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Differentiation of Modernization Processes in EU Countries and in Poland in Time and Space – Non Classical View

Abstract

The aim of this paper is a typology of EU-countries from the point of view of their modernization measures, a diagnostics and an evaluation of changes in a sectoral structure of the employment in EU-countries. Against this background there are exposed changes in Polish economy in the period 1997-2008. There were used the multidimensional comparative analysis of the sequence separation of homogenous objects subsets (cluster analysis and quick cluster) and the little known in Poland, but popular in the US, measurement technique of sectoral changes in time – the shift share-technique to illustrate and verify empirically the theory of three sectors by A. Fisher, C. Clark i J. Fourastiè, orientated to the evaluation of the modernization process of EU-economies.

1. Preliminaries algorithm of proceedings

As it mentioned in an article "Chosen Aspects of Modernization Processes in EU Countries and in Poland – classical point of view" a diagnostics and an evaluation of territorial changes in a sectoral structure of the employment in EU-countries in time will be elaborate in the next paper. So, the main aim of this paper is an analysis of differentiating of modernization processes of EU-economies in the years 1997-2008 presented from the point of view of changes of the employment structure in economic sectors. The background of this analysis is the theory of three sectors that lays much stress on the role of employment in changes of an economic structure towards its modernization.

Against this background there are exposed changes in Polish structure of the employment.

At this main stage of the research it is presented the application of methods and tools of the multidimensional comparative analysis (called taxonometric), then the application of the shift-share technique.

The division (typology) of EU-countries into homogenous groups, considered from the point of view of the modernization measures level according to the three-sectoral division of economies, in some chosen extreme moments is a result of the MCA[40] methods application. The convergence of conclusions, formulated at the next stage of the analysis, should result from this quasi-dynamic formulation of the typology. The shift-share technique could build up the hypothesis referring to the progressing modernization of EU-countries. It is worth noting that the shift-share analysis allows to separate countries with a relative (against the background of other countries) advantageous competitive position in each of three sectors of national economies in EU-countries in the analyzed period.

The typology (regionalization) of objects is conducted according to the sequence, hierarchic method of the nearest neighborhood of the agglomerations connection (that means the cluster analysis with the Euclid`s measure of distances among objects), with regard to alternative formulas of normalization (isotonic and standardization normalization).

2. Methodology of research

2.1. SAHN – methods of cluster analysis

Taxonomics is understood as a field of the Multidimensional Statistical Analysis (MSA) - its subject are theoretical rules of the classification of multi characteristic objects. The terms of the numeric taxonomics, that means the cluster analysis – the agglomerations analysis and SAHN[41]-methods are an equivalent of the Multidimensional Statistical Analysis. There are two main streams of research in the taxonomic analysis:

[40] Multidimensional Comparative Analysis

[41] SAHN- these are the first letters from the words: Sequence, Agglomeration, Hierarchic and Not-covering.

- a grouping of taxonomic operative units,
- a linear subordinating of operative units.

If the aim of research is only the grouping, without of hierarchization, the further proceeding refers to the choice of a strategy and next the choice of the grouping method. As far as the strategy is concerned there is the choice between the hierarchic and non-hierarchic grouping.

In this formula the SAHN-methods, suggested to the application, belong to the first type of the strategy, the k-means – method belongs to the second type where the starting-point is the arbitrary decision concerning the number of k-separated classes.

The aim of the cluster analysis is the division of objects into internally homogenous and externally heterogenic groups, so that the degree of connection among objects of the same group could be the highest, and the degree of connection with objects from other groups – the lowest.

The cluster analysis is a set of procedures (algorithms) that groups objects into subsets (clusters) using of a certain similarity or distance measure. The hierarchic tree called a dendrogram results from this grouping. It illustrates particular steps of connection of all objects clusters and clusters distances of each pair of a created cluster in one whole. The method of the clusters binding is based on the Lance-Williams distance measure in a form:

$$d(S_A, S_B) = \alpha_c \cdot d(S_c, S_b) + \alpha_d \cdot d(S_d, S_b) + \beta \cdot d(S_c, S_d) + \\ + \gamma \cdot |d(S_c, S_b)| - d(S_d, S_b) \quad (1)$$

where :

$d(S_o, S_o)$ – the distance between two clusters where:

S_b, S_c, S_d – – so adequately the cluster b, c, d,

S_A – a new agglomerated cluster made of the connection of clusters S_c and S_d,

$\alpha_c, \alpha_d, \beta, \gamma$ – parameters characterizing methods of a combinatory clustering.

Some methods of clustering are used in practice. In the table below there is a list of the most often applied variants of parameters characterizing the most popular, programmed, methods of clustering (St. Mynarski [ed.] 1992, p. 138). The symbols n_A, n_b, n_c, n_d mean the numerical force of clusters A, b, c, d.

Parameters of binding based on Lance-and-Williams distance measure in combinatory clustering methods

Method:	α_c	α_d	β	γ
Single Linkage	0,5	0,5	0	– 0,5
Complete Linkage	0,5	0,5	0	0,5
Median Method	0,5	0,5	– 0,25	0
Centroid Method	$\frac{n_c}{n_c+n_d}$	$\frac{n_d}{n_c+n_d}$	$-\alpha_c \cdot \alpha_d$	0
Average Linkage	$\frac{n_c}{n_c+n_d}$	$\frac{n_d}{n_c+n_d}$	0	0
Ward's Method	$\frac{n_c+n_b}{n_c+n_d+n_b}$	$\frac{n_c+n_b}{n_c+n_d+n_b}$	$\frac{-n_b}{n_c+n_d+n_b}$	0

The clustering of objects is made on the base of all distance measures among pairs of objects. In turn, these pairs are traditional measures (better: metrics) of dissimilarity that means they are multi characteristic (multidimensional) distance measures among objects based on the Minkowski-metrics, that for the object O_i and O_j is given as:

$$d_{ij} = d(O_i,\ O_j) = \left[\sum_{k=1}^{n} |z_{ik} - z_{jk}|^p\right]^{\frac{1}{p}} \quad (2)$$

where:

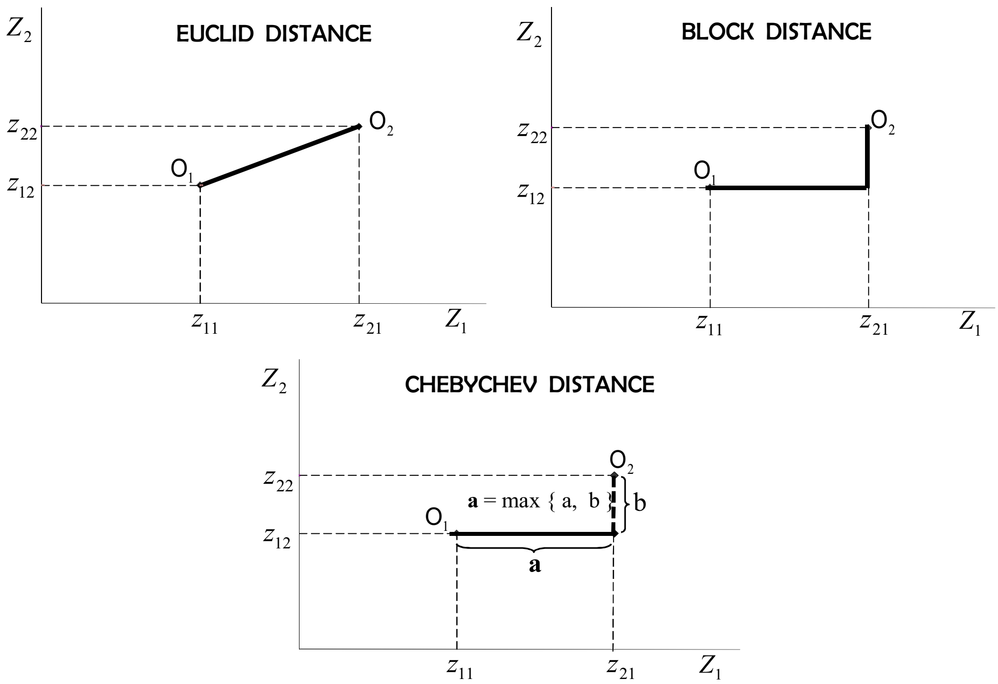
z_{ik}, z_{jk} – normalized values of the k-th variable adequately in i-th and j-th object ,

p – a natural number.

In this metrics it is permitted any p. However the practical meaning have only three values: $1,\ 2,\ \infty$. If $p = 1$ then d_{ij} *is the Hamming-distance measure*[42], for $p = 2$ – d_{ij} is *the Euclid`s distance measure*, and for $p \longrightarrow \infty$ – $d_{ij}$ is the generalized Euclid`s distance measure, called *Chebychew metrics*.

[42] Other known names of this distance measure are: city-block, Manhattan, taxicab.

The essence of differences among the Euclid`s, city-block and Chebychew distance measures in two-dimensional space illustrates the graphics:



The values of the above distance measures depend on the number of characteristics. To eliminate this effect the arithmetic means of distances are counted. A result of this rule are:

– *the average difference* called as Czekanowski distance measure:

$$d_{ij} = \frac{1}{n}\sum_{k=1}^{n}\left|z_{ik} - z_{jk}\right| \tag{3}$$

– *the average distance measure:*

$$d_{ij} = \left[\sum_{k=1}^{n}\left(z_{ik} - z_{jk}\right)^{2}\right]^{\frac{1}{2}} \tag{4}$$

– *the square of the average distance,*

– *the square of the Euclid`s distance measure.*

Each metrics (measure), analyzed above, is based on normalized realizations of characteristics – z_{ik} and z_{jk}. There are many normalization formulas, among them the following formulas are mentioned most often: a ranking, a quotient conversion, a standardization, a unitarization. The last three may be presented in the form:

$$z_{ij} = \left(\frac{x_{ij} - A}{B}\right)^p \tag{5}$$

where:

x_{ij}, z_{ij} – are adequately: initial and normalized values of the i-th variable in the j-th object,

A, B, p – parameters that may have various values according to the way of normalization.

Therefore if $A = \bar{x}_j$, $B = S(x_j)$, $p = 1$ then z_{ij} is so called standardized unit, and if $A = 0$, $B = \sum_{i=1}^{n} x_{ij}$ (n – the number of objects), $p = 1$ then z_{ij} is so called isotonic unit (measure). The second way of normalization is particularly adequate to compare differences in levels, not in a structure, of characteristics.

2.2. k-means method

The k-means method belongs to non-hierarchic, divisional, iterative, optimization methods of the clustering analysis. Its prototype was worked out in 50ties of the previous century by T. Dalenius and presented as an iterative procedure of the population division into k groups in order that the value of within group variance could be minimized (T. Grabiński 1989, p. 78). Then D. R. Cox (D. R. Cox 1957) defined the function that measures the value of losses connected with the division of objects into k groups according to a one-dimensional variable with a normal distribution. The generalization of this function was presented by Sebestyen (G. S. Sebestyen 1962). But the authorship of this method was put down to J. McQueen (J. McQueen 1967) who analyzed its effectiveness from the point of view of a complex choice of objects to distinguished groups (T. Grabiński 1989, p. 123).

Generally, the k-means method rely on dividing the whole set of objects into subsets according to the general rule of the maximization of variances between groups accompanied by the simultaneous minimization of variances inside the analyzed groups.

Idea of k-means method

The algorithm of the k-means, consisting in the improvement of a given division of objects from the point of view of an adequately defined criterion of the division optimum conditions, is as follows. Taking into account a priori k classes, the procedure begins with the random division of the set of operative units (objects) into the same number of separable classes. According to the criterion of the minimization of variability inside groups with the simultaneous maximization among groups, the objects are transformed among classes to the end. There are calculated values of Fisher's statistics [J. Jóźwiak, J. Podgórski 1997*,* p.336] for the reached optimal solution. This statistics verifies the hypothesis concerning the identity of means values of each variable in a given classification in all groups together (they are equal to the number of variables in research).

As an effect of frequent experience, consisting in differentiating of the classes number (k =2, 3, 4, ...), competitive sets of F- statistics are available. Consequently changes of F- statistics of a given variable, accompanied by the changing number of classes, are possible. The question is the quasi optimal choice of classes that should point at the adequate number of objects classes from the point of view of the analyzed phenomenon (described by multi elements set of variables). It is obvious that this quasi optimal number of classes is the most appropriate if all statistics in F-statistics set are significant. The preferable, most advantageous, situation depends on the natural inclination of used statistics to discrimination in clusters. Most often the choice of classes number is a choice of the lesser evil that means the choice consisting in an arbitrary decision of procedure that finishes if the number of not vital F-statistics increases or these values become worse loosing the statistical significance.

The problem to meet in the k-means analysis is to settle the initial division and the number of clusters. This division may be randomly settled or may be based on experts` opinion that results from the intuition or knowledge. Other taxonomic methods may be used also as it was done in the conducted research.

2.3. The core of shift-share technique

The shift–share technique is not a popular tool of the statistical analysis. Nevertheless it is worth reminding because the shift–share equation, applied in the empirical regional research in US (Herzog H., Olsen R. 1977), is designed to decompose the growth of the regional variable in three effects (Berzeg K. 1978):

a national growth – g, structural changes – m , and a competitive position – c[43]. The equation for a category (variant) i of the phenomenon in object j is as follows:

$$d_{ij} = g_{ij} + m_{ij} + c_{ij} \tag{6}$$

where:

$$d_{ij} = {}_1E_{ij} - {}_0E_{ij} \tag{7}$$

means a real change of the phenomenon E at two moments of time ($t = 1$ and $t = 0$),

$$g_{ij} = {}_0E_{ij} \cdot r_G \tag{8}$$

means an effect of a global (national) impact of the phenomenon E development,

$$m_{ij} = {}_0E_{ij} \cdot (r_{iG} - r_G) \tag{9}$$

means an effect of structural changes impact of the phenomenon E,

$$c_{ij} = {}_0E_{ij} \cdot (r_{ij} - r_{iG}) \tag{10}$$

means an effect of an impact of a local competitiveness position of the phenomenon E,

while:

r_{ij}, r_{iG} – represent local (j-th), national (global) changes rate of a i-th category (variant) of the phenomenon E defined as follows:

(11) $$r_{ij} = \frac{{}_1E_{ij} - {}_0E_{ij}}{{}_0E_{ij}}$$ $$r_{iG} = \frac{{}_1E_{iG} - {}_0E_{iG}}{{}_0E_{iG}}$$ (12)

r_G – means a national changes rate of the phenomenon E counted as follows:

[43] The shift-share literature varies on terminology. The national growth effects is also termed the share effect, sectoral-mix effect is also named compositional mix or proportionality shift, and the competitive position effect is sometimes called the differential shift or regional share – thus the name shift and share analysis.

$$r_G = \frac{{}_tE_G - {}_0E_G}{{}_0E_G} \tag{13}$$

where:

${}_tE_{ij}$ – the level of a variant i of the phenomenon E in an object j noted at the moment t while $t = 0$ or $t = 1$ (the case ${}_0E_{ij} = 0$ is not considered),

${}_tE_{iG}$ – the total (national) level of a variant i of the phenomenon E noted at the moment t,

${}_tE_G$ – the global (national) level of the phenomenon E noted at the moment t.

The development of the formula (6), after the decomposition of the position of local competitiveness into its pure effect and effect of allocation impact (Dworak E., Malarska A. 2009, according to Herzog H., Olsen R. 1977), is as follows:

$$d_{ij} = {}_0E_{ij} \cdot r_G + {}_0E_{ij} \cdot (r_{iG} - r_G) + {}_0\hat{E}_{ij} \cdot (r_{ij} - r_{iG}) +$$

$$+({}_0E_{ij} - {}_0\hat{E}_{ij}) \cdot (r_{ij} - r_{iG}) \tag{14}$$

where:

$${}_0\hat{E}_{ij} = {}_0E_j \cdot \left({}^{{}_0E_{iG}}\!/_{{}_0E_G} \right) \tag{15}$$

It follows from the equation (14) that the growth rate of the phenomenon E achieved in the economy in the analyzed period noted in the first element (referring to the national growth – g_{ij}) is weighted by a local level (j) of a given phenomenon category. It is worth noting that the difference between the change of the phenomenon in time (d_{ij}) and the effect of the global development impact (g_{ij}) is a clear change (a shift) of the category (variant) i of the phenomenon E in the object j. This shift is a sum of effects of structural changes and local competitiveness position impacts.

The second element (an effect of a structure classification – m_{ij}) for the phenomenon category i) is positive in a given object (a territorial unit) if the phenomenon variant i on the national level develops faster than it results from the global growth rate (it means: $r_{iG} > r_G$). And adequately: the effect of the phenomenon structure disappears if $r_{iG} < r_G$).

The last element of the equation (14), (the position (a degree) of competitiveness – c_{ij} of the object *j* from the point of view of the phenomenon variant *i*) is positive or negative according as the local growth of a given category level of the phenomenon if faster or slower (adequately: $r_{ij} > r_{iG}$; $r_{ij} < r_{iG}$) than the growth of this phenomenon variant on the national level. Moreover the positive (negative) competitiveness position means that the participation of the object in the national level of a given variant of the phenomenon increases (decreases) in the analyzed period.

It is worth pointing out that the analysis of structural shifts is no more than a measurement technique of decomposed changes of the local phenomenon and does not explain reasons for these changes. The equation (14) is only the identity and not a behavioral relationship.

The replacement of the category ${}_0E_{ij}$ by the expected value ${}_0\hat{E}_{ij}$ as an effect of the impact of competitiveness position (10) clears it from the influence of all local structural changes – $\hat{c}_{ij}$, and the residual, not explained, part of real changes of the phenomenon $\left(d_{ij} - g_{ij} - m_{ij} - \hat{c}_{ij}\right)$ is called an allocation effect $\left(a_{ij}\right)$.

This new element of the shift-share equation shows if the j-th object is specialized (in the sense of concentration) in these phenomenon variants $\left({}_0E_{ij} - {}_0\hat{E}_{ij}\right)$ where it achieves bigger competitiveness advantages $\left(r_{ij} - r_{iG}\right)$. The total allocation effect of a given object is advantageous if the decomposition of the phenomenon into various variants agrees with particular advantages.

Though the sign of the allocation effect may be positive or negative there are four possibilities of the local specialization $\left({}_0E_{ij} - {}_0\hat{E}_{ij}\right)$ and competitiveness advantages $\left(r_{ij} - r_{iG}\right)$. Table 1 presents the results of the allocation effects with identifying code number.

Table 1. Possible allocation effects

CODE No	Definition	Allocation Effect a_{ij}	Components	
			Specialization	*Competitive Advantage*
			${}_0E_{ij} - {}_0\hat{E}_{ij}$	$r_{ij} - r_{iG}$
1	Competitive disadvantage, specialized	–	+	–
2	Competitive disadvantage, not specialized	+	–	–
3	Competitive advantage, not specialized	–	–	+
4	Competitive advantage, specialized	+	+	+

Source: Own study.

Codes of allocation show the consistence of the saturation degree of the phenomenon with the competitiveness of the object. The specialized object is an object with the higher than expected level of phenomenon which means that there is a relative saturation of the phenomenon in this object. The competitive object is an object with the local rate of the phenomenon changes more advantageous than the national rate.

In not preferable situations both characteristics have opposite signs.

In preferable situations both characteristics have the same sign which means:

1° for signs „+” (code = 4) the object is attractive is sense of status quo (the high level and high rate of the phenomenon),

2° for signs „–“ (code = 2) the object is attractive in sense of the perspective development (the adequate growth of the phenomenon changes rate, with a low initial level of the phenomenon, may cause an increase of the phenomenon sufficient to conquer the saturation threshold.

Because the equation (14) still does not take into account structural changes of the phenomenon in the analyzed period, a new category of weighs was introduced – weighs of the final period of the analysis, real $\left({}_1E_{ij}\right)$ and hypothetic $\left({}_1\hat{E}_{ij}\right)$. Owing to the replacement of weighs of the basic year by weighs of the final year (${}_0E_{ij}$ with ${}_1E_{ij}$) the analysis of the change of the allocation effect is possible in all elements of the equation (14), and consequently changes of its interpretation are possible as well, as an effect of changes in a structure of the phenomenon in the analyzed period. Empirically it may happen that the object is not specialized in the initial year of the analysis $\left({}_0E_{ij} - {}_0\hat{E}_{ij} < 0\right)$ but it becomes specialized in the final year $\left({}_1E_{ij} - {}_1\hat{E}_{ij} > 0\right)$. As the sign of the formula $\left(r_{ij} - r_{iG}\right)$ remains constant it appears a problem how to assess the sensitiveness of the allocation effect sign.

As it is:

1° the change of the code from1 to2 if

$$r_{ij} - r_{iG} < 0 \text{ and } {}_0E_{ij} - {}_0\hat{E}_{ij} > 0, \text{ but } {}_1E_{ij} - {}_1\hat{E}_{ij} < 0 \qquad (16)$$

2° the change of the code from 3 to 4 if

$$r_{ij} - r_{iG} > 0 \text{ and } {}_0E_{ij} - {}_0\hat{E}_{ij} < 0, \text{ but } {}_1E_{ij} - {}_1\hat{E}_{ij} > 0 \qquad (17)$$

3° the change of the code from 2 to 1 if

$$r_{ij} - r_{iG} < 0 \text{ and } {}_0E_{ij} - {}_0\hat{E}_{ij} < 0, \text{ but } {}_1E_{ij} - {}_1\hat{E}_{ij} > 0 \qquad (18)$$

4° the change of the code from 4 to 3 if

$$r_{ij} - r_{iG} > 0 \text{ and } {}_0E_{ij} - {}_0\hat{E}_{ij} > 0, \text{ but } {}_1E_{ij} - {}_1\hat{E}_{ij} < 0 \qquad (19)$$

In first two cases the sign of the allocation effect is transformed from negative into positive one which means the adequate advantageous restructuring of the phenomenon in the object coherent with a local advantage (16) or disadvantage (15) of competitiveness. In two last cases the sign of the allocation effect is transformed from positive into negative one which means the inadequate restructuring of the phenomenon in the object, divergent nota bene with the local competitiveness characteristics.

3. Changes in sectoral structure of employment in EU-countries and in Poland – presentation, analysis and evaluation

3.1. Typology of EU-countries according to the level of measures of economies modernization

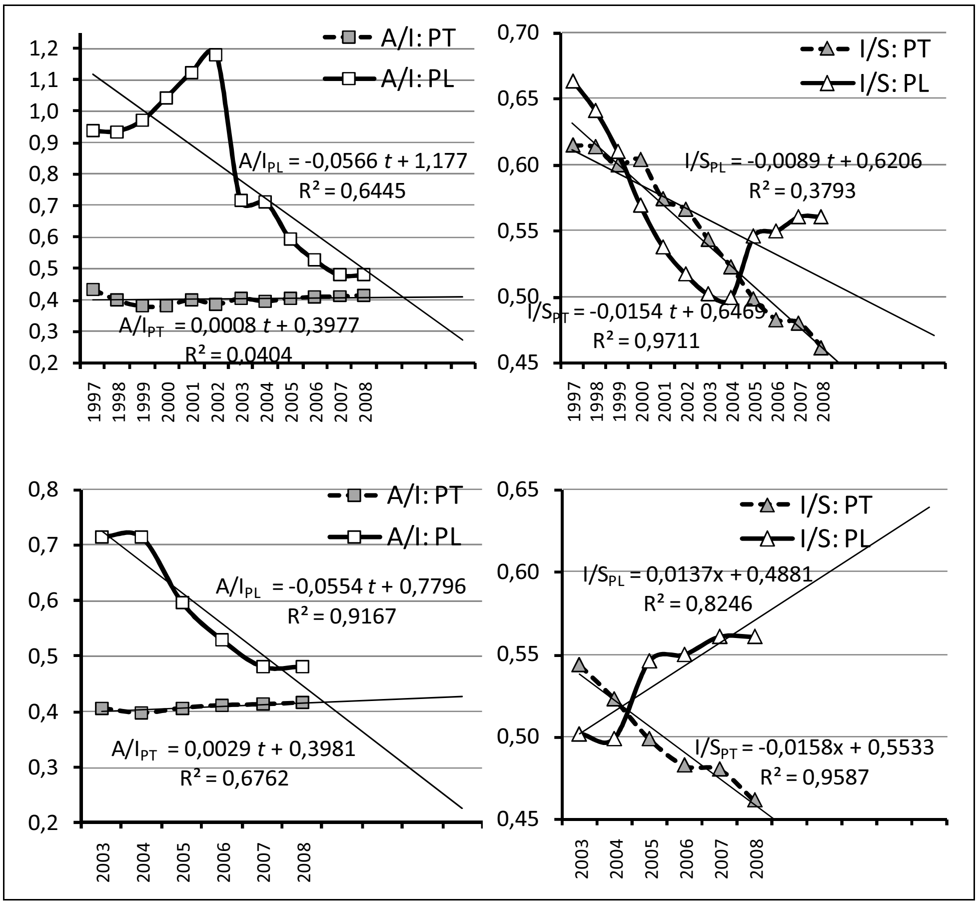
According to the methodology of the research the typology of EU-countries was prepared considering the level of quotient measures of modernization. Due to the lack of data referring to Malta and Romania and the restricted information about Greece economy, the period of presented analyses comprises the years 2000–2008 and only 25 EU– countries (without Malta and Romania).

On the base of alternative formulas of characteristics normalization (isotonic and standardization normalization) some dendrograms were drawn for 2008 (graphic pictures of sequence binding of objects in agglomerations); they are presented in an appendix.

Results of both procedures are coherent as far as the separation of a significant number of one-element groups of objects and a small number of multi-element groups are concerned. Nevertheless the separated multi-element groups differ as far as the composition of countries is concerned[44]. Both regularities point at a significant differentiation of the researched phenomenon according to objects and its complexity. Moreover, both procedures of the typology of objects made from the point of view of modernization measures of Polish economy locate it next to Portugal but separately. This result is surprising because one of the separately analyzed modernization measures (I/S), particularly in a short-term, denies the similarity of both countries. Fig. 1. illustrates this thesis.

[44] It is easy to notice if attempts of cuts of some dendrograms are made.

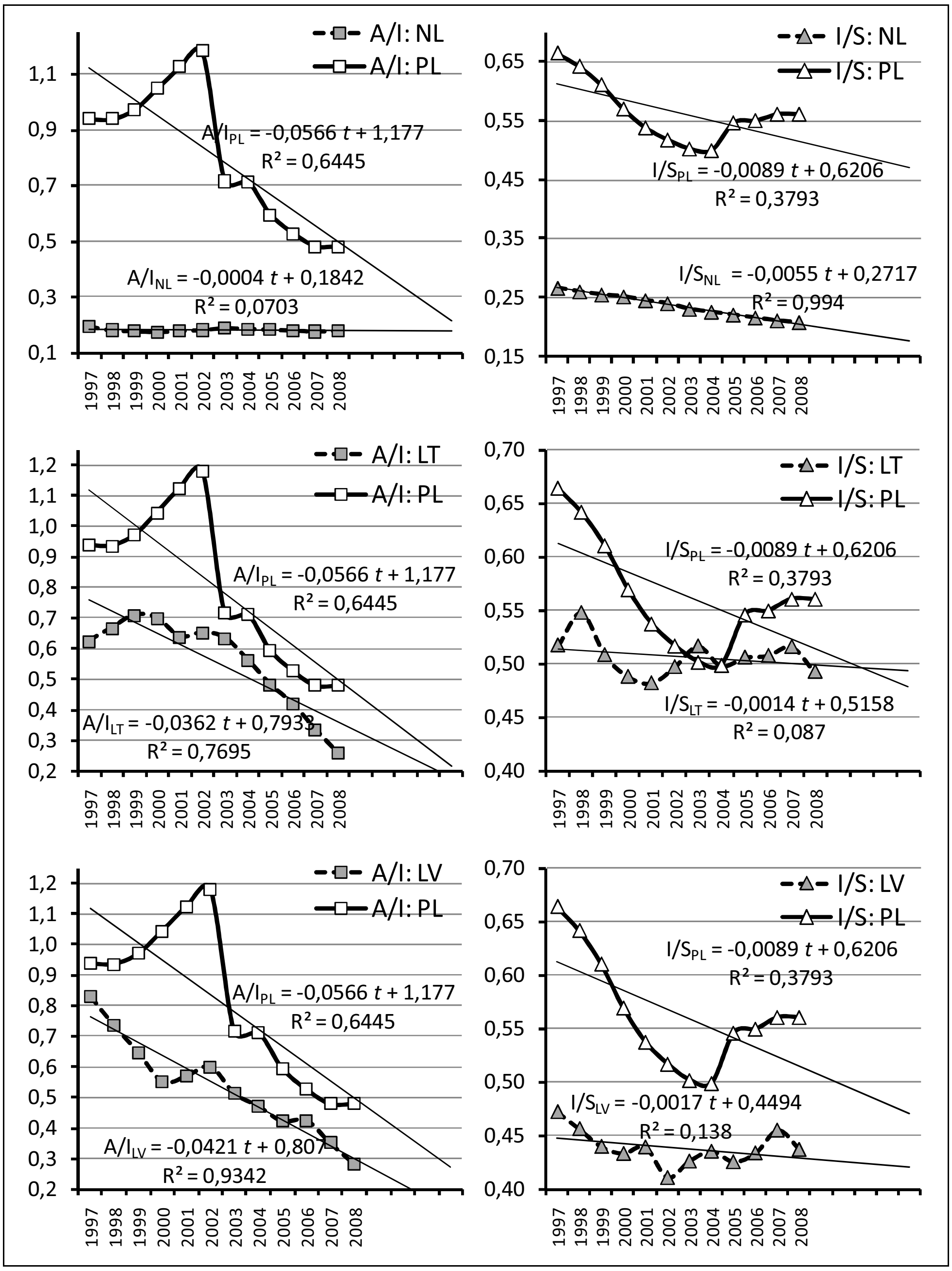
Figure 1. Tendencies of changes of quotient modernization measures of economies of Poland and Portugal in the period 1997 – 2008 and 2003 – 2008



Source: Own study based on EUROSTAT data.

The reference to the next method of objects classification does not decide the explicitness of the objects division into homogenous types. The k-means method point at the smaller number of one-element groups of countries and more numerous multi-element classes but its result does not meet requirements. Polish economy was located in 2008 in the same class as Netherlands (according to the isotonic measure) or, which is more probable, in the same class as Portugal (according to results of standardization). Doubts concerning substantial correctness of the k-means method are illustrated in Fig. 2.

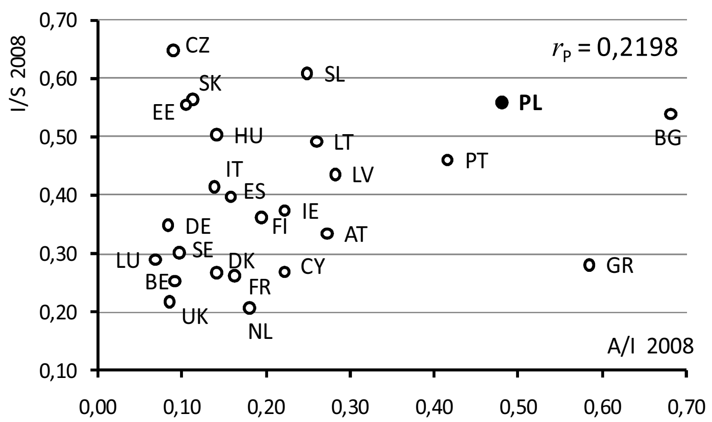
Figure 2. Tendencies of quotient modernization measures of economies of Netherlands, Lithuania, Latvia and Poland in the period 1997 – 2008



Source: Own study based on EUROSTAT data.

In search of causes for failures within the typology of countries, from the point of view of homogenous levels of quotient modernization measures, the level of their correlation was analyzed in all years of the period 2000-20008. The coefficient of Pearson linear correlation is never statistically vital and its values belong to [0,2198, 0,2862]. Fig. 3 illustrates an exemplary position of objects in two-dimensional space of analyzed quotient modernization measures.

Figure 3. Location of EU-countries in two-dimensional space of analyzed quotient modernization measures A/I and I/S in 2008



Source: Own study based on EUROSTAT data.

A very weak binding of values of quotient modernization measures according to objects in each year of the analysis is a sufficient obstacle in analyses of the objects typology in homogenous sub-sets regardless of the degree of refinement of the used method of clusters separation.

3.2. Analysis of stability and allocation of regional employment structures in the light of shift-share technique

Changes in the scale and in the employment structure in EU-countries and in Poland according to the three–sectoral division are the fact. But a diagnosis - deeper and different than the hitherto- may be done on the base of results of shift–share analysis.

In the light of data from the edge years of the period 2000-2008 it is obvious that there was a dynamic increase in the employment level in EU-countries only in services (13,7%) – see Fig. 5, it was accompanied by

a dynamic decrease in the employment in agriculture (13,3%) – see Fig. 4. On the other hand there is a clear stagnation of changes, with a very small increase (0,4%) in industry. At the same time changes in Poland are deeper because
a little higher increase in the employment in services (than in the EU) is noted (17,0%), a considerably deeper decrease in agriculture (47%) and a clear increase (not a decrease) in the employment in industry (15,2%).

The results of the shift-share technique are extensive so their presentation is selective. It is limited to exemplary compositions and general conclusions that result from all counting.

The base of generalization are 25 separate (for countries) compositions of components evaluations of the decomposed real change of the employment in the period 2000-2008. Therefore Tab. 2 illustrates exemplary information concerning the decomposition of the employment changes in Poland in chosen EU-countries.

Table 2. The components of the decomposed change of the employment in chosen EU-countries in the years 2000 – 2008

SECTOR of Economy / Country	Change in Employment d_{ij}	Components of Employment Change: Global Growth g_{ij}	Sectoral – Mix m_{ij}	Competitive Effect c_{ij}	Competitive Effect $\hat{c}_{ij}$	Allocation Efect a_{ij}	Allocation Code 1	Allocation Code 2
SERVICES	1235,9	562,2	447,2	226,5	328,8	– 102,3	3	3
AGRICULTURE	– 2039,3	334,6	– 1382,5	– 991,4	– 234,8	– 756,5	1	1
INDUSTRY	628,4	320,0	– 320,5	628,9	631,5	– 2,6	**3**	**4**
PL – Poland	– 175,0	1216,8	– 1255,8	– 136,0	725,4	– 861,5	—	—
SERVICES	153,4	43,6	34,7	75,1	84,2	– 9,1	3	3
AGRICULTURE	– 46,5	10,4	– 43,1	– 13,9	– 6,3	– 7,5	1	1
INDUSTRY	69,1	18,9	– 18,9	69,1	70,5	– 1,4	**3**	**4**
LV – Latvia	176,0	73,0	– 27,3	130,4	148,4	– 18,0	—	—
SERVICES	242,9	117,7	93,6	31,6	32,0	– 0,4	3	3
AGRICULTURE	– 13,9	10,6	– 44,0	19,5	21,2	– 1,7	**3**	**4**
INDUSTRY	1,5	49,3	– 49,4	1,5	1,5	0,1	4	4
FI – Finland	230,5	177,6	0,2	52,7	54,7	– 2,0	—	—

Source: Own study based on EUROSTAT data.

The components values of the decomposed employment increase for particular countries have a substantial value, particularly for searched regularities.

In Poland`s case the sums of the line PL-Poland describe the general character of employment changes. Consequently if the employment changes in

Poland were subordinated to the EU-regularities, the employment would increase by 1216 000 people, and not as it was really (there was a decrease by 175 000 people). In turn, the excessive, because higher than the global one, negative effect of sectoral changes points at the over and above average employment shares in delayed sectors in comparison to the development of the EU (caused by the negative difference of the sectoral and global rate).There are mainly agriculture and, to a smaller degree, industry. The negative effect of competitiveness position means also that the employment in Poland has been increasing slower than the effect of the impact of sectoral changes or the sectoral employment structure could indicate. Polish agriculture is an unstuck, uncompetitive and delayed sector, in comparison to the EU, that reduces excessively the competitiveness of services and industry, analyzed together. The standardization of Polish employment structure by the EU-structure (the projection of the EU-structure on Polish structure) indicates that globally Polish economy could compete with other economies (the pure effect of competitiveness is positive and high) if not the strong negative allocation effect. Its value and sign mean that, even under the fulfilled criterion of sufficient rate of changes in services, there is the insufficient level of employment in this sector in comparison to the expected standard. The main cause for the lack of adaptation of the sectoral employment structure in Polish economy to the EU-standard is yet attributed to agriculture. The agriculture is characterized by the excess level and insufficient rate of employment changes and, to a certain degree, by the lack of adaptation in industry.

Components of the decomposed employment change in each country (object) may be a subject of a sectoral analysis. Details of this procedure are in: Dworak E., Malarska A. [2009]. It must be emphasized that results of the employment analyses, conducted by means of the shift-share technique, reveal the clear weakness of regional changes of employment markets in the EU in time. It appears the EU, represented by 25 countries, is an inflexible group from the point of view of structural changes.

The intersectoral allocation of the employment concerns only 5 economies (among 75), excluding of services. Moreover, the structural shifts are positive in only three countries (only agriculture in Finland and industry in Poland and Latvia are characterized by the specialization and competitiveness status).

There are two reasons for the stagnation of intersectoral employment shifts in EU-countries in the years 2000-2008: the time horizon of the research and the level of the phenomenon aggregation. The second reason is not identified owing to the lack of the data. It is obvious that the analyses with more particulars would be more preferable, at least on the level of sections of national economies. However the first reason may be verified but it must taken into account the division of the researched period into sub periods, not on the contrary.

Due to the exposition of the structural employment changes in Poland against the background of EU-countries and the assumption that the adequate turning point is the year of Poland`s accession to the EU, the shift -share technique research was conducted in two periods: 2000-2003 and 2004-2008. Its result corresponds with expectations because specifies sub periods of sectoral changes in the sectoral employment of particular countries but not in Poland.

Table 3. The allocation codes of the employment in Poland and chosen EU–countries due to sectors in the period 2000–2008 and in sub periods

Contry	2000 – 2008 AGRICULT. code 1	code 2	Count	INDUSTRY code1	code 2
PL	1	1	PL	3	4
FI	3	4	LV	3	4
EE	1	2			
HU	1	2			

Contry	2000 – 2003 AGRICULT. code 1	code 2	Count	INDUSTRY code 1	code 2
PL	1	1	PL	2	1
ES	3	4	LV	3	4
CY	3	4			

Contry	2004 – 2008 AGRICULT. code 1	code 2	Count	INDUSTRY code 1	code 1
PL	1	1	PL	4	4
FI	3	4			
HU	1	2			
EE	1	2			
ES	1	2			
CY	1	2			

Source: Own study based on EUROSTAT data.

However the disaggregation of the data, according to the criterion of time, enriched the hitherto analyses. The range of countries, in those structural changes of the sectoral employment took place, did not change. On this basis one can conclude that the identification of changes in time requires the shorter time horizon and more details of the division of the economy. Its sectoral division seems to general to show changes in the shares shifts among the analyzed structure units by means of the shift-share technique.

4. Conclusion

Tendencies of the employment changes in EU-countries and in Poland in the period 1997-2008 are increasing. The sectoral division of the employment reveals however the difference of modernization processes in EU-economies and between Polish economy and EU-economies analyzed together. Consequently the attempt of typology of EU-countries into homogenous classes, on the base of similar quotient modernization measures, in chosen years of the analysis lost because of the complexity of modernization process.

However the research revealed that Poland`s accession to the EU stimulated animators of Polish social-economic life to implement and intensify the adjustment processes. The consequence of this accession is the incoherence of changes in Polish and EU-labour markets and the natural disclosure of two stages of the sectoral employment structures in Poland with a turning point in 2003. Just in the second sub period (2004-2008), before and after the accession, the most numerical characteristics of the employment in Poland became similar to EU-tendencies but not all relative characteristics (shares expressed in percentage). The research showed the opposite direction of changes tendencies of the employees share in Polish and EU-industry just after Poland`s accession.

In turn the analysis of the stability and allocation of the employment structures in the three-sectoral formula of EU–economies, conducted by means of the shift-share technique, revealed the clear stagnation of the expected changes. Polish economy is not exceptional against the EU-background. However the exception may be the evaluation of the employment allocation in Polish industry that is characterized, according to the shift-share technique, by advantageous changes of its attributes, since the year of Poland`s accession to the EU. Polish industry appears attractive in the period 2004-2008 owing to the over standard level and the competitiveness of the rate of the employment changes against the background of the EU.

In the light of the research results the final evaluation of Polish modernization process seems to be not explicit. The used analysis instruments confirmed some aspects of modernization but the complexity of the process of structural changes requires a more detailed statistical material. The sectoral division of the employment appeared to much aggregated. It is worth noting also that the processes of changes in the employment structure, in case of Poland and other developing countries from Eastern Europe, were accompanied by the active unemployment policy, particularly after 2004.

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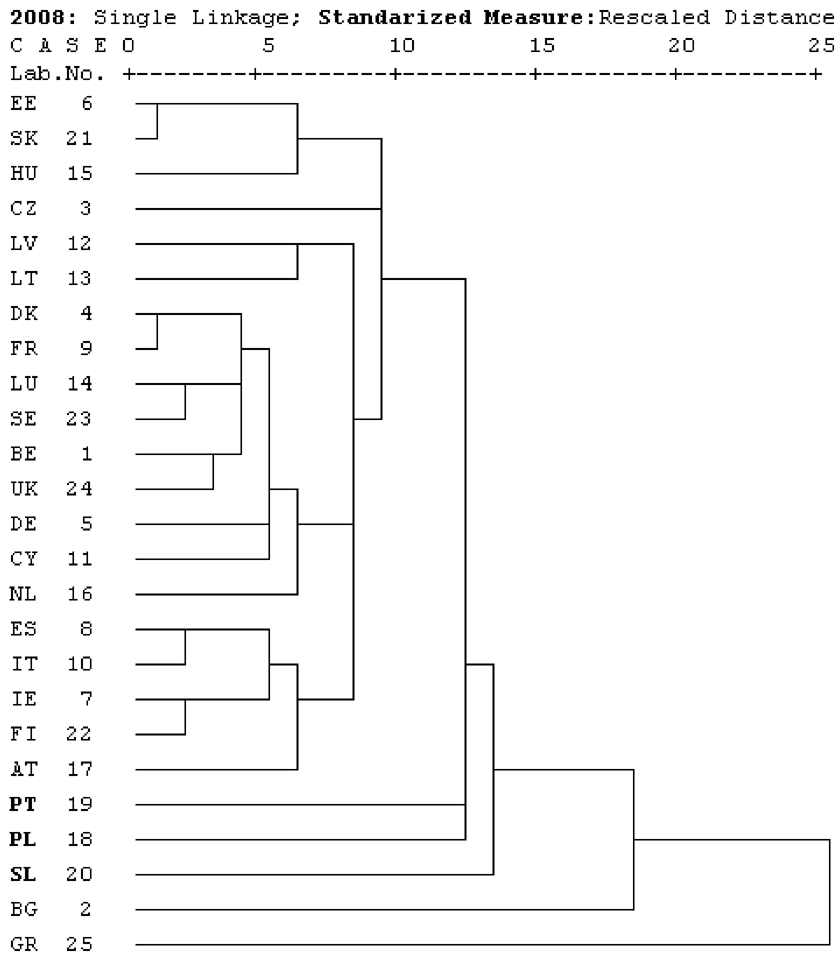
Appendix

Dendrograms of sequence binding of EU-countries into clusters using single linkage method according to alternatively formulas of normalization the quotient measures of modernization process in 2008.



2008: Single Linkage; **Izotonic Measure**: Rescaled Distance