



Regionalization in Global Space

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**OPPORTUNITIES FOR ASSESSING
THE DYNAMICS AND THE COHESION PROCESS
IN THE CONTEXT OF THE EUROPEAN
PILLAR OF SOCIAL RIGHTS**

Abstract

The article clarifies the essence of the indicators that characterise the principles on which the European Pillar of Social Rights is built, and the information provision of their statistical survey is presented. Official statistics published by Eurostat are used. The objective internal regularities of the time series for Bulgaria for the period 2005-2018 are established by using the autodetermination coefficient, while the viability of constructing univariate models for forecasting purposes is assessed. A cluster analysis has been applied for 2010 and 2018, as a result of which homogenous groups of EU countries have been established and the factors most significant for their formation have been identified. The survey is a preliminary assessment of both the dynamics of the indicators for Bulgaria and

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the social cohesion in the EU. The derived results can serve as information and analytical bases both for identifying appropriate methods for convergence analysis and for revealing the possibilities of cluster analysis for its evaluation.

Key words:

European Pillar of Social Rights; scoreboard for monitoring «societal progress»; coefficient of autodetermination; cluster analysis; social convergence.

JEL: C22, C38, I24, I38.

Problem Statement

Over the last decade, despite the efforts of the governing institutions of the European Union and the governments of the Member States to improve the economic and social conditions, there have been processes that limit the achievement of desired results. Economic consequences for each country individually and for the Union as a whole will cause the increasing migration pressure, the adverse demographic trends, the overwhelming social consequences of the financial and economic crisis. These challenges inevitably affect the Europeans' lifestyles and social status and they are prerequisite for violating their social rights, deepening income inequality, increasing long-term and youth unemployment, increasing the risk of poverty for large population groups, limiting access to health care, etc.

Extending and protecting citizens' social rights, reducing social disparities, ensuring favourable living and working conditions are at the core of policies that promote social cohesion in the EU. The ideas of the European social model are embodied in the European Pillar of Social Rights¹. The underlying principles are the basis for monitoring the progress of countries to build a fairer union and to achieve high social rating.

The article studies the indicators that assess the progress of each country in accordance with the principles of the European Pillar of Social Rights. In par-

¹ For conciseness of style and clarity in the work, «Pillar» will be used.

ticular, the authors focus on the internal regularities in the dynamics of the indicators for Bulgaria and possibilities for differentiation of the EU countries into qualitatively homogenous groups. **The aim** of study is to determine the potential for modelling and forecasting the dynamics of the indicators for Bulgaria through statistical and econometric methods and to assess the process of convergence among the countries of the European Union.

To achieve this aim the following **research tasks** are set

- Clarification of the essence and principles of the European Pillar of Social Rights.
- Introduction of the system of headline statistical indicators for characterising the European Pillar of Social Rights.
- Analysis of the dynamic of the headline indicators for Bulgaria for the period 2005-2016.
- Assessment of social cohesion among EU counties through cluster analysis.

The software of the study includes the products of R Version 3.4.1, packages «NbClust» and «Shiny», SPSS Version 19, an automated procedure available at: ovchinnikov.shinyapps.io/autodetermination/.

Theoretical Basis of the Study

1.1. The Principles of the European Pillar of Social Rights

The development of European Pillar of Social Rights, which is the core of the European social model, is an initiative of Jean-Claude Juncker, President of the European Commission in 2015-2019. He presented his idea in September 2015 in his first speech on the state of the European Union. Following consultations among Member States, the European Union institutions, social partners and civil society, the European Parliament called for a proposal for European Pillar of Social Rights with Resolution of 19 January 2017 (2016/2095(INI)). This commitment was fulfilled and on 26 April 2017 with a European Commission document, in which the Pillar was presented and the path for its implementation was outlined (European Commission, 2017a). The official announcement of the Pillar was made on 17 November 2017 in Gothenburg (Sweden) during the first Social Summit for Fair Jobs and Growth.

The European Pillar of Social Rights is of strategic significance for building fair social systems and well-functioning labour markets in the European Union. It embodies the social dimension of the European Commission's strategic programmes and social standards. It can be seen as a reference framework that guarantees the social rights of European citizens in the medium and long term. It focuses on building well-functioning labour markets and social support systems that meet the realities and needs of this century and support the process of cohesion among European countries by providing better living and working conditions for the population. The Pillar is based on existing legislation at European Union level and international level.

The principles of the European Pillar of Social Rights are fundamental to building a fairer economic and monetary union as a political priority of the European Commission. Although legally non-binding, these principles help to bring about the necessary economic, technological and social changes caused by the digital revolution and the introduction of modern technology. Twenty basic principles have been formulated covering three interrelated aspects of social rights (European Commission, 2017a)

- Providing **equal opportunities and access to the labour market** by developing life-long learning skills, active support for employment, lack of gender, ethnicity, etc. differences in access, conditions and wages.
- Ensuring **fair working conditions** that create favourable environment for secure and flexible employment, fair remuneration and social dialogue with the participation of employees, resulting in a balance between the rights and obligations of the employees.
- Providing **social protection and inclusion** through access to health-care and securing a minimum income, as well as **public support** for all vulnerable groups – children, the unemployed, the elderly, the disabled, the homeless.

The principles of the European Pillar of Social Rights are supported by legislative initiatives at EU level. Member States comply with these principles by adapting them to their national laws. It is normal for this transposition to take into account the level of socio-economic development, traditions and peculiarities of the social systems of individual countries.

1.2. Information Aspects of the Statistical Survey of Social Rights

The effectiveness of measures aimed at achieving the objectives of equal access to the labour market and effective social protection of all vulnerable social groups, in accordance with the principles of the European Pillar of Social Rights, needs to be quantified. For this purpose, a system of indicators has been set up to monitor trends and the achieved «social progress» in each country (European Commission, 2017b). Indicators are divided into three groups, corresponding to social rights aspects set out in the Pillar. Based on its main principles, twelve areas have been identified that allow quantifiability. For each of them, one or two *headline* and several *secondary indicators* are selected. This creates a system of over forty indicators. Further, only the headline ones are presented and analysed.

Indicator data sources are various Eurostat surveys, such as European Union Labour Force Survey (EU-LFS), European Union Statistics on Income and Living Conditions (EU-SILC), ICT Usage in Households and by Individuals, etc. Information is also provided by other European Commission Services such as Directorate-General «Employment, Social Affairs and Inclusion» and Directorate-General «Communications Networks, Content and Technology». The results of the international student literacy study, known as Programme for International Student Assessment (PISA), which is part of the OECD database, are used.

Equal opportunities and access to the labour market are examined by the following indicators:

1. Early leavers from education and training. It characterises the relative share of early leavers aged 18-24 who have completed primary education and those who have not participated in education and training in the last four weeks, incl. the observed week from the same age population. The study is performed on the basis of gender.

2. Gender employment gap. Full-time employment is considered and it is defined as the difference between the employment rates² of men and women aged 20-64. Although gender equality is more relevant to the equal pay for equal work, the choice made here in assessing gender equality for access to employment is linked to easier access to data for this survey.

3. Income inequality (S80/S20) is represented as the ratio of the equivalent net total income received by 20% of the highest-income population (first quantile) and 20% of the lowest-income population (last quantile). As it is known,

² The employment rate is calculated by dividing the number of employed people aged 20-64 by the population of the same age.

this is how income differentiation of the population is measured and assessment of the effectiveness of social policy is possible. The study is performed on the basis of gender.

4. At-risk-of-poverty or social exclusion rate is a complex measure and is calculated on the basis of three constituent indicators: the relative share of the population of persons at risk of poverty; the relative share of the population of persons living in material deprivation and the relative share of the population of persons living in households with low intensity of economic activity. Individuals are counted only once, even if they are presented in several sub-indicators (Shopova, 2018). The study is performed on the basis of gender.

5. Young people neither in employment nor in education and training, age group 15-24. The study is conducted on a gender basis and covers young people who are not employed during the period and did not participate in education or training during the last four weeks, incl. the observed week. It is calculated as a percentage of the same age population. The results of the analysis are significant for taking appropriate measures to limit the risk of poverty and social exclusion of young people.

The following indicators are used to characterise **dynamic labour markets and fair working conditions**:

6. Employment rate. The result is obtained by dividing the number of employees aged 20-64 by the total population of the same age.

7. Unemployment rate. It represents the relative share of unemployed people aged 15-74 in the economically active population.

The last two indicators are calculated by gender, age and completed education (Varbanov, 2014). The results of their analysis determined the choice of measures to guarantee equal access to the labour market and the pursuit of an active policy in order to reduce the risk of limiting the social rights of population due to poverty and social exclusion.

8. Activation measures – labour market policies participants per 100 persons wanting to work. It is calculated as a percentage of those participating in permanent active measures out of the total number of disadvantaged people in the labour market (unemployed, at-risk workers and inactive) who want to work. Labour market policy measures cover the activities of government or public institutions, which provide temporary support and aim to activate the disadvantaged groups in the labour market.

9. Adjusted gross disposable income of households in real terms. It is used to estimate the financial potential of households and is calculated per capita by purchasing power standard. For this purpose, the unadjusted gross disposable income of the Households and Non-Profit Institutions Serving Households

Sector is divided by the total resident population and the price index in terms of final consumption expenditure of households at the base of 2008 (2008 =100%).

10. Compensation of employees per hour worked. It presents the average compensation of employee received by hour worked. It is calculated by dividing gross wages and salaries as well as employers' social contributions (in national currency or in euro) by the total number of hours worked by all employees.

Opportunities for **Public support / Social protection and inclusion** are assessed through a third set of indicators:

11. Impact of social transfers (other than pensions) on poverty reduction. It gives an objective assessment of the effect of the benefits provided by the social protection system. It is calculated on a gender basis as the difference between the relative share of people at risk of poverty before and after social transfers.

12. Children aged less than 3 years in formal childcare. It represents the relative share of children up to the age of 3 of those of the same age who are receiving professional care outside the family for more than 1 hour per week regardless of gender. The higher values of this indicator are criterion for gender equality in the labour market.

13. Self-reported unmet need for medical care. It represents the relative share of people aged 16 and over living in ordinary households who have not received medical examination or treatment. The result of the indicator summarises the respondents' subjective opinions about the lack of need for medical care or its refusal due to financial constraints, availability of waiting list or health care location or living in a remote location.

14. Individuals' level of digital skills. The digital competence of people aged 16-74 in four specific areas of the use of information and communication technologies is assessed – information skills, communication skills, problem solving and content creation. The indicator is the relative share of people aged 16-74 who possess the two highest levels of digital skills in the population at the same age and is calculated on gender basis.

The existence of a common methodology for conducting a survey on the European Pillar of Social Rights allows comparisons to be made among EU countries. The results of the comparisons serve as a basis for assessing the possibilities of reducing and converging differences among Member States. The results of the calculated indicators are taken into account in the EU economic and fiscal policy coordination cycle (known as the European Semester).

1.3. Research Methodology

The aim of the research is realised in both projections of the study. On the one hand, the objective internal regularities in the dynamics of the indicators for Bulgaria for characterisation of social rights by means of autodetermination coefficient are studied. On the other hand, the process of social cohesion in the EU has been assessed on the basis of cluster analysis.

The autodetermination coefficient is used to extract information about the systematic and stochastic components of the time series variation, as well as about their modelling and forecasting. The methodology for estimating the autodetermination coefficient is proposed by L. Ivanov (2010). Its main requirement is that the coefficient must be calculated on the basis of a stationary time series.

To identify the nonstationarity in the indicators, a procedure for comparing the variances of the time series with those of their first differences was applied. The autodetermination coefficient is obtained on the basis of first k – autocorrelation coefficients for the stationary parts of the time series. Provided that the time series are nonstationary, the formula is transformed in a way that the coefficient is being calculated on the basis of the coefficient for the stationary part and the variances of the initial and differenced series. The number of autocorrelation coefficients r_k , included in the estimation of the autodetermination coefficient is determined by the last statistically significant partial autocorrelation coefficient for the stationary part of the series. The statistical significance of the autodetermination coefficient is established by Langrange multiplier test characteristic, which follows χ^2 – distribution with k degrees of freedom³. If its empirical value exceeds its theoretical value in absolute terms, the autodetermination coefficient is statistically significant. Otherwise, the coefficient does not differ significantly from zero.

An opportunity to evaluate the process of social cohesion of EU countries is to form qualitatively homogenous groups of them in relation to the headline indicators for characterising social rights. **The cluster analysis** is a multidimensional statistical method that is a set of algorithms based on which multiple objects can be grouped into two or more homogenous groups (clusters) according to the values of a particular set of variables. The particular clusters are characterised by internal homogeneity and clear external heterogeneity. Different types of cluster analysis have been developed in the literature, for instance Everitt et al. (2011) and Rencher (2002). They are classified depending on the chosen approach for determining the number of clusters, on the chosen metric for calculating the distance among the particular objects on a given attribute, as well as on the rules for assigning an object to a specific group.

³ Here, we work with a level of significance $\alpha = 0,05$.

In the subsequent empirical analysis, the clustering of the countries into homogenous groups was done by the method of *k*-means cluster analysis, which requires to determine the number of clusters in advance. This is essential for the reliability of the analysis results. Several approaches to the study of validity of clusters have been derived in the scientific literature, which according to Theodoridis and Koutroubas (2008) can be summarised in three groups. The first approach is based on external criteria, such as comparing the results with those of similar research, subjective considerations and research experience. The second approach is based on internal criteria, i.e. of specific results obtained during the analysis process, such as the distance at which pair of clusters merge. The third approach is adopted here, in which on the basis of relative criteria (both internal and external) structures for different numbers of clusters are compared and evaluated.

The following internal criteria are applied to determine the optimal number of clusters (Charrad et al., 2014): *Calinski and Harabasz index* (CH index), *Krzanowski and Lai index* (KL index), *Duda index* and *Cindex*. The optimal number of clusters according to *CH index* and *KL index* corresponds to their maximum values, according to *Cindex* – to the minimum value, and according to *Duda index* – the minimum number of clusters, where the empirical value of the criterion is greater than the theoretical one.

Empirical Analysis

The headline indicators were used to characterise the principles of the European Pillar of Social Rights presented in paragraph 1.2. The lack of official Eurostat data to allow the calculation of the headline indicator *Compensation of employees per hour worked*, necessitates its replacement by the secondary indicator from the same group *In work at-risk-of-poverty rate*.

2.1. Analysis of the Dynamics of Indicators for Assessing the State of Social Rights in Bulgaria

The dynamics of the indicators for assessment of the state of social rights in Bulgaria is studied for the period of 2005-2018⁴. The results of the analysis are presented in Table 1.

⁴ The available data determine the beginning of the study period for indicators No.3, No.4 and No.10 to be 2006, for No.12 to be 2007, for No.13 to be 2008, and for No.14 to be excluded from the analysis.

Table 1

Numerical characteristics for estimating the autodetermination coefficient of the headline indicators

Headline indicators*	Variances		Autocorrelation coefficients $r_k, k = 1, 2$	Autodetermination coefficients**	
	σ_y	$\sigma_{\Delta y}$		AUD	$AUD_{\Delta y}$
1	5,39	1,51	0,33	0,75	0,11
2	3,05	0,82	0,66 / 0,06	0,91	0,67
3	0,73	0,48	-0,18	0,37	0,03
4	66,50	27,48	-0,19	0,60	0,04
5	7,54	2,75	0,46	0,71	0,21
6	11,43	5,25	0,55	0,68	0,30
7	6,60	2,88	0,62	0,73	0,38
8	24,52	15,54	-0,10	0,37	0,00
9	248,11	16,39	-0,16	0,94	0,03
10	2,80	2,24	0,64	0,53	0,41
11	11,21	30,83	-0,45	0,20	-
12	7,22	9,70	0,08	0,01	-
13	17,91	2,89	-0,37	0,86	0,14

Note: calculation were made using software available at <https://ovchinnikov.shinyapps.io/autodetermination/>

Note*: for the headline indicators, the numbering from the exposition in 1.2 is used, as No.10 is replaced by the *in work at-risk-of-poverty rate*

Note**: statistically significant coefficients of autodetermination are indicated in **bold**

The variances calculated on the basis of the first differences of the indicators decrease in comparison with those estimated for the initial time series. Such behaviour is typical for nonstationary time series. Exceptions are the indicators *Impact of social transfers (other than pensions) on poverty reduction* and *Children aged less than 3 years in formal childcare*. Within these two indicators, the variance increases after differencing, which is the reason why the series are considered stationary. The autodetermination coefficients, respectively 0.20 and 0.01, are not statistically significant. The dynamics of these indicators is not due to objective internal regularities, but is formed by stochastic fluctuations. Their modelling on the basis of past observations of the series and the subsequent forecasting is unacceptable.

The autodetermination coefficients obtained on the basis of the stationary parts of trend series are not statistically significant for most of studied indicators. This means that their dynamics is not determined by cyclical fluctuations. Statis-

tically significant coefficients of autodetermination are obtained for the indicators *Gender employment gap*, *Employment rate*, *Unemployment rate* and *In work at-risk-of-poverty rate* – respectively 0.67; 0.30, 0.38 and 0.41. Only the coefficient for *Gender employment gap* is higher than 0.5. About 67% of its changes are due to cyclical dynamics.

All coefficients of autodetermination, estimated after taking into account the trend in indicators, are statistically significant. Therefore, certain internal regularities of systematic nature appear in their dynamics. The calculated values of the autodetermination coefficient are a measure of the possibility for modelling and forecasting through single models, built on the basis of past observations of the series.

Weak regularities are identified in the indicators *Income inequality (S80/S20)* and *Activation measures – labour market policies participants per 100 persons wanting to work*. Approximately 63% of their variations are random. For this reason, modelling and forecasting of these indicators based on their past is not recommended.

Moderate regularities are registered for *In work at-risk-of-poverty rate*, *Early leavers from education and training*, *At-risk-of-poverty of social exclusion rate*, *Young people neither in employment nor in education and training, age group 15-24*, *Employment rate* and *Unemployment rate*. The dynamics of the indicator *In work at-risk-of-poverty rate* is determined relatively equally by systematic and non-systematic factors, with cyclicity prevailing. Between 60% and 75% of the variation in the indicators *At-risk-of-poverty of social exclusion rate*, *Young people neither in employment nor in education and training, age group 15-24* and *Early leavers from education and training* are due only to the trend in them. About 68% and 73% of the dynamics of *the Employment rate* and *the Unemployment rate*, respectively, are formed relatively equally by the presence of trend and cyclical components. Thus univariate models cannot explain the time series variation well enough. The forecasting of these indicators can be improved with multivariate models on the basis of dynamic relationships with other indicators.

Strongly manifested regularities are observed in *Gender employment gap*, *Adjusted gross disposable income of households in real terms* and *Self-reported unmet need for medical care*. The trends and cyclical components account for approximately 91% of the *Gender employment gap* dynamics with cyclicity predominant. About 94% and 86% of the variation of *Adjusted gross disposable income of households in real terms* and *Self-reported unmet need for medical care*, are due to the trend. A significant part of the dynamics of these indicators is determined by systematic reasons and can therefore be explained by the construction of linear econometric models, and their future observations can be predicted with a very high degree of accuracy.

2.2. Clustering of EU Countries According to a System of Indicators for Assessing Their Progress on the European Pillar of Social Rights

Different variants of the number of clusters are tested – from two to eight to determine their optimal number. Empirical values of the applied internal criteria are presented in Table 2.

Table 2

Empirical values of the indices for determining the number of clusters

Number of Clusters	CH index		KL index		Duda index		Cindex	
	2010	2018	2010	2018	2010	2018	2010	2018
2	6,64	5,08	1,86	0,32	2,53	0,81	0,51	0,51
3	7,51	7,19	0,27	1,53	0,73	0,98	0,46	0,50
4	7,32	5,90	1,24	1,25	0,68	2,17	0,49	0,61
5	7,15	9,62	1,63	3,07	0,69	0,44	0,52	0,39
6	11,83	5,67	9,39	1,06	0,98	0,76	0,45	0,58
7	5,94	6,40	0,27	2,00	0,72	0,26	0,50	0,55
8	6,81	6,35	3,49	1,58	3,08	1,08	0,53	0,54

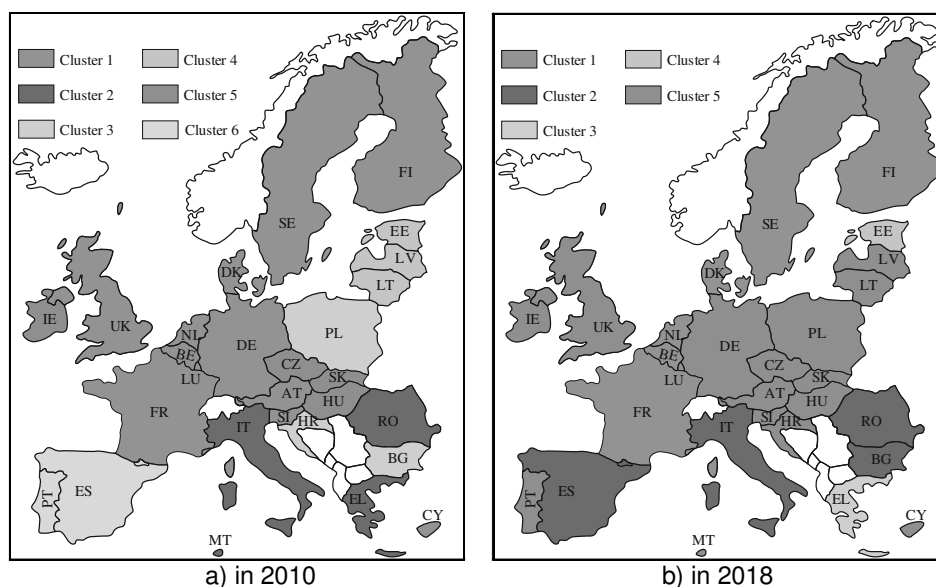
The four indices give a coherent conclusion that it is most appropriate to form six clusters in 2010 and five clusters in 2018. Therefore, the *k*-means method is applied to a five-cluster and six-cluster solution over the respective two years (Fig. 1). The indicators are normalised by *z*-transformation, and the analysis for 2010 does not include the indicator *Individuals' level of digital skills* due to lack of data.

In 2010, **cluster 1** included Belgium, Denmark, France, Germany, Cyprus, Luxemburg, the Netherlands, Austria, Slovenia, Finland, Sweden and the United Kingdom. The social models of most of these countries are characterised as conservative or social democratic, characterised by high costs of social protection and subsidisation of social services, moderate redistribution of income and state intervention in the labour market. The conducted social policy in the countries of these cluster results in the lowest group means of the key indicators *At-risk-of-poverty of social exclusion rate*, *Young people neither in employment nor*

in education and training, age group 15-24 and Unemployment rate. At the same time, the highest group means in terms of employment level and the relative share of children under 3 years of age in formal childcare are reported.

Figure 1

Clustering of the EU countries



Cluster 2 is formed by Greece, Italy, Malta and Romania. It is characterised by the highest group means for indicators assessing the gender employment gap and the relative share of those working at risk of poverty. At the same time, the countries in this cluster have some of the highest relative shares of people aged 18-24 who have left the education system prematurely, as well as the lowest employment rate and the lowest impact of social transfers on the level of poverty.

Cluster 3 includes three countries – Bulgaria, Croatia and Poland. This cluster has the highest group means for indicators *Adjusted gross disposable income of households in real terms*, *At-risk-of-poverty of social exclusion rate*, *Young people neither in employment nor in education and training, age group 15-*

24 and *Self-reported unmet need for medical care*. The disadvantage is also compounded by the lowest relative shares of children in formal childcare.

Cluster 4 includes the three Baltic States – Estonia, Latvia and Lithuania. The highest income inequality and the highest unemployment are registered here, while the increase in the disposable income of households compared to the base year 2008 is the lowest, as is the participation in active labour market measures. Only with regard to gender inequalities in the employment field, there is a significantly lower level than the average one for the European Union – by more than 10 times. The social model in these countries, as well as in the countries from cluster 3, is defined as liberal. It is characterised by a low level of social protection spending, a high level of income inequality, weak state intervention in the labour market and insufficient subsidies for social services.

Cluster 5 includes four countries – the Czech Republic, Ireland, Hungary and Slovakia. The cluster group means are the lowest for variables *Income inequality (S80/S20)* and *In work at-risk-of-poverty rate*. It also showcases the best-functioning social protection system in terms of the significance of social transfers in reducing the proportion of people at risk of poverty.

Cluster 6 includes Spain and Portugal. The group means values show that this cluster is characterised by the largest relative share of early school leavers, as well as the largest coverage of employment policies for those wishing to work. The cluster also features the lowest unmet need for medical care and a second position in kindergarten attendance.

In order to establish the reliability of the analysis results, the statistical significance of the variables is tested by one-factor analysis of variance. The results show that the difference in the group means for each of the variables is statistically significant at risk of error of 1%, with the exception of *Adjusted gross disposable income of households in real terms* in 2018.

The homogeneity in such clusters is analysed on the basis of Euclidean distances. It is found that the smallest distance is between cluster 1 and cluster 3, and the largest – between cluster 1 and cluster 4. The fourth cluster differs most from the rest because the average distance to each of the other clusters is the largest. Regarding the distance among particular countries and their respective cluster centres, again measured by the Euclidean distance, cluster 6 can be defined as the most homogeneous and cluster 2 – as the most heterogeneous. The reason for this is the average distance to the cluster centres, which are 1.690 and 2.595 standard units, respectively.

In 2018, there is a reduction in the difference among some of the EU countries, as a result of which five clusters are formed, two of which are formed by one country – Greece (cluster 3) and Estonia (cluster 4). Five of the countries included in cluster 1 in 2010 (Germany, Cyprus, Austria, Slovenia and the United Kingdom) join cluster 5, which also includes countries from the original cluster 2

(Malta), cluster 3 (Croatia and Poland), cluster 4 (Latvia and Lithuania) and cluster 6 (Portugal). As a result of this dynamics, cluster 5 now includes 15 countries, and the average distance to cluster centre has increased by 30%, i.e. cluster homogeneity has decreased. The other changes reported in terms of composition of the individual clusters in 2018 compared to 2010, are observed in cluster 2 – it is joined by Bulgaria and Spain, initially included in cluster 3 and cluster 6, respectively. Thus, these changes in the composition of individual clusters affect their degree of homogeneity – in 2018 the most homogeneous is cluster 1 (of course, excluding clusters 3 and 4, which are formed by one country), and the most heterogeneous – cluster 2. The Euclidean distances among clusters indicate that the distance between cluster 1 and cluster 5 is the smallest and between cluster 1 and cluster 3 – the largest. The third cluster is very different from the other clusters – the average distance of which to them is 7.49 standard units.

Conclusions

As a result of the conducted statistical analysis of the dynamics of indicators for assessing the state of social rights in Bulgaria and the application of the methodology of cluster analysis in assessing the cohesion among the EU countries, the following conclusions can be formulated.

First, in the dynamics of almost all indicators, there are certain internal regularities of a systematic nature. These regularities are mainly caused by the trend, but for four of the indicators the cyclical components also have an impact. The regularities in four of the indicators are assessed as weak, that is why modelling and forecasting based on their past observations is not recommended. Six of the indicators are characterised by moderate regularities. Their forecasting can be improved through multivariate models of dynamic dependencies. The regularities in the development of the other three studied indicators are strong. Their dynamics can be predicted to a very high degree by univariate models.

Second, there is an improvement in nine of the studied indicators for Bulgaria, as a result of which the country's lag behind the EU average levels has been significantly reduced. This is most clear in terms of *At-risk-of-poverty of social exclusion rate*, *Impact of social transfers on poverty reduction* and *Self-reported unmet need for medical care*. The lag in two of the headline indicators for characterising social rights remains too large – *Children aged less than 3 years in formal childcare* and *Individuals' level of digital skills*, which should be emphasised in the social policy of the country.

Third, during the studied period, convergence is registered among some of the countries included in the analysis and the transition from a six-cluster to a five-cluster solution, in which Greece and Estonia emerged as separate clusters.

They could be classified as divergent countries. Homogeneity in clusters decreases, and this process is present even for cluster 1, despite the significantly smaller number of countries that make it up. At the same time, an increase in the intercluster distances is observed in each pair of clusters, except for the distance between the first and the fifth clusters. Consequently, the differences between the countries in terms of indicators for characterising social rights are growing.

The study is preliminary assessment of both the dynamics of indicators for Bulgaria and social cohesion in the EU. The derived results can serve as information and analytical bases both for identifying appropriate methods for convergence analysis and for revealing the possibilities of cluster analysis for its evaluation.

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