

EUROPE 2020 OBJECTIVES IN THE NEW EUROPEAN UNION MEMBER STATES

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Abstract

In spite of the general critics Europe 2020 is still current long term development strategy for the European Union countries, which affects policy objectives at national and regional level. As a result, there is a long term need for constant assessment of the European Union countries' abilities to reach its aims. With this respect the main objective of the article is to assess disparities between the "new" European Union members states with respect to reaching the aims of the European 2020 plan. In the research the method of taxonomic measure of development proposed by Hellwig and Ward's clustering method were applied. The research was done for the years 2010 and 2016 with application of the Eurostat data. Based on the applied methods it was possible to rank the analysed countries and group them into relatively homogenous subsets. The conducted research confirmed significant disparities between the analysed countries with respect to reaching the objectives of the Europe 2020 plan.

Key words: Europe 2020, taxonomic measure of development, Hellwig's method, Ward's method, new EU member states

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Introduction

Europe 2020 is still the most important long term development strategy for the European Union countries, which provides guidelines for policy objectives both at national and regional level. The reforms and especially investments financed with participation of the EU funds, which are still greatly needed in the case of the "new" member states of Central and Southern Europe, are significantly influenced by the aims given in the strategy. Thus, it can be stated that the Europe 2020 plan has an important influence on allocative efficiency of the European Union. Therefore, there is a long term need for constant assessment of the European Union countries' abilities to reach its aims.

Thus, the main objective of the article is to assess disparities between the “new” members states, which joined the European Union after the year 2004, with respect to reaching the aims of the European 2020 plan.

The defined scientific problem was considered as a multiple-criteria analysis task, where the method of taxonomic measure of development proposed by Hellwig and Ward’s clustering method were applied. The study was conducted for the year 2010 and 2016. In the research the Eurostat data were used.

1 Research methodology

1.1 Diagnostic variables

In order to operationalize the objective of building a smart, sustainable and inclusive growth European Commission has proposed the following headline targets, which should be measured with sixteen diagnostic variables provided by Eurostat (Balcerzak, 2015):

- a) 75 % of the population aged 20-64 should be employed.
- b) 3% of the EU's GDP should be invested in R&D.
- c) The "20/20/20" climate/energy targets should be met (including an increase to 30% of emissions reduction if the conditions are right).
- d) The share of early school leavers should be under 10% and at least 40% of the younger generation should have a tertiary degree.
- e) 20 million less people should be at risk of poverty.

The specific diagnostic variables, with their classification on stimulants and dis-stimulants are given in table 1. Thus, the problem of assessment the countries’ results in the process of reaching the proposed targets should be considered as a multiple-criteria analysis task.

The data for the diagnostic variables were obtained from the Eurostat database (<https://ec.europa.eu/eurostat/data/database>). In the first stage all the variables given in table 1 were normalized with classic standardization formula based on average value and standard deviation.

Tab. 1: The diagnostic variables for Europe 2020 objectives

Variable	Description	Unit	Character
Target 1. 75 % of the population aged 20-64 should be employed			
X _{1t}	Employment rate of females	% of the population aged group 20-64	Stimulant
X _{2t}	Employment rate of males	% of the population aged group 20-64	Stimulant
Target 2. 3% of the EU's GDP should be invested in R&D			
X _{3t}	Gross domestic expenditure on R&D	% of GDP	Stimulant
Target 3. The "20/20/20" climate/energy targets should be met (including an increase to 30% of emissions reduction if the conditions are right)			
X _{4t}	Greenhouse gas emissions	base year 1990. Index (1990 = 100)	Dis-stimulant
X _{5t}	Share of renewable energy in gross final energy consumption	Percentage	Stimulant
X _{6t}	Primary energy consumption per capita	Million tonnes of oil equivalent (TOE) per capita	Dis-stimulant
X _{7t}	Final energy consumption per capita	Million tonnes of oil equivalent (TOE) per capita	Dis-stimulant
X _{8t}	Greenhouse gas emissions in ESD sectors per capita	million tonnes CO2 equivalent per capita	Dis-stimulant
Target 4. The share of early school leavers should be under 10% and at least 40% of the younger generation should have a tertiary degree			
X _{9t}	Early leavers from education and training – females	% of the population aged 18-24 with at most lower secondary education and not in further education or training	Dis-stimulant
X _{10t}	Early leavers from education and training – males	% of the population aged 18-24 with at most lower secondary education and not in further education or training	Dis-stimulant
X _{11t}	Tertiary educational attainment – females	% of the population aged group 30-34;	Stimulant
X _{12t}	Tertiary educational attainment – males – age group 30-34;	% of the population aged group 30-34;	Stimulant
Target 5. 20 million less people should be at risk of poverty			
X _{13t}	People at risk of poverty or social exclusion	% of total population	Dis-stimulant
X _{14t}	People living in households with very low work intensity	% of total population	Dis-stimulant
X _{15t}	People at risk of poverty after social transfers	% of total population	Dis-stimulant
X _{16t}	Severely materially deprived people – percentage of total population	& of total population	Dis-stimulant

Source: own work based on Eurostat data.

1.2 Multiple-criteria analysis and grouping methodology

Current multiple-criteria analysis literature provides a great variety of methods for multiple-criteria and taxonomic research, which can be effectively used in comparative regional and international research (Pietrzak, 2017; Rogalska, 2018a; Markhaichuk & Zhuckovskaya, 2019; Gnat, 2019; Meluzín *et al.*, 2018a, 2018b).

In order to reach the objectives of current research taxonomic measure of development method proposed by Hellwig was applied. The main reason for choosing the method relates to its high elasticity, good recognition and methodological simplicity (Rogalska, 2018b; Pietrzak & Ziemkiewicz, 2018a; 2018b). These factors can be considered as crucial methodological advantages of the method, which are especially important in the case of multiple-criteria decision analysis.

The core of the method is a construction of the taxonomic measure of development (TMD), which is built as a distance from an abstract pattern of economic development (Miłek, 2018; Nowak, 2018; Piersiala, 2019). The pattern is assessed with application of formulas 1 and 2:

$$x_{0jt} = \max_{it} x_{ijt} \quad \text{for } j \in S, \quad i = 1, 2, \dots, n; \quad j = 1, 2, \dots, p; \quad t = 1, 2, \dots, l, \quad (1)$$

$$x_{0jt} = \min_{it} x_{ijt} \quad \text{for } j \in D, \quad i = 1, 2, \dots, n; \quad j = 1, 2, \dots, p; \quad t = 1, 2, \dots, l, \quad (2)$$

where:

S – a set of standardized stimulants;

D – a set of standardized dis-stimulants.

Then, the distance from the pattern of economic development can be obtained with application of the Euclidean distance given with equation 3.

$$d_{i0t} = \sqrt{\sum_{j=1}^p (x_{ijt} - x_{0jt})^2} \quad i = 1, 2, \dots, n; \quad j = 1, 2, \dots, p; \quad t = 1, 2, \dots, l. \quad (3)$$

Finally, the TMD is assessed with equation 4.

$$d_{it} = 1 - \frac{d_{i0t}}{d_{0t}} \quad i = 1, 2, \dots, n; \quad j = 1, 2, \dots, p; \quad t = 1, 2, \dots, l, \quad (4)$$

where $d_{0t} = \bar{d}_{0t} + 2s_{dt}$, and \bar{d}_{0t} , s_{dt} are given with formula (5).

$$\bar{d}_{0t} = \frac{1}{n} \sum_{i=1}^n d_{i0t}, \quad s_{dt} = \sqrt{\frac{1}{n} \sum_{i=1}^n (d_{i0t} - \bar{d}_{0t})^2} \quad i = 1, 2, \dots, n; \quad t = 1, 2, \dots, l. \quad (5)$$

The method enables to obtain rankings of the countries, which are ordered starting with the best performing economies to the worst ones.

In the second stage of the research the countries were compared with respect to their similarity to each other. For this purpose cluster analysis was used, which enabled to classify the countries into relatively homogeneous groups (clusters) based on a designated similarity between objects. The classification was carried out using the Ward's method, which is considered as one of the most applicable agglomeration methods in economics. The method is based on the analysis of variance, where clusters are determined on the basis of the criterion of minimizing the sum of squares of distances between objects. The classification enable to create a hierarchy of the analysed objects, where the criterion for object selection is the similarity previously assigned. The hierarchy is started by all objects that are combined into groups according to the accepted similarity criterion. In successive levels of the hierarchy, the objects are joined in increasing groups in terms of numbers. Combining of objects into groups is performed until there is only one group to which all objects belong (see Tatarczak & Boichuk, 2018; Szymańska, 2018, Miłek, 2018, Nowak, 2018).

2 Results

The main objective of the article was to assess the results obtained by the „new“ member states that joined the European Union after the year 2004. For this purpose the year 2010, which was the first year of the Europe 2020 implantation, and 2016 were analysed. The year 2016 was determined by the data availability for all the diagnostic variables given in table 1 (especially for the variables relating to Target 3 – the "20/20/20" climate/energy targets). The obtained rankings after application of Hellwig's method with fixed pattern for both analysed years are presented in table 2.

The dynamics of TMD values in the analysed years indicates that most of the analysed countries were able to improve their results. In the case of seven countries: Poland, Slovakia, Hungary, Czechia, Latvia and Malta one could see higher level of TMD in the year 2016 than in the first year of the Europe 2020 strategy implementation. That result indicates the diminishing distance of that group to the obtained abstract pattern of development. Only four countries: Estonia, Croatia, Bulgaria and Romania obtained lower values of TMD in the second year, which indicates that the countries were not able to implement the objectives of the strategy with the same speed as the first group – significantly lower value of TMD as in

the case of Croatia, Bulgaria and Romania, or a minor drop of TMD value as it was in the case of Estonia that in the year 2010 was a second country in the ranking, and lost its position to the third place in the year 2016.

In the analysed years the biggest improvement was obtained by Poland that was able not only to increase the value of its TMD, but also moved in the ranking from the fifth position in the year 2010 to second place in the year 2016.

Tab. 2: Ranking of the countries with respect to Europe 2020 objectives in the years 2010 and 2016

No	2010		2016	
	Country	TMD	Country	TMD
1	Lithuania	0.31673	Lithuania	0.3481
2	Estonia	0.31007	Poland	0.3055
3	Slovenia	0.30995	Estonia	0.2970
4	Cyprus	0.30816	Slovakia	0.2794
5	Poland	0.27940	Latvia	0.2694
6	Slovakia	0.22631	Hungary	0.2653
7	Hungary	0.20516	Slovenia	0.2532
8	Czechia	0.18183	Czechia	0.2283
9	Croatia	0.17420	Cyprus	0.2043
10	Latvia	0.13407	Malta	0.1402
11	Bulgaria	0.10129	Croatia	0.1007
12	Romania	0.03463	Bulgaria	0.0341
13	Malta	0.02262	Romania	-0.0031

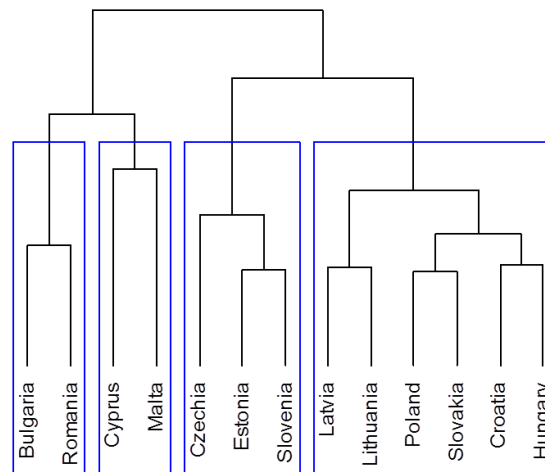
Source: own work based on Eurostat data.

The negative value of TMD obtained by Romania in 2016 indicates that the country is not only unable to keep the speed of implementation of the Europe 2020 objectives, which was reached by other “new” member states, but the situation in the country has significantly deteriorated with respect to the objectives of the Europe 2020 strategy. Based on the detailed analyses of the values of diagnostic variables, the country has the biggest problems with implementation of the last target relating to reduction of poverty. As a result, the country has become an outlier characterised with the biggest distance to the abstract pattern of development.

Figures 1 and 2 present result of Ward’s method implementation in order to group the countries into homogenous clusters. The obtained grouping in the case of both years are

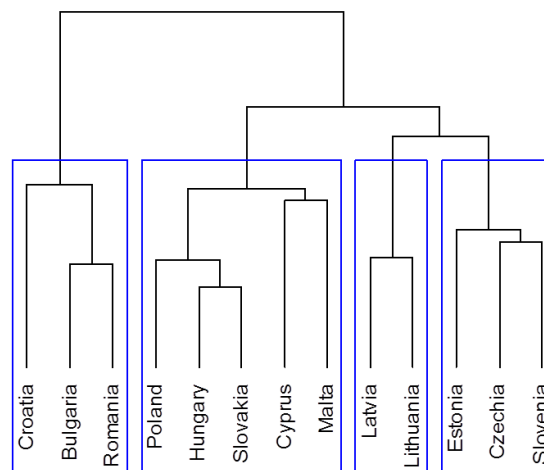
conducive with ranking obtained after implementation of the Hellwig's method. In both years four relatively homogenous clusters could be found. In the year 2010 the biggest cluster was grouping Latvia, Lithuania, Poland, Slovakia, Croatia and Hungary. Then three smaller clusters were formed with: a) Czechia, Estonia and Slovenia; b) Cyprus and Malta; c) Bulgaria and Romania. In the year 2016 the biggest cluster was formed by Poland, Hungary, Slovakia, Cyprus and Malta, then smaller ones: a) Croatia, Bulgaria and Romania that all obtained poor results in the analysed field, b) Latvia and Lithuania, where Latvia significantly improved its results and diminished its distance to the Lithuania as the leader, c) Estonia, Czechia and Slovenia.

Fig. 1: Dendrogram with grouping results for the year 2010



Source: own work based on Eurostat data.

Fig. 2: Dendrogram with grouping results for the year 2016



Source: own work based on Eurostat data.

Conclusion

The main objective of the article was to evaluate disparities between the “new” countries that joined the European Union after the year 2004 with respect to reaching the aims of the European 2020 plan.

In the study the methods of Hellwig’s taxonomic measure of development and Ward’s clustering method were applied for the first year of the Europe 2020 strategy implementation (2010) and the last year of data availability (2016). After application of the proposed methods it was possible to rank the analysed countries and group them into homogenous subsets.

The conducted research confirmed significant disparities between the Central European economies, where Bulgaria and Romania have the biggest problems with keeping the distance to other Central European countries with respect to implementation of the strategy.

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