per capita, social protection financial supports, unemployed people, expenses in research, total subsidies allocated by the local and national authorities, and life expectancy (Tab. 2). In contrast, an indirect link has been found between the variable emigrated people and the variables population growth, and agricultural areas. As such, it can be said that in Romanian counties where emigration is higher, population growth is lower. In general, findings have fitted into the framework in which emigration is a phenomenon of counties characterised by modest land capital endowments, which condition drives people to leave subsistence farms in search of better standards of living.

Weak and indirect correlations have been found among the variable agritourism and the variables GDP in the primary sector, agricultural areas, and public subsidies allocated by national and local authorities.

Findings in the multiple regression model assessed by the weighted least squares (WLS) method, which has been fundamental in reducing the issues of heteroscedasticity in

the dataset, reveal that emigration is directly correlated to the independent variables subsidies allocated by national authorities in favour of social protection. Emigration correlates directly to the variables agricultural area, unemployed people, life expectancy, and agritourism in Romanian rural areas (Tab. 3). In contrast, gross domestic product in the primary sector does not have any effect on the dependent variable permanent emigration from Romanian counties. The value of R2 and adjusted R2 are equal to 0.77 hence, an increase of variables in the model has not implied significant changes in the variance explained by the multiple regression model.

*Table 3. Main results in the multiple regression model. Dependent variable emigration*

Variables	Coefficient	St. error	T value
Constant	-649.25	294.17	-2.207**
GDP primary sector	-2.95 e-06	2.76e-06	-1.06
Social protection subsidies	-1.06 e-06	3.17 e-07	-3.35 ***
Agricultural areas	0.00036	6.03 e-05	5.98***
Unemployed people	0.00211	0.00091	2.33**
Research expenses	0.00011	3.36 e-05	3.41***
Total subsidies for social support	0.00063	0.00016	4.03***
Population growth	0.026	0.0051	5.091***
Agritourism	0.27	0.13	2.082**
Life expectancy	8.16	4.01	2.03**

\*\* means significance at 1-5%; \*\*\* significance at 1%

*Source: author's own elaboration on data from the TEMPO timeline series available on the website <http://statistici.insse.ro/shop/?lang=en>*

Table 4 presents the different endogenous variables estimated in the Partial-Least-Square Structural Equation Modelling in all Romanian counties for two different years of study, namely 2001 and 2016, using the data published in the TEMPO dataset of the Romanian Institute of Statistics (INSSE).

Research findings in a preliminary assessment of the index of rurality in 2001 highlight that the latent variable income acted directly on the endogenous variable index of rurality, even if the items agricultural areas and the item number of agritourisms had greater impacts. This implies that on-farm activities and the diversification stimulated by financial subsidies allocated by the EU under the second pillar of CAP or under the LEADER initiative have influenced the rurality index (Fig. 1).

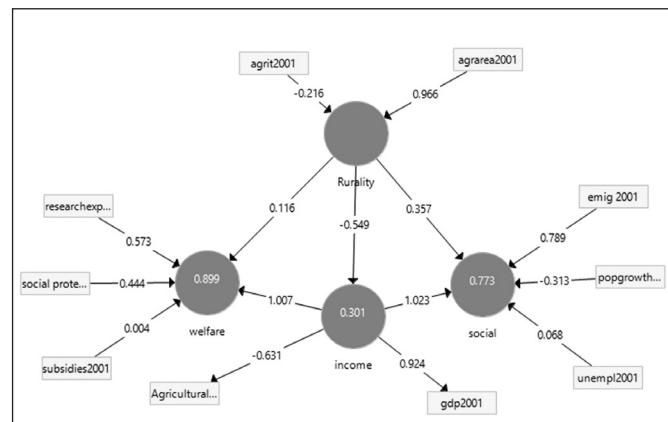
**Table 4- Endogenous variables and items investigated in PLS-SEM approach in all Romanian counties**

Endogenous variable	Items 2001	Items 2016	Description
Rurality	Agrit2001	Agrit2016	Romanian farms specialised in agritourism
	Agrarea2001	Agrarea2016	Land capital in terms of usable agricultural areas
Welfare	Resercherexp	Resercherexp	Public funds for research in Romania
	Socialprote	Socialprote	Financial subsidies allocated to supporting social protection and people at risk of social exclusion
	Subsidies2001	Subsidies2016	Total subsidies allocated by public authorities
Income	GDP2001	GDP2016	Gross Domestic Product produced by all Romanian counties
	Agricultural	Agricultural	GPD produced by the primary sector
Social	Emig2001	Emig2016	Permanent emigrated people from Romania
	Popgrowth	Popgrowth	Increase of people in each year of study
	Unempl2001	Unempl2016	People without any job

In regards to the endogenous variable social, there was a direct and significant impact from the variable emigrated people from Romania in 2001. Furthermore, the item GDP had a direct and important impact on the endogenous variable income, and GDP produced by the agricultural sector had a negative impact on the endogenous variable income. Investigating the different latent variables in depth, findings reveal that the items permanent emigration and population

growth have acted partially on the index of rurality. The values of R2 in the latent variables social and welfare were above 0.75 meaning that more than 75% of the variance is explained by the construct in the model.

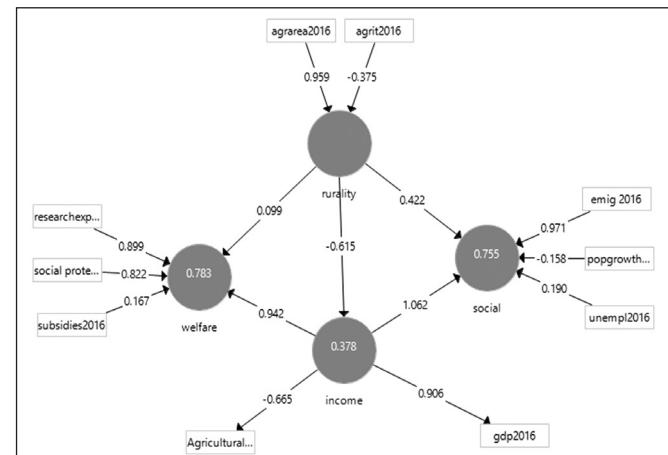
**Figure 1- Main results of the rurality index in 2001 in all Romanian counties.**



Source: author's own elaboration on data from the TEMPO timeline series available on the website <http://statistici.insse.ro/shop/?lang=en>

Focussing attention on the year 2016, findings reveal that an increase in agritourisms has had a significant relationship on the index of rurality (Fig. 2), and financial subsidies allocated by the Romanian public authorities for social protection and for research have had meaningful correlations to the latent variable welfare. In general, the financial subsidies allocated under the Common Agricultural Policy have played a positive role in the growth of agritourism in Romania, with positive impacts on the index of rurality. In both PLS-SEM models assessed in 2001 and in 2016, with the sole exception of the latent variable income, the level of R2 in the endogenous variables social and welfare exceeded 0.70 meaning that over 70% of the variance in both endogenous variables is explained by the investigated items.

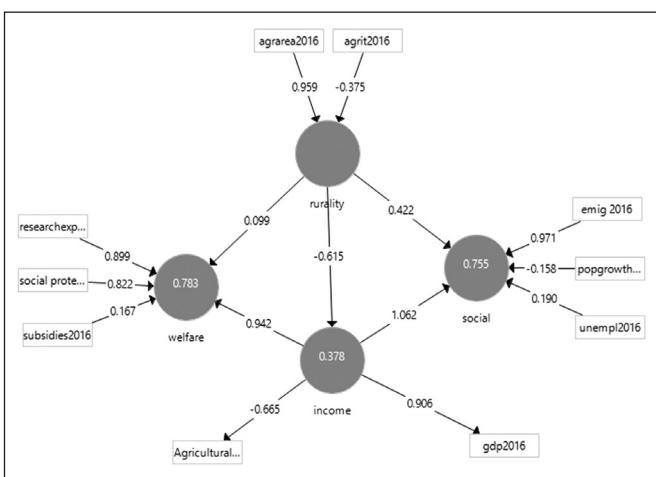
**Figure 2- Main results of the rurality index in 2016 in all Romanian counties.**



Source: author's own elaboration on data from the TEMPO timeline series available on the website <http://statistici.insse.ro/shop/?lang=en>

The findings in the efficiency analysis of the DEA output oriented model intended to estimate the efficiency in constant and variable returns to scale and also considering technical efficiency show an increase in the level of the output, that is the level of emigration over the period of investigation (Fig. 3), which implies a sharp growth of emigration, particularly following the economic crises and the recession through the years 2008-2016. Focusing in depth on the different level of emigration in all Romanian counties, the research outcomes reveal differing scenarios. In fact, Romanian counties in the south where the GDP per capita is lower have suffered the highest level of emigration, and consequently the highest level of inefficiency.

*Figure 3- Main results in the DEA analysis of efficiency output oriented model. CRTS, VRTS, and TE signify constant return to scale, variable return to scale, and technical efficiency, respectively.*



Source: author's own elaboration on data from the TEMPO timeline series available on the website <http://statistici.insse.ro/shop/?lang=en>

## CONCLUSION

The situation in Romanian rural areas highlights the continuing need to increase the level of infrastructure, and reveals the positive impact the growth in agritourism has had on the rurality index by improving living conditions in the Romanian countryside. In fact, the main consequence of improvements in infrastructure has been a significant drop in emigration, corroborating the role of local public administration and public financial support in mitigating socio-economic marginalisation in disadvantaged rural areas. This research has also corroborated the complexity of the variables forming a holistic definition of rurality through a quantitative approach; hence, it is essential to fine-tune actions in rural areas in function of the features and socio-economic bottlenecks which are typical of different rural territories.

To recapitulate, financial subsidies allocated under the Common Agricultural Policy and other initiatives of the European Union such as LEADER have, in the framework of rural development, been pivotal and irreplaceable in reducing the socio-economic marginalisation of rural areas and their own socio-economic divisions. In general, a low level of land capital endowment and of infrastructure are the

most significant factors in the socio-economic divide between rural and urban areas, and for the next seven-year period of the Rural Development Plan, 2021-2027, it is important to increase the amount of financial support allocated under the second pillar, rather than reduce it, as some new EU budget constraints seem to require. In the light of Brexit, it is important to focus the attention of stakeholders on a different allocation of financial subsidies allocated under the second pillar of the CAP to avoid reducing the total budget for rural development, since even a modest decrease in the level of public financial support available to rural areas will have a huge negative impact on the socio-economic development of rural territories. From this perspective, the European Union hopes that a direct engagement of local authorities in a bottom-up approach is able to ensure a cohesive and shared rural development continues; hence, it is important to stimulate local rural communities to exercise due diligence and seek sustainability in pursuing socio-economic growth.

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