Aspect of Structural Changes in Manufacturing: Search of New Approaches for Classifying the European Union Member Countries

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The article describes the author's original empirical research, during which structural changes in value added and in employment in manufacturing branches are evaluated in the European Union and its member countries. The results of structural changes are used to search for classification of the European Union member countries in context of structural changes in manufacturing. Topicality of the research is reinforced by the fact that due to consequences of the global economic downturn and increasing competition in the global economic space the changes of economic structure of the European Union and its member countries in favor of upgrading to innovative manufacturing branches are the one of the main tasks of the strategy „Europe 2020". The aim of study is to assess the way in which is possible to classify the European Union member countries on the basis of structural changes in the manufacturing (could this classification be different from usual practice or not), as well as identifying the countries with more successful experience in process of providing structural changes in favor of the innovative manufacturing branches. Possible new classification of the European Union member countries will make possible to search in future studies linkages within one group, which could provide more or less successfull structural changes. For achieving the aim of the study the calculation of the Structural Change Index (SCI) and hierarchical cluster analysis are applied. The study results indicate that optimal distribution of the European Union member countries in research context includes all countries in one group. Better performance of structural change in favor of innovative manufacturing branches the new European Union member countries show. The survey revealed the countries, whose performance in structural changes in the manufacturing indicate different trends compared to other countries within the same group.

JEL classification: L60, O11, O31

Key words: structural changes, manufacturing, innovative manufacturing branches, European Union, European Union member countries.

Introduction

European Union brings together 27 (from July 2013 onwards 28) countries with different levels of economic development. Despite these differences, the aim of the European Union is to raise the overall competitiveness at the global economic space. The European Union member countries should be as close as possible to each other along economic development for achieving this goal.

Currently, in accordance with habitual practice, which is based on available statistical indicators of economic performance, geographic position of countries (linking it to economic success), achievements in the creation and implementation of innovations, as well as on some studies about the European Union, countries are classified in different ways. For example, the European Union 15 countries, the new European Union member countries, euro zone countries, innovation leaders, innovation followers, Scandinavian countries, countries of Southern Europe, etc. These classifications show certain differences along particular characteristics among member countries. As a result, perception of country is formed, successes and challenges of economic activities are clearly defined, approach, which allows to evaluate the country's economy, is provided. As well as it is easier to look for linkages, which led to similar results in different countries within group.

It should be noted that irrespective of the classification, the group of countries, which by economic performance should come closer to average indicators of the European Union and countries leaders in certain field is defined. A country's ability to move from one classification group to another, with stronger economic performance, indicates to the development of the country.

Despite the differences in economic performance, similarity of the European Union member countries along branch structure should be noted – dominance of service sector over manufacturing sector (Eurostat 2013a). Taking into account effect of the global economic downturn, as well as increasing competition from countries BRICK (Brazil, Russia, India, China, Korea) and countries BRAC (Brazil, Russia, Australia, Canada) manufacturing and innovations are defined like priorities in the strategy „Europe 2020" (Eiropas Komisija 2010; European Comission 2010a).

The current branch structure indicates that in order to reach the objectives of the strategy, the European Union member countries should ensure the structural changes in favor of the manufacturing branches, particularly in favor of innovative manufacturing branches.

Currently it is appropriate to evaluate the ongoing structural changes in the European Union member countries in manufacturing till present time, in order to determine, in which member countries and, in which branches positive structural changes occured in context of development of innovative economy.

It should be noted that the European Union member countries have different starting positions for future structural changes in manufacturing, which are results of differences in experience, in available resources, in effects of global economic downturn, but have the common objective, which is noted in the strategy „Europe 2020", why the experience of each member country is important.

The study aims to assess the way in which the member countries of the European Union on the basis of structural changes in the manufacturing is possible to classify (could this classification be different from usual practice or not), as well as this could provide information about countries with more or less successful experience in structural changes in favor of innovative manufacturing branches. Consequently, in the article sets out the following tasks: 1) theoretically justify the author's choice to use the structural changes in manufacturing like foundation for searching new classification of the European Union member countries; 2) explain the research methodology; 3) to carry out the classification of the European Union member countries in context of structural changes in manufacturing; 4) to provide analysis of the study results.

Topicality and novelty consists of the author's attempt to classify the European Union member countries on the basis of structural changes in the manufacturing branches, because the changes of the structure of economy in favor to innovative branches is one of the main tasks of the strategy „Europe 2020", while the author's approach to the classification of the European Union member countries will provide possibilities for seeking linkages, which provide similar (more or less successful) results within one group.

Literature Review

„In the world had been changing the thousands of generations. Of these, 55 800 generations lived in a primitive society, 90 - knew the writing, 9 - book printing, 2 - use electric motors" (Strods 1992). Process of improvement of economic activity is endless. Using, as well as further developing of the manufacturing processes and technologies, which were created during

previous stage of existence, the society comes to new features that ensure rational, efficient use of resources and individual needs.

The nature and the role of structural changes has much definitions and approaches. One of the more widespread is the approach which is based on the recognition that structural changes are sustainable and permanent changes in the structure of economic systems (for example, Chenery, Robinson, Syrquin 1986; Syrquin 2007; UNIDO 2009).

Traditionally, the analysis of structural changes is associated with economic growth in economic theory. For example, according to the point of view of Schumpeter, innovations provide structural changes, while the Kuznets indicates that without structural changes economic growth is not possible, as well as Pasinetti indicates that economic growth is based on the ongoing continuous structural changes (Schumpeter 1939; Kuznets 1971; Pasinetti 1981; UNIDO 2009).

Nowadays, there are two basic approaches, which explain the changes in the economic structure.

The first approach is based on big cycles of conjuncture of the Russian economist Kondratiev (Н. Кондратьев). According to this approach until now five large cycles of conjuncture has changed: manufactory (1785-1835), steam engines (1830-1890), machine building (1880-1940), mass production (1930-1990), information technology (since middle of 1980 till present time). The modern economy is in its fifth stage of development meaning that the economic growth should be based on the knowledge and information technology, which in turn contributes to the change of the economic structure in favor of the service branches (Макаров 2005).

The second approach is based on the apportionment of the economy into three sectors. English economist K. Clark in his work „Conditions of Economic Progress" (1940) and the French economist D. Fourastie in his work „Post-Industrial America: A Geographical Perspective" (1985) formulated the methodological principles of the economic distribution into three sectors: primary (agriculture), secondary (manufacturing) and tertiary (services) (Макаров 2005, Clark 1940).

During analysis of the structural dynamics D. Fourastie showed that development takes place gradually from the agrarian society in which the most economically active population is employed in the extraction of raw materials and production (mostly in agriculture) to an industrial society, where the greater part of the the economically active population are employed in the processing and transformation of raw materials into finished products (manufacturing),

and finally to a post-industrial, where the greater part of the economically active population is engaged in the provision of various services (services) (Макаров 2005).

It should be noted that regardless of the approach, service sector is dominated in today's economy. However, W. J. Baumol as well as other authors indicate that the increasing of importance of services in processes of economic growth with the low level of productivity in this branches compared to manufacturing branches creates unfavorable conditions for sustainable growth (for example, Baumol 1967; Bonatti, Felice 2008).

In conditions of postindustrial economy knowledge and technology became the foundation for productivity growth and hence sustainable development. The importance of these indicators in processes of providing sustainable growth and employment are analyzed in models of structural changes by Pasinetti (for example, Pasinetti 1981), as well as in models of endogenous growth, which was developed by Romer (for example, Romer 1986).

In a result of structural changes the shift of resources across sectors occurred and through this the structure of the economy is being modernized. The country's economic structure indicates on its sustainability and efficiency, as well as allow to occupy a certain place in the world economic system. Technological advances and societal needs become more complicated thus providing changes in share of economic sectors. This means that a viable can be termed only production, which in a result of structural changes will produce innovative products, which would be competitive in both the domestic and foreign markets (Абузярова 2011).

One of the key processes within the structure of the economy under affect of innovations is the decreasing of share and importance of labor-intensive branches and the increasing of share and importance of knowledge-intensive branches. In conditions of postindustrial economy as one of the most important in economic growth becoming the branches, which directly implements scientific advances. Consequently, there are significant changes in the structure of economics in favor of knowledge-intensive and high-technology branches.

The aim of the European Union is smart, sustainable and inclusive economy delivering high levels of employment, productivity and social cohesion. Three main directions are set for achieving this aim:

- Smart growth: developing an economy based on knowledge and innovation;
- Sustainable growth: promoting a more resource efficient, greener and more competitive economy;
- Inclusive growth: fostering a high-employment economy delivering social and territorial cohesion (European Comission 2010b).

The global economic downturn and its impact showed that the economic structure in the European Union is unsustainable; therefore for future sustainable economic growth restructuring process in favor to innovative manufacturing branches is necessary.

Europe needs industry and industry needs Europe. One out of 4 jobs in the private sector in the European Union is in manufacturing industry, and at least another one out of four is in associated services that depend on industry as a supplier or as a client (European Comission 2010a).

Given the impact of globalization and consequences of the global economic downturn, as well as the objectives of the strategy „Europe 2020", it can be concluded that to ensure long-term economic growth, and thus the development of one of the most important steps for the European Union and its member countries is to ensure the structural changes in the economy in favor to innovative manufacturing branches.

The Data and Methodology of Empirical Research

Structural changes, which are associated with changes in relative importance of different branches during specified period of time, are measured using data on the share of output and employment rates (UNIDO 2009). This paper uses data about value added produced within branches, and the number of employees from Eurostat data base (National Accounts (including GDP)) and OECD data base (Stat Extracts Complete Databases available via OECD's Library STAN database for Structural Analysis).

Information at the branch level from Eurostat database is applied based on the classification of economic activities NACE Rev. 1. NACE Rev. 2 classification is not used, because not all the data necessary for research are available in the Eurostat database in conformity with the new version of the classification. The data for branches from the OECD database are classified according to the ISIC Rev. 3 classification. The ISIC is an international standartized classification that uses at global level, in turn the NACE is derivative of ISIC at the European Union level. Taking into account this fact, it is possible to assume that it would be correct to take data from OECD data base for the European Union countries, which are members of the OECD and for which data in the Eurostat data base are not available.

In this context, limitations of the study should be noted. Some restrictions on the availability of data should be noted, therefore data from two statistical databases are applied. In

some cases, data for a shorter period were used, again because of limitations in data availability, but all periods are enough long to assess the structural changes. Tte data about Bulgaria and Malta were not available to the author, therefore these countries are not analyzed in the article. However, due to the economic performance of these countries at the European Union level, can assume that the calculation results will not show distinctions from the European Union figures.

The assessment of structural changes is often based on calculations of Structural Changes Index (SCI), which is expressed by the following formula:

(1) $SCI = \frac{1}{2} \sum | x_{i,t} - x_{i,t-1} |$ (OECD 1994; Productivity Comission1998)

The SCI for output may be defined as half the sum of the absolute value of the differences in value-added shares over time. SCI values varies between 0 and 100, where 0 indicates on the absence of structural changes, while the 100 indicates on the complete change of structure (OECD 1994; Productivity Comission1998). The calculations are made for the period from 1995 till 2009.

High technology branches are devided in conformity with OECD Directorate of Science, Technology and Industry elaborated classification „ISIC REV. 3 Technology Intensity Definition. Classificationof Manufacturing Industries into Categories Based on R&D Intensities" (OECD Directorate of Science, Technology and Industry, Economic Analysis and Statistics Division 2011).

For interpretation of research results the author of the study uses traditional practice and divides the European Union member countries into two groups – the European Union 15 member countries and the new European Union countries.

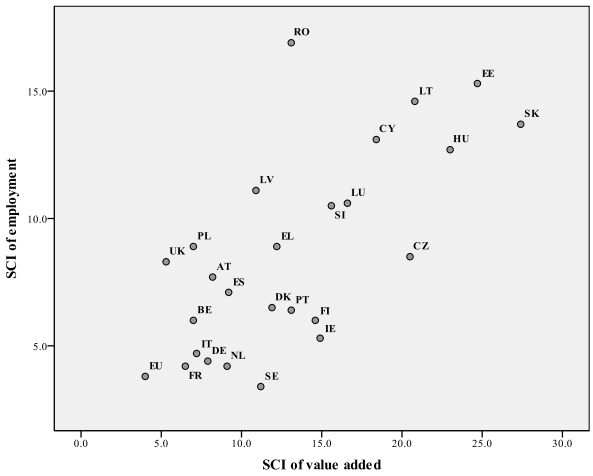
For achieving the objective of the study and assessing, in which way it is possible to classify the European Union member countries in context of structural changes in manufacturing branches hierarchical cluster analysis is used. Hierarchical cluster analysis is implemented using IBM SPSS Statistics 19 software.

Research Results

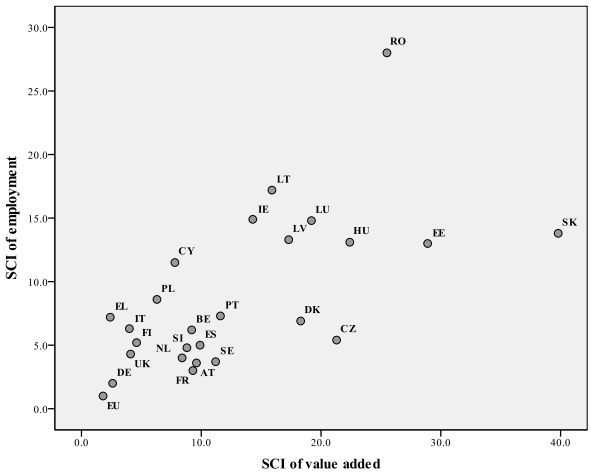
The assessment of structural changes in manufacturing branches in the European Union and its member countries is based on data about value added and employment. Before classifying the European Union member countries in accordance with the SCI values, the calculation results are presented in accordance with usual practice - the European Union 15 member countries and the new European Union member countries.

Figure1

SCI of value added and employment in manufacturing in the European Union countries, in conformity with NACE Rev. 1.1



SCI in all manufacturing branches
(DA-DN)



SCI in innovative manufacturing branches
(DG, DK, DL, DM)

* Data about Bulgaria, Malta are not available
BE – Belgium, CZ – Czech Republic, DK – Denmark, DE – Germany, EE – Estonia, IE – Ireland, EL – Greece, ES – Spain, FR – France, IT – Italy, CY – Cyprus, LV – Latvia, LT – Lithuania, LU – Luxembourg, HU – Hungary, NL – Netherlands, PL – Poland, PT – Portugal, RO – Romania, SI – Slovenia, SK – Slovakia, FI – Finland, SE – Sweden
Source: author's calculations by Eurostat 2013a, Eurostat 2013b

Evaluation of the structural changes in the manufacturing branches in the European Union and its member countries points to several aspects:

1. calculated SCI values in all European Union member countries and in all manufacturing branches indicate on a modest structural changes;
2. highest SCI values both in all manufacturing branches, as well as in innovative manufacturing branches can be observed in the new European Union member countries;
3. SCI values in the European Union 15 member countries indicate on inconsiderable structural changes;
4. assessing of SCI values in all manufacturing branches in European Union memeber countries show that the structural changes were similar in value added and employment;
5. after assessment of SCI values in innovative manufacturing branches, it should be noted that in most cases, the major structural changes took place in the value added.

The data of Figure 1 indicate that the pronounced grouping of the European Union member countries by using SCI values in value added and employment was not occurred.

The most significant change in the branch structure of the manufacturing using SCI values, assessing the value added indicators, held in the new European Union member countries: in Slovakia SCI=27,4, in Estonia SCI=24,7, in Hungary SCI=20,8 and in Czech Republic SCI=20,5. While the SCI values in the European Union 15 countries indicate that the changes in the branch structure of the manufacturing during the period analyzed almost did not happen: the lowest SCI values were observed in countries like United Kingdom SCI=5,3, France SCI=6,5, Belgium SCI=7,0, Italy SCI=7,2.

It should be noted that there are high SCI values in the European Union 15 countries also, the highest SCI value among this group of countries were observed in Luxembourg SCI=16,6. As well as relatively low SCI values were observed in the new European Union member countries, for example in Poland, where SCI=7,0.

SCI value of the structural changes in the manufacturing branches in the European Union, assessing the value added is 4.0, what indicates that the change in the structure of manufacturing in the European Union almost did not happen. This can be explained by the fact that major structural changes took place in the new European Union member countries, while their share of the produced value added in the European Union's economy is smaller than the share of produced value added of the European Union 15 countries.

Assessment of the SCI values, using indicators of value added, allow to conclude that the structural changes in the manufacturing branches over the period analyzed in the European Union and its member countries does not indicate on strong scattering or grouping of the countries.

Structural changes in the manufacturing branches, using indicators of employment, in the European Union member countries also do not indicate on major changes of structure. In this aspect the new European Union member countries are leaders too. For example, the highest SCI values among the new European Union member countries were observed in Romania SCI=16,9, Estonia SCI=15,3, Lithuania SCI=14,6 and Hungary SCI=12,7. SCI values in employment in manufacturing branches in the European Union 15 member countries show relatively minor changes in the structure: SCI=3,4 in Sweden, SCI=4,2 in Netherlands and France, SCI=4,4 in Germany. It should be noted that changes in the structure of employment in manufacturing in the European Union almost did not happened on what indicates SCI value, which is only 3.8. In this regard it is noted that the most significant changes in employment occurred in the labor intensive and low and medium technology branches due to decreasing of importance and share of these branches in economy.

Given challenges for today's economy to base the economic growth and development on the innovative branches, the author evaluates the structural changes in innovative manufacturing branches. The calculation results in innovative manufacturing sectors indicates on the stronger dominance of the new European Union member countries by SCI values compared to the values of SCI in all manufacturing branches, using data of value added and employment.

Pronounced structural changes in innovative manufacturing branches in the European Union member countries, using data of value added and employment, occured in Romania $SCI_{(value\ added)}$=25,5, $SCI_{(employment)}$=28,0, in Slovakia $SCI_{(value\ added)}$=39,8, $SCI_{(employment)}$=13,8 and in Estonia $SCI_{(value\ added\ in\ innovative\ branches)}$=28,9, $SCI_{(employment\ in\ innovative\ branches)}$=13,0. Here, too, the SCI values indicate that the overall changes in branch structure in manufacturing were not significant. For example, the SCI for the European Union, using the data of value added and employment, respectively, are equivalent to 1.8 and 1.0. Possible to assume that due to impact of global trends the major structural changes occured in low and medium technology manufacturing branches due to decreasing of share and importance of these branches, but as a negative aspect rather inexpressive structural changes in innovative manufacturing branches should be noted.

Data of Figure 1 about innovative manufacturing branches indicate on more pronounced grouping of the European Union countries by SCI values, using data of value added and employment.

In some cases, the SCI values in innovative manufacturing branches were higher than in manufacturing as a whole. For example, the highest value of SCI, using the data of value added, in the European Union 15 member countries in innovative branches is equivalent to 19.2 in Luxembourg, and 18.3 in Denmark, and these are higher values than in assessment of similar indicators in the manufacturing as a whole. A similar situation is in the new European Union member countries too, where SCI values varies from 39.8 to 22.4 between the highest calculated values, but in some cases, the SCI values in value added in this group of countries were very low, for example, in countries such as Poland SCI= 6.3, Cyprus SCI=7.8 and Slovenia SCI=8.8.

The higher values of SCI in employment in innovative manufacturing branches were observed in the new European Union member countries. For example, SCI=28.0 in Romania, SCI=17.2 in Lithuania, SCI=13.8 in Slovakia, while SCI=2.0 in Germany, SCI=3.0 in France and SCI=4.0 in Netherlands. However, just as for manufacturing as a whole, and in innovative manufacturing branches can be finded relatively low SCI values in the new European Union member countries, such as SCI = 4.8 in Slovenia and SCI = 5.4 in Czech Republic, as well as

relatively high SCI values in the European Union 15 countries, such as SCI = 9.14 in Ireland and SCI = 14.8 Luxembourg.

The data of Figure 1 and its analysis allows us to draw several conclusions regarding the possible classification of the European Union member countries of the in context of structural changes in the manufacturing branches:

1. calculation results indicate relatively low changes in the manufacturing structure in the European Union and its member countries;
2. taking into account collected data and calculations it should be concluded that we do not see pronounced grouping of the countries, except the case of Romania, where indicators of structural changes indicate on a more bright trends in the country's manufacturing branches compared with the European Union and other European Union member countries, but also indicate that there were not serious changes in the manufacturing branches during period analyzed in Romania;
3. SCI values are similar both in manufacturing as a whole, as well as in innovative manufacturing branches, however indicators of structural changes in innovative manufacturing branches points to greater opportunities for grouping the European Union member countries.

To achieve the objective of the study and assess in which way is possible to classify the European Union member countries in context of structural changes in manufacturing branches hierarchical cluster analysis was used. Hierarchical cluster analysis was based on four variables: SCI values of value added and employment in manufacturing, as a whole and SCI values of value added and employment in innovative manufacturing branches, calculated by author.

First table shows the clustering sequence and the optimal number of clusters. It should be noted that the optimal number of clusters is determined as the difference between the number of cases and the number of steps, after which the coefficient increases uneven (Бююль, Цёфель 2002).

After evaluation of the data of Table 1 it could be assumed that the European Union member countries in context of structural changes in manufacturing branches, using parameters selected by author, could be divided from one to three clusters (see Table 1).

Table 1

The results of hierarchical cluster analysis:
agglomeration schedule of the clusterization of the European Union member countries

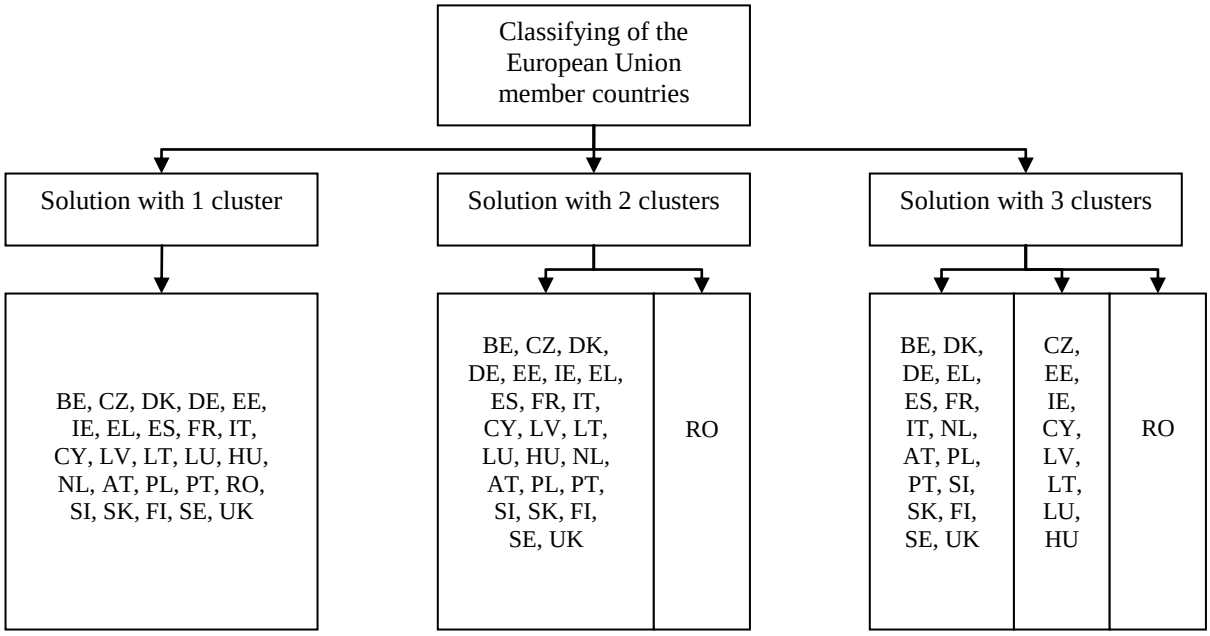
Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	9	18	.103	0	0	3
2	10	17	.207	0	0	5
3	2	9	.328	0	1	9
4	1	5	.441	0	0	13
5	10	25	.451	2	0	8
6	4	20	.570	0	0	17
7	19	26	.659	0	0	9
8	10	11	.815	5	0	13
9	2	19	.816	3	7	15
10	8	24	.857	0	0	14
11	13	15	.939	0	0	18
12	6	16	1.010	0	0	20
13	1	10	1.131	4	8	15
14	8	22	1.324	10	0	17
15	1	2	1.568	13	9	19
16	12	14	1.953	0	0	21
17	4	8	2.019	6	14	19
18	7	13	2.470	0	11	21
19	1	4	2.504	15	17	24
20	6	23	2.951	12	0	23
21	7	12	3.725	18	16	22
22	3	7	4.703	0	21	23
23	3	6	7.063	22	20	24
24	1	3	11.519	19	23	25
25	1	21	21.328	24	0	0

* Data about Bulgaria, Malta are not available
Source: the algorithm carried out by the author, using the software IBM SPSS Statistics 19

Since the key role in process of determining optimal number of clusters play coefficient values and its uneven increasing, depending on the author's interpretations, the European Union member countries could be divided into different number of clusters, because of lack of pronounced uneven increasing of the coefficient (see Table 1). The increase of the coefficient is not brightly pronounced and occurs three times. For example, the first increasing of the coefficient value occured at 23rd step of merging clusters, as well as the similar increasing of the coefficient value occured at 24th step of merging clusters that, respectively, divides the European Union member countries on 3 and 2 clusters. The largest increase in the value of the coefficient occured at the 25th step, which indicates that all European Union member countries are integrated into a single cluster.

Figure 2

Cluster membership of the European Union member countries in context of structural changes in manufacturing branches



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Source: the algorithm carried out by the author, using the software IBM SPSS Statistics 19

The solution with one cluster combines all the European Union member countries, thus indicating that the structural changes in the manufacturing branches in all member countries were similar.

The solution with two clusters highlights the case of Romania. Analysis of the data (see Figure 1) indicated that according to author's calculations only Romania among European Union member countries shows relatively high SCI values in manufacturing branches both in manufacturing as a whole, as well as in innovative manufacturing branches, using indicators of value added and employment. For example, $SCI_{(value\ added)}$=13.1, $SCI_{(employment)}$=16.9 in all manufacturing branches, as well as $SCI_{(value\ added\ in\ innovative\ branches)}$=25.5, $SCI_{(employment\ in\ innovative\ branches)}$=28.0 in innovative manufacturing branches. Therefore in solutions with 2 and 3 clusters like second and third cluster Romania is offered. If to assume that the solution with two clusters is optimal, then the patterns that contributed to similar trends in structural changes and different economic outcomes should be sought by comparing the cases of Romania and other European Union member countries. In similar way the results should be analyzed within the group of other

European Union member countries, which includes the European Union 15 member countries and the new member countries.

The solution with three clusters distributes the European Union member countries as follows: in the one cluster European Union 15 member countries (except Luxembourg) plus Poland, Slovakia and Slovenia are included; another cluster includes new European Union member states (with the exception of Poland, Slovakia and Slovenia) plus Luxembourg; the third cluster includes Romania. In essence, the solution with three clusters shows us almost like the traditional grouping of the European Union member countries - European Union 15 member countries and the new member countries.

Given that the calculated SCI values for the European Union varies from 1.0 to 4.0 and, therefore, indicate that the structural changes in the manufacturing branches in the European Union almost did not occured, as well as the largest increase of coefficient during hierarchical cluster analysis takes place at 25th step of merging clusters, it is possible to assume that the solution with one cluster could be optimal. In this case, linkages, which led to similar changes in the manufacturing structure, but provided different economic success, should be studied among all European Union member countries within one group.

Conclusions

1. Calculated SCI values indicate on relatively small and similar structural changes in manufacturing branches in the European Union and its member countries in both in value added, as well as in employment, what makes classification of the European Union member countries more difficult, however SCI values in innovative manufacturing branches points to greater opportunities for grouping the countries;
2. The most successful results in structural changes in the manufacturing for the benefit of innovative manufacturing branches show the new European Union member countries, as indicated by the calculated SCI values;
3. Given the opportunities, which hierarchical cluster analysis provides, by the author's calculations and selected parameters, it should be noted that the European Union member countries can be divided from one to three clusters;
4. According to the calculated SCI values, it would be logical to assume that the optimal classification of the European Union member countries in context of structural changes in manufacturing branches merges all member countries in the one cluster;

5. Linkages within one group of countries, which have provided successful or less successful implementation of structural changes is possible to search within the European Union, other possibility is to use usual practice and compare the European Union 15 countries with the new member countries, as well as to do focus on the case of Romania;
6. Poland, Slovakia, Slovenia, Romania among the new European Union member countries and Luxembourg among the European Union 15 member countries are the countries, whose performance in structural changes in manufacturing points to diverging trends in comparison with other countries within the group;
7. Further analysis of structural changes in manufacturing branches in the chosen context can reveal new possibilities of classification of the European Union member countries, what may help explain the more and less successful practice in providing of structural changes in the manufacturing branches.

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ESF EIROPAS SOCIĀLAIS FONDS
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This work has been supported by the European Social Fund within the Project
«Support for the implementation of doctoral studies at Daugavpils University»
Agreement Nr. 2009/0140/1DP/1.1.2.1.2/09/IPIA/VIAA/015