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AN ANALYSIS OF KEY INDICATORS OF RURAL DEVELOPMENT IN SERBIA: A COMPARISON WITH EU COUNTRIES

ABSTRACT: *In accordance with the strategic aim of Serbia regarding European Union accession, harmonization with European Union rural development policy is an important issue for the creators of rural policy. Accordingly, the basic aim of this paper is to analyse the rural development level of Serbia in comparison to European Union countries, using multivariate statistical analysis. Factor analysis and cluster analysis are applied to extract three factors of rural development: the relative economic significance of rural areas, the general level of economic and agricultural development, and rural development. The results clearly show that Serbia has a lower level of rural development than European Union countries. Therefore defining adequate actions and mechanisms to achieve the policy aims of Serbian rural development is imperative.*

KEY WORDS: *Rural Development, Factor Analysis, Cluster Analysis, Serbia, EU.*

JEL CLASSIFICATION: R11, R12, C38, P25

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1. INTRODUCTION

Rural development is a multidimensional and complex process to transform rural areas. To systematically monitor rural development it is necessary to have clear definitions of the borders of the geographical areas to which the concept 'rural' is applied and of the specificities which determine the differences between rural and urban areas. Given that rural areas are often more economically backward than urban areas, economic revitalization of rural areas is a national development priority. Many authors, such as Huylenbroeck and Durand (2003), Potter (2004), Cairol et al. (2008), and Bednarikova (2015), have researched different aspects of rural development. The complexity of this process is also analysed as part of the EU's rural development policy. The aims of the second pillar of the Common Agriculture Policy (CAP) are increasing the competitiveness of the agricultural sector, enhancing the environment and countryside by supporting land management and enhancing the quality of rural life, and promoting economic diversity (European Commission 2008).

Individual countries are very different in terms of the economic, social, and ecological factors that determine the level of rural development. Ciutacu, Chivu, and Andrei (2015) demonstrate the difference between agriculture in Western Europe, where the development of the agricultural sector is based on private property, and agriculture in Eastern Europe, where agricultural development is based on collective ownership. Rossing et al. (2007) look at differences in the rural development models of France, Germany, and the Netherlands, as the dominant EU states.

As a candidate for EU membership, Serbia will have access to EU funds for agriculture and rural development through the Instrument for Pre-Accession in Rural Development (IPARD). Matkovski and Kleut (2014) emphasize the importance of IPARD funding and show that the primary aim of other EU candidate countries in using these resources is to invest in projects that increase competitiveness, whether in farms or in the processing and marketing of agri-food products. Bogdanov and Božić (2010) underline the comparative significance of rural areas and agriculture in the Serbian economy and communities, thus demonstrating the importance of the rural issue in Serbia. The position of the new member states that were formerly socialist countries presents a benchmark for Serbia, because they are undergoing a process which, to a lesser or a greater extent, Serbia will have to follow in the future. Zekić and Matkovski (2015) analyse rural areas of Serbia, and conclude that investment is necessary and would benefit both the rural population and society as a whole. This is the context

in which this research analyses the level of rural development in Serbia compared to EU countries.

The main objective of this paper is to determine the indicators of rural development. The Organization for Economic Cooperation and Development (OECD), the Food and Agriculture Organization (FAO), the European Commission (EC), and the World Trade Organization (WTO) have defined rural development indicators (UN 2007). In practice, the number and extent of the indicators used depends on available data. It is important to take into consideration if the indicators are defined at the national, regional, or local level. Hay (2002) emphasizes that EU rural development indicators do not always conform to the specified levels, which complicates comparative analysis between countries. The European Commission (2009) uses a Sustainable Development Indicator (SDI) pyramid consisting of three levels; the first level consists of indicators that are "robust and available for most of the EU member states" and concentrate on the key aims of EU rural policy. The FAO built on existing efforts to develop a universal framework, the Sustainability Assessment of Food and Agriculture systems (SAFA). It consists of 118 indicators developed through practitioner and expert analysis of the most critical components of each sub-theme: the economy, the environment, society, and governance (FAO 2017).

The focus of this paper is on general indicators of rural development at the national level in order to determine the development level of rural areas in the EU countries and Serbia. Multivariate statistical analysis is used to compare countries, i.e., cluster analysis and factor analysis. Factor analysis is the leading statistical technique in the natural and especially the social sciences. By analysing the correlation between a number of variables, factor analysis defines a set of common basic dimensions, known as factors. Many authors, such as Gorsuch (1997), Manly (2004), and Tabachnick and Fidell (2005) identify factor analysis as the methodological basis for data structure research. Cluster analysis is used for a more complete comparison and groups countries according to similarities in rural development indicators.

There are several studies of rural development that are based on the multivariate method and include data at the national, regional, and local level. Pierangeli, Henke, and Coronas (2008) use indicators that describe the following functions of rural development for the EU-25: production, landscape preservation, territorial preservation, diversification, the environment, and food safety and quality. Their results show the difference between Southern European and Northern European EU countries, and the new member states that were formerly socialist countries.

Deller et al. (2001) use factor analysis and cluster analysis to determine the benefits of rural tourism and diversification. Their four obtained factors point to the sociological, cultural, and environmental dimensions of rural areas. Hossain, Begum, and Papadopoulou (2015) use seventeen significant rural development indicators which define five factors that explain 82.41% of variation: rural market development, accessibility, community development, land resources, and relative location. This research also emphasizes the significance of rural development multidimensionality, i.e., an integrated approach when choosing variables. Madu (2007) relies on sixteen significant indicators of rural development, whereby four factors are identified. The factor scores are used to compare local communities in the observed region as a starting point for defining their rural development. Bogdanov, Meredith, and Efstratoglou (2008) use multivariate methods to classify Serbian rural municipalities according to the following indicators: demography, geography, economy, employment-related, human capital, agriculture, tourism, and infrastructure, which explain 78% of the variation. The importance of this classification is that it is able to define problems in each type of rural area in order to implement appropriate measures.

This paper is divided into four sections. After the introduction, the second part presents the methodological basis of the research, giving a description of the multivariate methods used. The third part gives the research results, and the last part presents the conclusions based on the results.

2. MATERIAL AND METHODS

This paper uses multivariate statistical analyses: cluster analysis and factor analysis. The data comes from the Statistical Office of the European Communities (EUROSTAT), the Food and Agricultural Organisation statistical databases (FAOstat), the World Bank, and the national databases of Serbia (Statistical Office of the Republic of Serbia) and Croatia (Croatian Bureau of Statistics). The analysis is conducted in Statistica 12 software. The research covers the period 2008 to 2012. The observed units for comparative analysis are the EU-28[1] countries and Serbia, in order to compare Serbia and the EU countries. Twelve national-level indicators are chosen that are directly or indirectly linked to the level of rural development. Following the research discussed above, the variables are related to the general development of the country as well as to agricultural and rural development.

1 Although Croatia joined the EU in 2013, in this research it is analysed together with the other EU-27 member states.

Table 1. Selected indicators of rural development

Variable	Variable description
X_1:	Rural territory (% of total area)
X_2:	Rural population (% of total population)
X_3:	Rural GDP (% of total GDP)
X_4:	Rural employment (% of total employment)
X_5:	Agriculture (% of GDP)
X_6:	Average economic farm size
X_7:	Labour productivity in agriculture
X_8:	Farmers with other gainful activity (%)
X_9:	Adults with medium or high educational attainment in rural areas (%)
X_{10}:	GDP per capita
X_{11}:	Internet users (per 100 people)
X_{12}:	Environmental protection expenditure (EUR per capita)

Rural territory (X1), rural population (X2), rural GDP (Gross Domestic Products) (X3), and rural employment (X4) are indicators of the significance of rural areas in terms of their contribution to the overall economy, which has unavoidable consequences for rural development. As agriculture is the key economic activity in most rural areas, factors which illustrate its particularities are also included in the analysis: share of agriculture in GDP (X5), average economic farm size (X6), labour productivity in agriculture (X7), and farmers with other gainful activity (X8). As the overall development of the country has a crucial impact on rural development the following factors are included: GDP per capita (X10), internet users (per 100 people) (X11), and environmental protection expenditure (EUR per capita) (X12). Adults with medium or high educational attainment (X9) are included as a factor that indicates rural areas' socioeconomic vitality (Table 1).

Cluster analysis involves grouping observed units into classes so that similar units are placed in the same cluster. This paper uses a hierarchical method, resulting in a dendrogram that represents clusters in a tree diagram. This method is applied in order to group the EU countries and Serbia according to similarities in the chosen rural development indicators. For comparison with Serbia, old EU member states representing 'northern' and 'southern' models of EU agriculture and new EU member states that were former socialist countries are chosen from the 28 EU countries: Austria, Bulgaria, Croatia, Czech Republic, Denmark,

France, Germany, Hungary, Lithuania, Netherlands, Poland, Slovenia, Spain, United Kingdom.

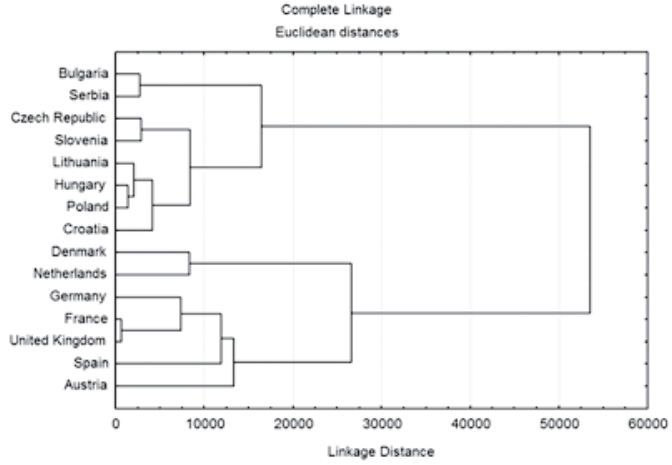
The primary objective is to determine the factors, which are obtained using principal component analysis, the most common extraction method (Er and Özçelik 2014). Eigenvalues are used to determine of the number of factors in the analysis: factors whose eigenvalues are greater than one are considered. After defining the basic factor analysis model it is necessary to rotate the factors in order to determine which variables with similar characteristics belong to which factor. The most frequently used factor rotation is Varimax, which attempts to minimize the number of variables that have high loadings on a factor (Comrey and Lee 1992). Factor rotation redefines and provides a better understanding of each factor. This paper uses Varimax with Kaiser normalization. The last step is to determine the factors' value for each observed unit, i.e., the factors' scores, to facilitate interpretation of the analysis results.

3. RESULTS AND DISCUSSION

3.1. The Application of Cluster Analysis

Cluster analysis clearly 'extracted' two dominant clusters from the selected indicators of rural development (Figure 1). The first consists of the old EU member states, which have a higher level of agricultural development and more economically vital rural areas. Within this cluster, Denmark and the Netherlands have a high level of development in both the agricultural sector and rural areas. In the second cluster are the new EU member states with a common socialist inheritance. Serbia and Bulgaria are in one sub-cluster, while the other countries of Central and Eastern Europe (CEE) are in another.

Figure 1. Cluster analysis of rural development in the EU and Serbia



Source: Authors' calculations

At this point, cluster analysis can give some indication of further results of the analysis. Regarding key factors of rural development, it is expected that Western European countries will differ from Central and Eastern European countries, and especially from the Balkan countries. As well as having a higher initial level of development, these countries have been EU member states for a long period of time, during which EU agricultural policy and, within it, rural development policy have significantly advanced economic vitality in rural areas. The CEE countries have been EU member states for more than a decade and have been able to access significant funds for regional and rural development and to develop agricultural infrastructure, thus advancing the level of rural development. Serbia is currently unable to access EU funds for agricultural and rural development, which means that its rural development is limited.

3.2. The Application of Factor Analysis

The first step in factor analysis is to determine eigenvalues, which represent a share of the total variance. Twelve eigenvalues are identified, but the first three together explain 82% of the variation. As seen in Table 2, there are three factors that have eigenvalues greater than one. Thus, we have obtained three factors in our study.

Table 2. Total variance and % of individual factors

	Eigenvalue	Total Variance (%)	Cumulative Eigenvalue	Cumulative (%)
1	6.706	55.887	6.706	55.887
2	2.035	16.960	8.742	72.847
3	1.085	9.038	9.826	81.885

Source: Authors' calculations

Table 3 shows a very clear classification of rural development indicators into three groups, i.e., three factors. The total variance for the three extracted factors is 81.88% and the value of the cumulative eigenvalues is 9.826.

Indicators which have similar characteristics and which are statistically significant for a particular factor are classified in the following way. The first factor has an eigenvalue of 6.706, which explains 55.89% of the total variance. It is determined by four indicators: rural territory (X_1), rural population (X_2), rural employment (X_4), and rural GDP (X_3). All these indicators have a positive value approximate to one and are significantly differentiated from other indicators for this factor. This group of indicators is an economically logical result, so the first factor represents the relative economic significance of rural areas in the EU countries and Serbia quite well. The share of rural territory, which directly influences the other three indicators, population, employment, and GDP, shows the total contribution of rural areas to a country's economy.

Table 3. Rotated factor loads

Indicator of rural development	Factor Loading		
	Factor 1	Factor 2	Factor 3
Rural territory (% of total areas)	**0.877***	-0.352	-0.126
Rural population (% of total population)	**0.889***	-0.358	0.152
Rural GDP (% of total GDP)	**0.951***	-0.248	0.089
Rural employment (% of total employment)	**0.917***	-0.354	0.098
Agriculture (% of GDP)	0.203	**-0.727***	-0.276
Average economic farm size	-0.347	**0.802***	-0.054
Labour productivity in agriculture	-0.439	**0.808***	-0.149
Farmers with other gainful activity (%)	0.235	0.084	**0.755***
Adults with medium or high educational attainment in rural areas (%)	-0.063	0.036	**0.851***
GDP per capita	-0.236	**0.823***	0.059
Internet users (per 100 people)	-0.152	**0.813***	0.395
Environmental protection expenditure (EUR per capita)	-0.444	**0.766***	-0.147

Source: Authors' calculations

Indicators sorted into the second factor, with eigenvalues of 2.035 and 26.96% of of the total variance, represent a country's economic and agricultural performance. The share of agriculture in GDP (X_5), GDP per capita (X_{10}), internet users (per 100 people) (X_{11}), and environmental protection expenditure (EUR per capita) (X_{12}) represent the level of economic development, while the factors average economic farm size (X_6) and labour productivity in agriculture (X_7) show agricultural development. In other words, the countries which have a smaller share of agriculture in GDP, larger average economic farm size and productivity in agriculture, higher level of GDP per capita, larger number of internet users, and larger environmental protection expenditure can be classified in the group of more developed countries with a higher level of agricultural development. The specified indicators have high values, clearly differentiated from the other indicators, and economically logically extracted into one factor.

Within the third factor, whose eigenvalues amount to 1.085 and which explain 9.04% of the total variance, only two indicators are extracted: farmers with other gainful activity (X_8) and adults with medium or high educational attainment in rural areas (X_9). Here, again, the listed indicators are extracted with relatively high values. This factor is the most difficult to define, since it is determined by only two indicators and one of them can be interpreted in two ways. The educational structure of rural areas certainly affects rural development; however, the share of farmers with other gainful activity is a problem. This can at the same time be an indicator of the economic power of farms that are capable of diversifying their activities, and an indicator of the poverty of a rural population that is forced to diversify its income through employment in other sectors. A complete analysis of this indicator means determining which model of diversification ('demand-pull' or 'distress-push') predominates in a particular country, which is beyond the scope of this research. Despite reservations, this factor can conditionally be named an indicator of the level of rural areas' development.

The last step in the factor analysis is to determine the factor scores for each country, shown in Table 4. Factor 1, which shows the relative significance of rural areas, is most important in Ireland, the Scandinavian countries, Croatia, Greece, and Portugal. All these countries have a significant share of rural areas in the total territory, a significant percentage of rural population, and GDP originating in rural areas. The smallest significance of this factor is in the highly urbanized countries of Great Britain and the Benelux member states. Serbia is in a relatively high position, indicating a relatively high level of rurality and the significance of rural areas in Serbian society and the Serbian economy.

Table 4. Countries according to factor scores of rural development

Factor Scores **Rotation: Varimax normalized**					
Factor 1		**Factor 2**		**Factor 3**	
Ireland	2.911	Denmark	2.207	Slovenia	1.835
Denmark	1.474	Netherlands	1.871	Sweden	1.765
Finland	1.015	Luxembourg	1.751	Czech R.	1.299
Croatia	0.846	Ireland	1.270	Germany	1.243
Greece	0.659	France	0.921	Slovakia	1.175
Portugal	0.645	Belgium	0.876	Estonia	0.933
Serbia	***0.605***	Finland	0.833	Poland	0.785
Austria	0.560	Austria	0.735	Latvia	0.767
Estonia	0.558	Sweden	0.648	Lithuania	0.567
Slovakia	0.537	Germany	0.464	U. Kingdom	0.544
Malta	0.496	U. Kingdom	0.337	Finland	0.463
Slovenia	0.404	Malta	0.246	Hungary	0.414
Hungary	0.361	Italy	-0.135	Austria	0.369
France	0.088	Portugal	-0.202	Ireland	0.118
Cyprus	0.067	Czech R.	-0.242	EU-28	0.049
Sweden	0.061	Slovenia	-0.261	Bulgaria	0.009
Lithuania	0.040	Spain	-0.268	Cyprus	0.005
Romania	-0.014	EU-28	-0.379	Denmark	-0.176
Czech R.	-0.290	Estonia	-0.414	Luxembourg	-0.400
Latvia	-0.314	Slovakia	-0.417	Romania	-0.418
Poland	-0.349	Cyprus	-0.442	France	-0.625
Bulgaria	-0.596	Greece	-0.460	Netherlands	-0.696
Italy	-0.727	Hungary	-0.610	Belgium	-0.742
EU-28	-0.833	Croatia	-0.726	Croatia	-1.005
Germany	-0.910	Lithuania	-0.822	Spain	-1.028
Spain	-0.977	Latvia	-1.008	Italy	-1.227
Belgium	-1.293	Poland	-1.053	Malta	-1.256
Luxembourg	-1.549	Romania	-1.481	Greece	-1.323
Netherlands	-1.696	***Serbia***	***-1.592***	***Serbia***	***-1.542***
U. Kingdom	-1.810	Bulgaria	-1.646	Portugal	-1.898

Source: The authors' calculations

Factor 2, which refers to general economic and agricultural development, is most significant in the most economically developed countries with highly developed agrarian sectors. Denmark, the Benelux countries, France, Ireland, Scandinavia, Austria, and Germany have a high level of GDP, high labour productivity in agriculture, economically larger farms, and so on. This factor is the least significant in the less-developed countries, which, except for Greece and Cyprus, are all former socialist countries from Central and Eastern Europe. Serbia is in the penultimate position, indicating a general economic and agricultural lag.

Unlike the first two factors, factor 3, which indicates the level of rural development, does not show the expected results to a large degree, at least when it comes to positioning countries. This is probably the result of problems in the indicators that determine this factor. Serbia is also in the penultimate place here, which is a relatively expected result. A high level of rurality, a relatively low level of economic development, and a relative lag in agricultural production hinder rural development in Serbia. Rural development is part of overall development and therefore a certain degree of cohesion with the second factor is inevitable.

4. CONCLUSION

A clear strategic commitment of Serbia to EU accession means large challenges for creators of economic policy. Joining implies a process of harmonization with the Union's *acquis communautaire*. Serbia is a country with a relatively high level of rurality, where agriculture occupies a significant position in the overall economy and even more so in the rural areas, where it is often the dominant activity for most of the population. Therefore the creation of an adequate rural policy that is harmonized with EU policy as much as possible is a priority task. For this it is necessary to identify the level of rural development compared to EU countries in order to provide a clearer picture of the situation and show the way forward. European integration is key to solving problems in agriculture and rural development in Serbia. Since some countries in the region, such as Croatia, which is similar to Serbia in the analysed indicators, have adopted the EU agricultural and rural development policy, Serbia should follow their path in order to create opportunities for rural development.

In order to analyse the level of Serbian rural development compared to EU countries, factor analysis with twelve indicators of rural development was carried out for both Serbia and the EU. The analysed indicators describe various aspects of the level of rural development and factor analysis extracted three

factors of rural development: the significance of rural areas, general economic and agricultural development, and rural development. This result shows the multidimensionality of rural development, which relies on a large number of interconnected processes. The level of economic development, connected to a large degree with the development of agriculture, is the key factor in increasing the quality of rural life. The possibility of employment outside agriculture is the direct consequence of total economic development, as the main generator of non-agricultural activities. The level of the significance of rural areas shows no clear implications for the level of rural development, although more urbanized countries also have rural areas that are more economically vital.

In comparison to the EU countries, rural areas are very significant in Serbia but have lower levels of economic and agricultural development. Consequently, it is imperative that Serbia's agricultural and rural policy is harmonized with the EU Common Agricultural Policy, acknowledging the specifics of a developing country with policies that develop the vitality of rural areas. This is possible by improving the infrastructure and general economic environment to allow alternative employment opportunities and diversification of income. In the future, one of the mechanisms to achieve these aims will be efficient use of IPA funds, i.e., the IPARD part of EU pre-accession aid to candidate countries. IPARD funds can be used to enable more efficient management of the supply chain through measures supporting rural development, i.e., through investment in the manufacturing industry. In addition, in contrast to EU practice, Serbia does not attach importance to the protection of the environment and these second-pillar measures have small budget support. Accordingly, the future course of action should include the integration of environmental policy in the agrarian policy and rural development of Serbia. This means that Serbia must establish the operational structures necessary for using these funds.

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