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Measuring the Progress in Realizing the Strategy “Europe 2020” in 2010–2016 in 28 European Union Member States

Abstract: The paper presents the results of the research over the measurement of the progress in the realization of the objectives specified in “Europe 2020 – a strategy for smart, sustainable and inclusive growth” in 2016 in comparison with 2010. The analysis availed itself of the statistical data of Eurostat which describes the main indicators of the strategy for all member states of the European Union. The available empirical data allowed for constructing a synthetic measure reflecting the progress in realizing the objectives specified in the Strategy. The analysis of the values that the said measure assumed became a basis for creating a rating of EU member states for two distinct years that were subject to scrutiny. Also, there was specified the variation in the value of the said measure and the changes in the positions occupied by particular states in the mentioned rating. What was also conducted was a cluster analysis, which allowed for dividing the scrutinized countries into groups in case they are described by more than one property. Except for this and as compared to all the previous works on the subject, the method of the construction of the synthetic measure was considerably sharpened.

Keywords: *Europe 2020, taxonomic analysis, synthetic measure, indicators*

Introduction

On January 17, 2010, at the summit of the European Council, the strategy of the growth of the European Union “Europe 2020 – a strategy for smart, sustainable and inclusive growth” was adopted, the strategy being supposed to be an answer to the consequences of a financial crisis dating back to 2008–2009. According with the assumptions, reaching the targets adopted within the Strategy is supposed to contribute to the modernization of the EU economy and lead up to its dynamic, sustainable and stable growth. The targets established in the Strategy should be monitored. Therefore, what matters is their respective measurability. That is why, a set of main indicators allowing for estimating the level of the realization of the assumed objectives was constructed.

In the paper, the following research problems were assumed:

P1: Do the European Union member states realize the assumptions of Strategy Europe 2020 at the same pace; that is, will the comparison of the ratings of respective countries with the help of the synthetic measure yield similar results in two extreme years of the period under consideration?

P2: Can one indicate the groups of countries in which the realization of the objectives of Strategy Europe 2020 proceeds in the same manner?

The research process required that the following hypotheses be stated:

H1: The development of some of the European Union member states does not proceed in the sustainable fashion, the reflection of which will be considerable changes in taxonomic distances between the synthetic measure of the progress in the realization of Strategy Europe 2020.

H2: Due to the incommensurable pace of the realization of the objectives of Strategy Europe 2020 by the European Union member states, there occur essential changes in the group of leaders and outsiders of the very process in question.

The main aim of this paper is measuring the progress in the realization of five major targets of the Strategy Europe 2020 by 28 European Union member states at two distinct moments: 2010 (the beginning of the Strategy being realized) and 2016 (the last year for which the complete statistical Eurostat-based data is available, for all the indicators employed). In this case, the expression ‘objective’ means considering the progress in the realization of all the objectives with the use of only one measure. It implies that the assessment of the realization of the strategy in particular countries will be made by dint of the simultaneous analysis of multiple aspects of their respective development.

To realize the assumed objective, one constructed, resorting to the methods of taxonomic analysis, a synthetic measure determining the degree of realizing the objectives assumed in the Strategy. The values that the said measure assumed allowed for creating a rating for all the member states for two analyzed years in terms of the degree to which the assumptions of the strategy are realized. The next goal is to group the European Union member states according to the value of the synthetic measure applied. It will allow for pointing to such

groups of countries which to a similar degree realize the objectives of Strategy Europe 2020 as well as for indicating the situations in which some specific states enter a higher or lower group.

Literature Review

Analyzing the professional literature related to the programme of socio-economic development of the European Union in 2010–2020 “Europe 2020 – a strategy for smart, sustainable and inclusive growth”, one should pay attention to numerous studies connected with each of three main priorities of the strategy: smart development, sustainable development and the growth conducive to social inclusion. These studies were done on the basis of theoretical analyses conducted by researchers and of empirical investigations over the assumptions and the objectives specified in the Strategy. The conclusions stemming from the conducted analyses are published in the form of thematic publications, articles in refereed journals and of reports compiled both at the level of the EU and of its member states.

In the subject-matter literature, it is stressed that in the analyses related to the progress in implementing Strategy Europe 2020 what should be applied are proper indicators and indices (Pasimeni, 2011; Çolak, Ege, 2013; Rappai, 2016). Some researchers suggest that these indicators should be of synthetic nature (Saltelli et al., 2011; Çolak, Ege, 2013; Pasimeni, 2012; Pasimeni, 2016; Rappai, 2016). That is why, the synthetic measure was constructed specially for Strategy Europe 2020, the measure being Europe 2020 Index, which was employed to measure and monitor as well as to assess the progress in the realization of the objectives of the strategy in question (Pasimeni, 2011, 2012, 2016). It is not entirely clear which of the methods of constructing the synthetic measure and of the procedures for establishing the benchmark were actually applied while constructing Europe 2020 Index. On the basis of the information included in the cited works, one can conjecture that it was developed on the basis of Hellwig’s measure (which is not mentioned by the authors of the indicator), which was worked out within the so-called Wrocław taxonomy. From then onwards, it was employed many times. Among others, it was once applied for the sake of constructing the index of financial dependence of the EU member states (Siemiątkowski, 2015; Marszałek-Kawa, 2019).

In the subject-matter literature, it is pointed out that the assumptions provided in Strategy Europe 2020 are of wide socio-economic scope. It is stressed that the indicated directions of changes are to be considered justified. Still, the issue is raised whether it is possible to simultaneously achieve all the assumed goals. Furthermore, some threats are mentioned which may lead up to the situation in which the goals of the strategy will not be achieved within the scheduled time horizon.

1. Strategy Europe 2020 is in principle a project oriented at the realization of the objectives from the perspective of the entire European Union. The strategy assumes different target values for particular parameters and for particular member states.

This seems economically justified; however, in the opinion of many researches it may be a factor contributing to the fact that it will take longer to realize the assumed objectives than the scheduled time horizon originally stipulated (Gasz, 2014).

2. In Strategy Europe 2020, the policies pursued by particular member states were reduced to their common denominator. In reality, they differ considerably from one another and this very fact is regarded as a threat to the realization of the objectives of the Strategy. Furthermore, it is to be borne in mind that the majority of the EU member states is focused on the current local problems and not on the realization of the objectives set for the entire Community (Ząbkowicz, 2016).
3. There is a serious risk that the EU member states could not afford to take the actions directed at the realization of the objectives assumed in the Strategy (Kukuła, 2017).

Hence, it is suggested that it is necessary to extend the time horizon for the realization of the Strategy, coupled with introducing some legal-organizational changes as well as the potential corrections thereof.

Strategy Europe 2020 constitutes the continuation of the Lisbon Strategy, with the former being based on the latter. Nonetheless, in contradistinction to the latter, the currently realized strategy includes, apart from the scenario of “sustainable recovery”, which assumes that thanks to the realization thereof the European Union successfully faces the most pressing challenges, also two pessimistic warning scenarios: “slow growth” and “the lost decade”. The former results from the slow and uncoordinated pace of reforms, whereas the latter assumes that the reforms will be neglected. That is why, what is recorded in many member states is slow growth and social unrest and the loss in significance on the international arena. The main problem of the EU seems to be low competitiveness in the global economy relatively to a rather high standard of living of its citizens. If competitiveness does not increase, sustaining the currently high standard of living in the Community will be very difficult indeed. Researchers point out that the policy sustaining this high standard of living through increasing debt of particular EU member states cannot be pursued in the long run. However, the attempts to restore financial stability is contested by the society at large (Sulmicka, 2011).

The subject-matter literature very often makes the point that the objectives assumed in Europe 2020 strategy directly and indirectly relate to labor market – mainly in the context of the demand for particular professions and workers’ competences. This results from the dynamic development of information and telecommunication technology and knowledge-based economies. Furthermore, the EU labor market also faces other challenges that should be overcome (also from the perspective of the year 2020); for example, aging and the European manpower resources diminishing, the growth of innovativeness in all the domains of its economy, and the assurance of the resources of well-qualified manpower. It is to be borne in mind that without increasing efficiency of labor, the future economic growth of the states comprising EU will be impossible (Mazur-Wierzbicka, 2016). It is to

be borne in mind that without increasing efficiency of labor, the future economic growth of the states comprising EU will be impossible (Mazur-Wierzbicka, 2016). On the basis of the published research, it is to be noted that the progress in the realization of particular objectives of Strategy Europe 2020 considerably varies in the EU member states (Kryk, 2016; Błaszczuk-Zawiła, 2015; Kasprzyk, Fura, Wojnar, 2016).

Monitoring the progress in realizing the objectives specified within three mutually-reinforcing priorities of smart, sustainable and social-inclusion-promoting economic growth, as specified in the Strategy “Europe 2020” is represented in the publications of Eurostat (Dijkstra, Athanasoglou, 2015; Bley et al., 2017). What was subjected to analysis were the indicators of the strategy “Europe 2020”, which were selected to verify the progress in realizing the objectives thereof (Leschke, Theodoropoulou, Watt, 2015; Zeitlin, Vanhercke, 2014).

Theoretical considerations indicate the fact that higher education, constant occupational development and training ensure the possibility of climbing the social ladder. A properly pursued education policy contributes to social cohesion. Better management in the realm of education may exert a positive influence on economic growth, creating vacancies and the increase in competitiveness. Family-friendly measures, including e.g. better access to child-care, more flexible working schemes and incentives to employers can help individual to return to work. (Camilleri, Camilleri, 2016; Deeming, Smyth, 2018; Van Gyes, Schulten, 2015).

In the professional literature, there were also some attempts made at defining and explaining what role a social policy, non-governmental organizations as well as citizens are to play when it comes to economic growth promoting social inclusion on the global scale and in the changes to the binding social norms accompanying the former process (Deeming, Smyth, 2018).

The issues related to the scrutinized five dimensions of social integration (that is, the prophylaxis of combating poverty, equitable education, access to the labor market, social cohesion and non-discrimination as well as healthcare) constitutes for each member states a common denominator when it comes to establishing the European Union institutions, research institutes and universities (Arpe, Milio, Stuchlik, 2016).

The main purpose of the present European Union strategy “Europe 2020” is the development of innovative companies of high quality of labor which create more and better vacancies. It is supposed to contribute to social integration to minimize existent inequalities. The European Commission perceives innovations as the main factor of growth of the European Union. Unfortunately, innovativeness of the European Union is lagging behind its major international competitors, such as USA or Japan and its advantage over the new competitors such as China, is getting smaller. There are also disparities in the level of innovativeness among the EU member states. There is a lot of attention in the professional literature paid to the evaluation of innovation policies pursued in the EU, the said policies mainly pertaining to the quality of labor and employment. It also contains commentaries and recommenda-

tions related to how innovation policies should be pursued in the future so that they should successfully deal with innovation-related challenges that Europe is currently facing (Makó, Illéssy, Warhurst, 2016; Campagnolo, Eboli, 2015; Ghisetti, Mancinelli, Mazzanti, Zoli, 2015; Ghisetti, Mancinelli, Mazzanti, Zoli, 2017).

At the beginning of 2014, the European Commission designated a group of experts whose task was to identify and put forward some indicators allowing for monitoring and assessing the initiatives taken within the programme of Responsible Research and Innovation (RRI). The reports presented the results of their work; and what was reviewed were the indicators that could be possibly applied in the crucial areas of RRI policy and the specific suggestions related to designing RRI indicators were put forward (Strand, 2015; Drumaux, Joyce, 2017; Kerschner, Ehlers, 2016).

The Assumptions of Europe 2020 Strategy

“Europe 2020 – a strategy for smart, sustainable and inclusive growth” is a long-term programme aimed at socio-economic development of the European Union for the period 2010–2020. It was approved by the European Council on June 17, 2010 and replaced the Lisbon Strategy, realized in the period 2010–2020. The strategy “Europe 2020” takes into consideration the long-term challenges that Europe is facing, the challenges being related to globalization, ageing societies, the growing need for rational use of resources.

The essence of the Strategy involves taking up some actions aimed at setting in the European Union member states the conditions conducive to long-lasting and sustainable economic growth. This aim is to be achieved through developing a low-emission knowledge-based economy, promoting the environmentally-friendly technologies and the efficient use of resources. This is to be accompanied with the care of maintaining social and territorial cohesion so that the benefits flowing from the economic growth were widely available.

The strategy “Europe 2020” encompasses three mutually-connected priorities:

1. smart growth: the development of an economy based on knowledge and innovation,
2. sustainable growth: endorsing an economy making efficient use of resources, more environmentally-friendly and more competitive,
3. growth conducive to social inclusion: endorsing an economy of high employment rate, ensuring social and territorial cohesion.

In the strategy “Europe 2020”, the European Union specified the target it would like to reach in 2020. Instead of one primary goal, the Strategy adopted a package of five main quantitative (indicators-related) targets. The European Commission recognized that the selected targets are of utmost importance to all the member states, regardless of the duration of their respective membership and of the disparities in the development among them. The targets are to be of representative nature and their task is to show the general condition of

the European economy with respect to the most important parameters from the standpoint of development policy pursued within the Strategy.

The EU member states were obliged to translate from the objectives of the Strategy Europe 2020 into the national ones. Each year, in April, they publish national reform programmes in which they present the actions taken aimed at realizing national plans.

Tab. 1. The targets and main indicators of the strategy “Europe 2020 – a strategy for smart, sustainable and inclusive growth”

Item no.	Primary targets of the Strategy	National targets of the Strategy for Poland	Main indicators
1.	The increase in employment rate for the people aged 20–64 to the level of 75%	The increase in employment rate for the people aged 20–64 to the level of at least 71%	Employment rate for the people aged 20–64
2.	Dedicating 3% of GDP of the EU to investments in research and development (R&D)	Dedicating 1,2% of GDP to investments in research and development (R&D)	Resources spent on R&D (in percent of GDP)
3.	Reaching the target „20/20/20” with respect to climate and energy – reducing the emission of greenhouse gas by 20% as compared to 1990; increasing the share of renewable energy in the overall energy consumption and increasing the energy efficiency by 20%	The increase in energy efficiency, the growth of significance of renewable sources of energy, the reduction of emission of greenhouse gas	Emission of greenhouse gas (1990 =100) Share of renewable energy in gross final energy consumption Primary energy consumption
4.	Increasing the level of education through reducing share of early leavers of education or training to less than 10% and increasing, at least to the level of 40%, the share of the population aged 30–34 having completed their tertiary or equivalent education	Increasing the level of education through reducing the share of young people neither in employment nor in education or training to the level of 4,5% and increasing to 45% the share of the population aged 30 to 34 with a tertiary or equivalent education	Young people neither in employment nor in education or training The population aged 30 to 34 having completed their tertiary education
5.	Decreasing poverty through lifting at least 20 million people out of poverty or social exclusion	Decreasing by 1,5–2 million, the number of people living below relative poverty threshold	Indicator of risk of poverty or social exclusion (the headline indicator constituted by three sub-indicators stated below): • Low work household intensity • Monetary poverty (considering social transfers) • Severe material deprivation

Source: own work based on http://stat.gov.pl/cps/rde/xbcr/gus/POZ_Wskazniki_Europa2020.pdf (7.12.2017).

From the point of view of a development policy, the indicators realized within the Strategy and mentioned in Table 1 represent the most important parameters of the said strategy; that is, employment, research and development, sustainable use of energy, education, combating poverty and social exclusion. The main indicators for 2020 assume specific values for particular member states. In the case of Poland, employment rate among the people aged between 20–64 is supposed to amount to at least 71%; the share of investments allocated to R&D is to amount to 1,2% of its GDP on average, reducing the population leaving education prematurely into 4,5%; increasing the population aged between 30 and 34 with the higher education into 45%, reducing the number of people living below the poverty line by 1,5–2 million.

The enumerated development targets are not closed-ended. They are constructed in such a manner that they should be favorable to each member state.

In order to enable the progress in the realization of the main priorities of the Strategy, what was formulated were seven flagship initiatives:

1. Smart growth priority:

- „Innovation Union”,

This initiative is aimed at improving the general conditions of and access to funding research and innovations. Innovative ideas are to be turned into new products and services, which is supposed to contribute to economic growth and creating vacancies.

- „Youth on the move”,

This initiative is aimed at improving the quality of education at all the levels thereof as well as making it easier for youth to enter the labor market.

- „Digital agenda for Europe”

The aim of this initiative involves popularizing fast Internet and allowing households and business to derive benefits from a digital single market.

2. Sustainable growth priority:

- „Resource efficient Europe”,

This initiative is aimed at making economic growth independent of the use of resources, shifting into a low-emission economy, increasing the exploitation of renewable sources of energy, modernization of transport and promoting energy efficiency.

- „An industrial policy for a globalization era”

This initiative encompasses the actions aimed at improving the business environment, particularly with reference to medium- and small-sized enterprises and endorsing the development of strong and sustainable industrial base, ready to compete on global markets.

3. Inclusive growth priority:

- „An agenda for new skills and jobs”,

This initiative is directed at introducing the changes allowing for modernizing labor markets (through the promotion of life-long learning in order to increase economic activity rate) and to better adjust the demand for labor to the supply thereof (among others, due to the mobility of workforce).

- „European platform against poverty”.

This initiative is aimed at endorsing the actions ensuring social and territorial cohesion so that the benefits flowing from economic growth and employment should be widely available and the poor and excluded persons could live in dignity and actively participate in social life.

The Strategy Europe 2020 is implemented through general directives of economic policies of the EU member states (Council Recommendation EU 2015/1184) and the directives to a policy of employment in the EU member states (Council Decision EU 2015/1848), both replacing the directives of the Lisbon Strategy.

The European Commission is obliged to carry supervision over the progress in the realization of the Strategy. It presents an annual vision of the growth, evaluates the agendas of reforms in the EU member states and submits to each state detailed recommendations.

Taxonomic Analysis of the Progress in the Realization of the Strategy Europe 2020

What is essentially important while analyzing the tendencies and monitoring the accomplishments of Strategy Europe 2020 are the measures employed for the mentioned reasons. In order to create a list of the European Union member states rated according to their respective progress in the realization of the strategy “Europe 2020”, the present study made use of the method of linear ordering (Zielaś, 1991; Grabiński, Wydymus, Zielaś, 1989; Kolenda, 2006; Nowak, 1990). This sort of taxonomic analysis is a set of methods serving to estimate the level of the diversification of the objects of study by dint a closed set of statistical properties.

Selecting diagnostic measures for the sake of research, with the former constituting synthetic measures, the following properties were assumed (Młodak, 2006):

- a) significance from the point of view of the phenomenon under scrutiny,
- b) unequivocal and sharp definitions,
- c) exhausting the scope of the phenomenon scrutinized,
- d) logicalness of mutual interdependencies,
- e) the preserved proportionality in representing fractional phenomena,
- f) measurability,
- g) availability and completeness of statistical data.

At this point, what must be stressed is that the list of indicators taken into consideration while constructing the measure of the progress of the realization of Strategy Europe

2020 is limited by the very limitations of the strategy. It means that the other properties of the scrutinized objects (of the states) will not be considered, except for the ones actually indicated in the analyzed document. The process of selecting the variables thus reduces in this case to checking the completeness of statistical data. The indicators specified in the Strategy after all in principle satisfy the remaining properties.

The first stage in constructing a synthetic measure applied in the present study is an insightful analysis of the properties describing the objects of the said study (Siemiątkowski, 2015, pp. 443–448). In this case, the analysis is rather simple. It is because diagnostic variables constitute the main indicators of the strategy “Europe 2020”. In the conducted research, one resigned from ascribing weights to particular diagnostic variables.

The next state of constructing the synthetic measure is the standardization of properties. It may be done in a variety of ways. The method of selecting the standardization of properties is predicated upon the assumed method of determining the synthetic measure. Basically, the “procedures of the determination of the synthetic measure may be divided into two groups:

- non-model methods,
- model methods” (Ostasiewicz, 1998, p. 119).

In the present study, the model method was employed, in which what is assumed is the existence of the model-patterned object (or simply stated: the pattern), against the benchmark of which the taxonomic distance between studied objects is determined. “The typical and the most usually employed method in practical research by dint of synthetic measure of that group of methods is Hellwig’s measure (due to its original applications to study the economic growth that measure is also referred to as the measure of growth)” (Ostasiewicz, 1998, p. 120).

In the case of employing Hellwig’s measure, the standardization of properties follows according to the formula below:

$$x_{ij} = \frac{x_{ij} - \bar{x}_j}{S_j}$$

- x_{ij} – empirical values of j-property in i-object,
- \bar{x}_j – the arithmetic mean of j-property,
- S_j – standard deviation of j-property.

The determination of the pattern involves the selection from the standardized matrices, by dint of the model of properties, of the maximal value for stimulants or alternatively the minimal value for properties other than stimulants:

$$x_{0k} = \begin{cases} \max_i x_{ij} \text{ dla } j \in S \\ \min_i x_{ij} \text{ dla } j \notin S \end{cases}$$

The synthetic measure is the following value:

$$d_i = 1 - \frac{d_{i0}}{d_0}$$

where:

d_{i0} – Euclidean distance between the object from the model object ,

d_0 – the critical distance of a given unit from the model.

Euclidean distance is calculated according to the following formula:

$$d_{i0} = \sqrt{\sum_{j=1}^p (x_{ij} - x_{0j})^2}$$

Whereas the critical distance of the unit from the model is calculated as follows:

$$d_0 = \bar{d}_0 + 2S_d$$

where:

\bar{d}_0 – arithmetic mean of taxonomic distances:

$$\bar{d}_0 = \frac{\sum_{i=1}^n d_{i0}}{n}$$

s_d – standard deviation from taxonomic distances:

$$s_d = \sqrt{\frac{\sum_{i=1}^n (d_{i0} - \bar{d}_0)^2}{n}}$$

In order to conduct a taxonomic analysis of the progress in the realization of the strategy "Europe 2020", what was distinguished are the following eleven properties of the objects of study (of the states under scrutiny):

X_{1t} – Employment rate for the people aged 20–64,

X_{2t} – Resources spent on R&D (in percent of GDP),

X_{3t} – Emission of greenhouse gas (1990 =100),

X_{4t} – Share of renewable energy in gross final energy consumption,

Tab. 2. The actual values of the indicators applied in the construction of the synthetic measure in 2016

States	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉	X ₁₀	X ₁₁											
	val	place val	place val	place val	place val	place val	place val	place val	place val	place val	place val											
Belgium	67,7	22	2,49	14	8,7	25	49	8	8,8	12	45,6	10	20,7	16	14,6	4	15,5	19	5,5	15		
Bulgaria	67,7	22	0,78	23	18,8	12	17,6	17	13,8	5	33,8	20	40,4	1	11,9	7	22,9	2	31,9	1		
Czech Republic	76,7	6	1,68	11	64,9	22	14,9	17	39,9	10	6,6	21	32,8	23	13,3	28	6,7	24	9,7	28	4,8	18
Denmark	77,4	4	2,87	4	70,71	19	32,2	5	17,2	18	7,2	19	47,7	7	16,7	25	10,6	10	11,9	26	2,6	24
Germany	78,6	2	2,94	3	73,36	18	14,8	18	295,8	1	10,3	10	33,2	21	19,7	19	9,6	14	16,5	13	3,7	22
Estonia	76,6	7	1,28	13	44,72	26	28,8	6	6,1	23	10,9	9	45,4	11	24,4	12	5,8	28	21,7	6	4,7	19
Ireland	71,4	13	1,18	18	109,17	4	9,5	22	14,6	20	6,3	22	52,9	4	24,2	13	18,2	1	16,6	12	6,5	13
Greece	56,2	28	0,99	19	93,4	7	15,2	16	23,5	15	6,2	23	42,7	16	35,6	3	17,2	2	21,2	7	22,4	3
Spain	63,9	25	1,19	17	119,41	2	17,3	14	117,2	5	19	2	40,1	17	27,9	7	14,9	3	22,3	3	5,8	14
France	70	17	2,22	7	85,4	11	16	15	235,4	2	8,8	12	43,6	14	18,2	22	8,4	17	13,6	23	4,4	20
Croatia	61,4	27	0,84	21	75,38	17	28,3	8	8,1	21	2,8	28	29,3	26	27,9	7	13	5	19,5	9	12,5	8
Italy	61,6	26	1,29	12	84,48	12	17,4	13	148,4	4	13,8	5	26,2	27	30	5	12,8	6	20,6	8	12,1	9
Cyprus	68,7	21	0,5	26	144,45	1	9,3	23	2,4	27	7,6	16	53,4	3	27,7	9	10,6	10	16,1	17	13,6	5
Latvia	73,2	11	0,44	28	44,12	27	37,2	3	4,3	25	10	11	42,8	15	28,5	6	7,2	23	21,8	5	12,8	7
Lithuania	75,2	8	0,74	24	41,99	28	25,6	9	6	24	4,8	27	58,7	1	30,1	4	10,2	12	21,9	4	13,5	6
Luxembourg	70,7	14	1,24	15	88,93	10	5,4	28	4,2	26	5,5	24	54,6	2	19,8	18	6,6	25	16,5	13	1,6	27
Hungary	71,5	12	1,21	16	65,3	21	14,2	19	23,9	14	12,4	7	33	22	26,3	10	8,2	18	14,5	20	16,2	4

States	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉	X ₁₀	X ₁₁											
	val	place	val	place	val	place	val	place	val	place	val	place										
Malta	69,6	19	0,61	25	99,23	6	6	26	0,7	28	19,7	1	29,9	25	20,1	17	7,3	22	16,5	13	4,4	20
Netherlands	77,1	5	2,03	8	91,44	8	6	26	64,8	7	8	14	45,7	9	16,7	25	9,7	13	12,7	24	2,6	24
Austria	74,8	9	3,09	2	101,63	5	33,5	4	31,8	12	6,9	20	40,1	17	18	24	8,1	20	14,1	21	3	23
Poland	69,3	20	0,97	20	82,76	13	11,3	21	94,3	6	5,2	25	44,6	12	21,9	15	6,4	27	17,3	11	6,7	12
Portugal	70,6	15	1,27	14	117,92	3	28,5	7	22,1	16	14	4	34,6	19	25,1	11	9,1	15	19	10	8,4	10
Romania	66,3	24	0,48	27	47,68	25	25	10	31,3	13	18,5	3	25,6	28	38,8	2	8,2	18	25,3	1	23,8	2
Slovenia	70,1	16	2	9	90,68	9	21,3	11	6,7	22	4,9	26	44,2	13	18,4	20	7,4	21	13,9	22	5,4	16
Slovakia	69,8	18	0,79	22	55,57	24	12	20	15,5	19	7,4	17	31,5	24	18,1	23	6,5	26	12,7	24	8,2	11
Finland	73,4	10	2,75	5	79,58	15	38,7	2	33,1	11	7,9	15	46,1	8	16,6	27	11,4	8	11,6	27	2,2	26
Sweden	81,2	1	3,25	1	76,57	16	53,8	1	47,1	9	7,4	17	51	5	18,3	21	8,5	16	16,2	16	0,8	28
United Kingdom	77,5	3	1,69	10	66,36	20	9,3	23	181,7	3	11,2	8	48,2	6	22,2	14	11,3	9	15,9	18	5,2	17

val – value

Source: EUROSTAT and own calculations.

- X₅₁ – Primary energy consumption,
- X₆₁ – Young people neither in employment nor in education or training,
- X₇₁ – The population aged 30 to 34 having completed their tertiary education,
- X₈₁ – Indicator of risk of poverty or social exclusion,
- X₉₁ – Low work household intensity,
- X₁₀₁ – Monetary poverty (considering social transfers),
- X₁₁₁ – Severe material deprivation.

The properties X_{1t} , X_{2t} , X_{4t} , X_{7t} , were recognized as stimulants, whereas the remaining ones as destimulants. Due to the necessity of the scrutinized properties satisfying the requirement of completeness of statistical data, the determination of the synthetic measure of development proved possible only for 2010 (before, not all the countries discharged their statistics-related duties, publishing incomplete data, or not publishing them at all). Regrettably, the data more recent than the one dating back to 2016 is still unavailable.

Tab. 2 represents the actual data related to the values of the scrutinized properties for the economies of respective EU member states. For each property specified in the table, the position in the ranking of EU member states was given. Considering the fact that some properties are regarded as stimulants, whereas the others as destimulants, one must underline a considerable ranking-wise variation of particular states with respect to the scrutinized properties. For example, Luxemburg – when it comes to its share of the consumption of energy from renewable sources as compared to the consumption of energy as such – occupies the last position. However, once we consider higher education as a factor (property no. 7), Luxemburg occupies the second position. The same applies to other properties and to the remaining countries. This variability contributes to the fact that the overall assessment of the progress made by the member states with respect to the realization of the objectives of Strategy Europe 2020 is possible only with the help of the synthetic measure.

Tab. 3. The results of the taxonomic analysis of the progress in the realization of the strategy “Europe 2020” in the European Union member states in 2010 and 2016

2010			2016			
Country	TMD	R	Country	TMD	R	ΔR
Sweden	0,761766	1	Sweden	0,711253	1	0
Finland	0,638987	2	Denmark	0,668223	2	1
Denmark	0,593449	3	Finland	0,632722	3	-1
Slovenia	0,528354	4	Austria	0,571783	4	1
Austria	0,524223	5	Slovenia	0,517661	5	-1
Estonia	0,504812	6	Czech Republic	0,488144	6	2
Netherlands	0,451454	7	Estonia	0,463071	7	-1
Czech Republic	0,426176	8	Netherlands	0,447118	8	-1
Luxembourg	0,416499	9	Luxembourg	0,408694	9	0
Belgium	0,387125	10	France	0,394205	10	1
France	0,36038	11	Lithuania	0,393646	11	4
Slovakia	0,33257	12	United Kingdom	0,381209	12	2
Germany	0,331129	13	Latvia	0,379907	13	8
United Kingdom	0,30482	14	Poland	0,379464	14	2
Lithuania	0,300171	15	Slovakia	0,379266	15	-3

2010			2016			
Country	TMD	R	Country	TMD	R	ΔR
Poland	0,293403	16	Belgium	0,366337	16	-6
Hungary	0,270672	17	Hungary	0,330017	17	0
Portugal	0,268765	18	Germany	0,320749	18	-5
Cyprus	0,23787	19	Portugal	0,302958	19	-1
Croatia	0,224983	20	Ireland	0,26826	20	4
Latvia	0,218892	21	Croatia	0,248257	21	-1
Greece	0,211539	22	Cyprus	0,210578	22	-3
Italy	0,186836	23	Malta	0,183161	23	4
Ireland	0,166079	24	Italy	0,133387	24	-1
Spain	0,162191	25	Spain	0,107033	25	0
Romania	0,121468	26	Greece	0,067833	26	-4
Malta	0,118271	27	Bulgaria	0,066447	27	1
Bulgaria	0,055867	28	Romania	0,043643	28	-2

R – the position of a given state in the ranking

Source: own work.

The taxonomic analysis of the progress in the realization of the Strategy Europe 2020 with the help of Hellwig's synthetic measure brought about rather surprising results. In comparison with standard observations of changes in particular main indicators, the synthetic measure demonstrates that not all the member states realize the assumed targets of the strategy "Europe 2020" at the same pace. In 2010, the taxonomic synthetic measure assumed the values within the range of almost 0,06 to barely over 0,76, which at the first glance means that the scrutinized group of states was rather diversified with respect to analyzed properties. Among all the 28 European Union member states, in as many as 19 cases, the synthetic measure did not exceed 0.4; and in case of 6 of them, it assumed the value below 0,2.

The states that clearly stand out positively in this rating are Scandinavian states; they exhibit the highest values of the taxonomic synthetic measure. On the opposite side of the spectrum in this rating, there are the poorest EU member states, that is Bulgaria, which occupied the last position in 2010; as well as Malta and Romania. Relatively low positions were occupied by some states subsumed under the so-called PIIGS group, that is the states burdened with the greatest budget-related trouble in the EU: Spain, Ireland, Italy and Greece.

In 2016, as compared to 2010, in several cases there were considerable shifts in the rating of the EU member states, the rating being constructed on the basis of the synthetic measure based on the main indicators of the realization of the Strategy Europe 2020. Within the

position from 1 to 10, there were relatively minor shifts, the only exception being Belgium, which from position 10 in 2010 dropped to 16 in 2016. The most radical changes took place in the middle part of the rating. Apart from already-mentioned Belgium, the states that recorded a significant drop in the rating was Germany (by five positions: from 13 to 18) and Slovakia as well as Cyprus (a drop by 3 positions). The biggest increase was recorded by Latvia, which advanced from position 21 in 2010 to position 13 in 2016. It was also Lithuania, Ireland and Malta which advanced by 4 positions.

In the ultimate part of the rating, it is worthwhile to hint at the fact of the deteriorated position of Greece- by as many as 4 positions. Its drop from position 22 in 2010 to 26 in 2016 was probably caused by the generally unfavorable situation of its entire economy, caused mainly by the consequences of the financial crisis 2008+. It was also Romania which recorded the deterioration of its position in the rating, by occupying the last spot in 2016. The state that stood out positively in the ultimate part of the rating was Malta, improving its classification by 4 positions (from 27 to 23).

The changes in the effects of the realization of Strategy Europe 2020 are readily noticeable in Fig. 1.

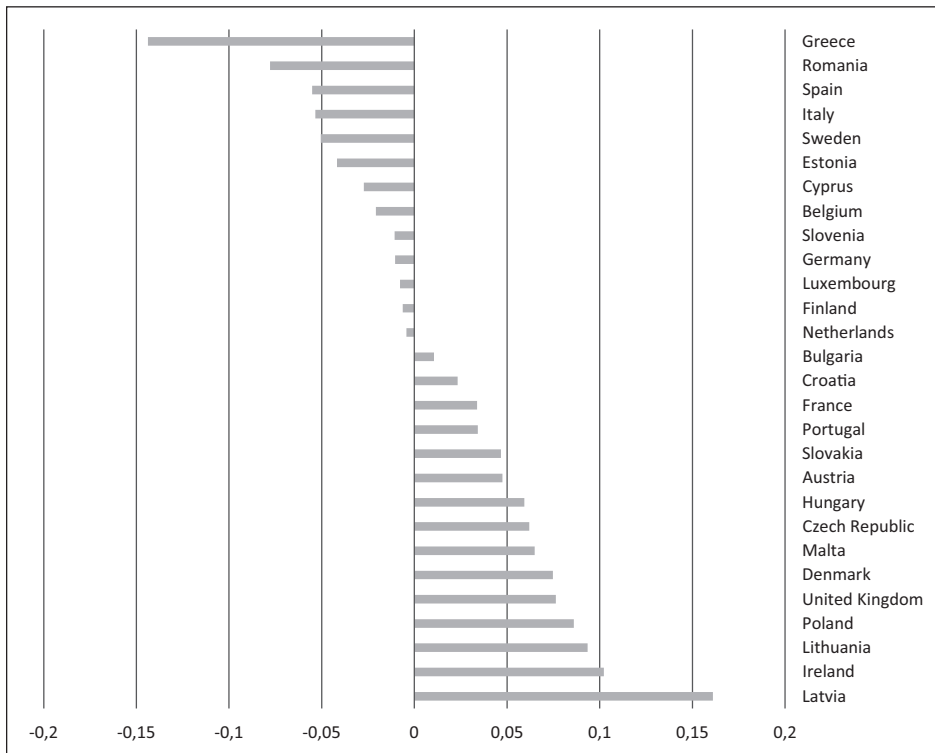


Fig. 1. The changes in the values of the synthetic measure (absolute value) in 2016 in comparison with 2010
Source: own work.

In case of 15 member states, there occurred an increase in the value of a measure in 2016 as compared to 2010. Therefore, one can conclude that in these states there are no problems connected with the realization of the targets adopted in the Strategy. The biggest progress in this respect was made by Latvia, Ireland, Lithuania and Poland. The alarming tendencies (illustrated as a decrease of the value of the measure) occurred in 13 states, and mainly in Greece, Romania, Italy and Sweden.

In case of Latvia, what proved to be a decisive factor yielding the highest of the all the countries increase in the synthetic measure was mainly a significant increase of the indicator of employment among 20–64-year-old people (from 64% to over 73%) as well as a noticeable decrease of the indicator of material deprivation (from 27,6% to 12,8%). Quite the opposite situation was recorded in Greece – the highest decrease in the synthetic measure, which was caused by a decrease of the employment indicator (from 63,8% to 56,2%), an increasing risk of poverty (27,7 % to 25,6%) as well a significant increase of the indicator of aggravated material deprivation (11,6% to 22,4%).

The analyzed synthetic measure allows not only to systematize the scrutinized objects (the states) but also to distinguish groups of similar objects. The states shifting between the groups may serve as some evidence of increasing or decreasing distance between them with respect to some property under consideration.

Tab. 4. The level of synthetic measure of the EU member states, as divided into groups

		2010		2016		
	States	Number of states	Average value of TMR	States	Number of states	Average value of TMR
Group A (very high): TMR ≤ 0,75	Sweden	1	0,76	-	0	-
Group B (high): 0,50 ≤ TMR ≤ 0,75	Finland, Denmark, Slovenia, Austria, Estonia	5	0,56	Sweden, Denmark, Finland, Austria, Slovenia	5	0,60
Group C (medium): 0,25 ≤ TMR ≤ 0,50	Czech Republic, Netherlands, Luxembourg, Belgium, France, Slovakia, Germany, United Kingdom, Lithuania, Poland, Hungary, Portugal	12	0,34	Czech Republic, Estonia, Netherlands, Luxembourg, France, Lithuania, United Kingdom, Latvia, Poland, Slovakia, Belgium, Hungary, Germany, Portugal, Ireland	15	0,38
Group D (low): TMR ≤ 0,25	Cyprus, Croatia, Latvia, Greece, Malta, Italy, Ireland, Spain, Romania, Bulgaria	10	0,17	Croatia, Cyprus, Malta, Italy, Spain, Greece, Bulgaria, Romania	8	0,13
Average value of TMR	-	-	0,34	-	-	0,35

TMR – taxonomic measure of development

Source: own work.

Cluster analysis allows for distinguishing the groups of similar objects (the states) in case these are described in terms of more than one property. In this case, four groups of states were distinguished. The analysis thereof entitles us to assert that in the majority of cases, the EU member states belong to Group C (a medium level of the measure) or D (low level of the measure). It means that the objectives of Strategy Europe 2020 are realized by them at most to a medium degree. It is worth noting that in 2016 none of the countries were to be found in Group A.

What can be also observed among the groups are shifts in time. It means that some of the states still better and better realize the objectives of Strategy Europe 2020 (e.g. Latvia and Spain). In one case (Sweden), there occurred a shift of the object (of the state) from the first to the second group, which means that, as compared to the previous period, the objectives of the strategy are realized more slowly.

Conclusions

To sum up, we claim that the synthetic measure reflects the variation in the degree of realization of the strategy “Europe 2020” better than the observation of separate indicators. The strategy is meant to comprehensively monitor the processes taking place in respective economies of the EU member states. It means that in some areas, progress takes place at a more rapid pace than in others; whereas in still others there can be some regress to be observed too. The advantage of the synthetic measure consists in its comprehensive view over the entire problem. One measure containing all the progress in the realization of the strategy allows for easily making comparisons with respect to its realization across many states. On the other hand, the changes caused by the changes in one of the components of the synthetic translate into minor changes to the whole.

The theoretical approach put forward in the present paper embraces a greater – as compared to other theoretical studies – number of indicators and also sharpens the whole method itself (the process of linear ordering). While pointing to the author of the very method of analyzing the synthetic measure (which has not been done in the hitherto known works), it takes advantage of the most recent data available. Another merit of the paper is the inclusion of cluster analysis, which allows for dividing the scrutinized states into groups in case they are described in terms of more than one property (11 properties were included herein).

A deeper analysis of the progress in the realization of the strategy Europe 2020 leads us to the conclusion that not all the states strive for the improvement of their respective situation at an equal pace. The greatest activity in this respect is exhibited by the new member states of the Community such as Latvia, Lithuania or Malta. The old member states such as Germany, Belgium or Greece occupy still lower and lower positions in the rating of the realization of the strategy.

The improvement of the progress in the realization of the strategy is to a large degree dependent on general conditions of a given economy, in particular on the budget condition of a given state and on the degree of the already achieved levels of particular indicators. The economies suffering from economic problems do not deal so well with the realization of the adopted strategic targets.

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