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CHANGES IN SECTORAL STRUCTURE OF EMPLOYMENT IN POLAND IN COMPARISON TO THE EUROPEAN UNION

Abstract. The aim of the article is to prepare a diagnosis and evaluation of changes in sectoral structure of employment in countries of European Union over time. Against this background there are shown changes in economy in Poland in the years 1997-2008. To illustrate an empirical verification of the theory of three sectors by A. Fisher, C. Clark and J. Fourastiè, oriented to the assessment of modernization process of EU-countries, there were used classical instruments of statistical analysis and, a little known in Poland measurement technique of sectoral changes over time – the shift-share technique.

Key words: sectoral structure of employment, decomposition of growth, European Union, shift-share technique.

1. INTRODUCTION

Each economy may be characterized as a set of elements. The identification of these elements means describing its structure. An economic structure is therefore a set of elements of economy and relations among these elements (Nowa Encyklopedia Powszechna, [1996], p. 80; M. Klamut, [1996], p. 58; A. Łukaszewicz, A. Karpiński, [2001], p. 451). This definition has a general character. It is worth noting that the precise describing the economic structure requires the identification of individual elements of the structure. That is because the character of these elements determines the existence of various types of the structure. There are distinguished some types of the economic structure in the economic literature (E. Kwiatkowski, [1980], p. 58):

- an institutional structure,
- a territorial structure,
- a production structure.

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The institutional structure is a kind of the economic structure distinguished on the ground of forms of a production factors ownership; it comprises a state sector, a private sector, a collective sector and a mixed sector. The territorial structure is built by economic regions. The production structure comprises various areas of the economic activity, for example: branches, sections and economic sectors (W. Jakóbiak, [1997], p. 18).

It is worth pointing out that the economic structure comprising these three elements is called the structure of a *largo* sense (S. Marciniak, [1970], p. 14). Such a structure makes a base to conduct complete research of the economy. It may be well to add that the research of the economic structure is restricted most often to its chosen elements, it means to the analysis of the production or employment structure; these two types of a structure are called in the literature the structure of a *stricto* sense (E. Kwiatkowski, [1980], p. 59).

An interesting background for the research of the economic structure in a sectoral dimension is the theory of three sectors by A. Fisher, C. Clark and J. Fourastié. These authors distinguish three sectors of the economic structure: (1) agriculture, (2) industry and (3) services. The main thesis of the theory is that changes of the economic structure occur according to some rules (W. Kwiatkowska, [2009], p. 110).

A. Fisher claimed that the share of a agricultural sector in work and capital resources decreases and the share of services increases in the process of the economic development. However initially the share of an industrial sector increases in production factors resources, in later phases of the development the share of this sector decreases to the advantage of services (E. Kwiatkowski, [1980], p. 91).

C. Clark studied long-term changes of employment structures in countries characterized by a differentiated GDP per capita. He came to the conclusion that “in the process of the development the number of employees in agriculture declines in relation to the number of employees in industry, and that one decreases in relation to the number of employees in services” (C. Clark, [1957], at: E. Kwiatkowski, [1980], p. 91). These trends are confirmed, in Clark’s opinion, in underdeveloped and high-developed countries.

Similar conclusions in reference to changes of the economic structure formulated J. Fourastié. He divided the economic development into three phases: ante industrial society, industrial society and postindustrial society. In the second one he distinguished three stages: a start (characterized by a quick increase in employment in industry), an expansion (maximal employment in industry), a complement (a decrease of employment in the agriculture to the advantage of services). In the postindustrial phase employment in services amounts to about 80% of labour work (D. Hübner, M. Lubiński, [1986]).

According to A. Fisher and C. Clark the main determinant of changes of the economic structure and the employment structure are changes of the

consumption demand occurring in the economic development. They result from meeting of consumption needs which is shown by income elasticity ratios in particular phases of the economic development (W. Kwiatkowska, [2000], p. 5). In the process of the development the ratio of the income elasticity for products of the agricultural sector declines the most quickly which leads to the reduction of the agriculture. As far as industry is concerned the tendencies of the demand development for products of this sector are quite different. In the first stage of the income increase the elasticity ratios increase. In higher stages the demand for these products appears to be satisfied. Consequently the production of industry decreases. While the demand for services and the income elasticity ratios tend to increase in all stages of the economic development. The increasing demand is an incentive to accelerate the development of this sector.

To recapitulate considerations about the three sectors theory one can formulate some conclusions:

1° the sectoral structure of the employment may be considered as a vital measure of the economic development;

2° the demand for products of agriculture and industry decreases and the demand for services increases in the process of the economic development, consequently the importance of the first and second sector declines whereas the importance of the third sector grows;

3° “the centre of gravity” of the economic activity is shifted from the first sector to the third sector;

4° changes of the economic structure result from the process of the economic development but they create the economic development also (there is an interaction).

The three sectors theory seems to be very useful to assess changes in the economic structure of countries. It evaluates the level of the economic development and lays much stress on a reallocation of labour work resources among sectors. However the theory is submitted to a critical examination. So it is worth noting the theory is based on big aggregates (economic sectors). The use of common income elasticity ratios for all products of a given sector is not reliable. Moreover, for the economic development, there are important not only changes of shares of particular sectors but also changes inside these sectors which is not taken into account in this theory. Considering of the consumption demand only and ignoring of the investment demand makes also reservations.

The aim of the article is a diagnosis and evaluation of changes in the sectoral structure¹ of the employment in countries of the European Union in time. Against this background there are shown changes in Poland in the years 1997-2008. To illustrate an empiric verification of the theory of three sectors by

¹ A sector should be treated as a group of branches with a homogenous production (see. K. Górka, [2000], s. 67.

A. Fisher, C. Clark and J. Fourastiè, oriented to the evaluation of modernization processes of EU-countries, there were used classical instruments of a statistical analysis and a little known in Poland measurement techniques of sectoral changes in time - shift-share techniques.

2. METHODOLOGY OF ANALYSIS

2.1. Algorithm of proceedings

A diagnostics and an evaluation of changes of the sectoral structure of employment in EU-countries in time is subordinated to the main aim of the article. Against this background there are exposed changes of the sectoral structure of the employment in Poland.

At the first stage there are used classical tools of the statistical analysis supporting basic research. They should help to illustrate, measure and describe tendencies in changes of the state and the sectoral structure of the most important labour market characteristics in Poland against the background of changes in EU-countries.

At the next stage there is presented the application of the shift-share technique. It is assumed that results of this application allow to show other, not standard aspects of changes in sectoral employment structures in EU-countries and in Poland. Moreover they should enable to evaluate a stability of changes and a division of countries into homogenous types of the employment allocation among sectors and they allow to distinguish countries with a relative advantageous competitive position in particular sectors in EU-countries and in Poland in the analyzed period.

2.2. Presentation 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 (K. Berzeg [1978]): a national growth – g , structural changes – m , and a competitive position – c^2 . The equation for a category (variant) i of the phenomenon E in object j is as follows:

² 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

$$d_{ij} = g_{ij} + m_{ij} + c_{ij} \quad (1)$$

where

$$d_{ij} = {}_1E_{ij} - {}_0E_{ij} \quad (2)$$

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

$$g_{ij} = {}_0E_{ij} \cdot r_G \quad (3)$$

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

$$m_{ij} = {}_0E_{ij} \cdot (r_{iG} - r_G) \quad (4)$$

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

$$c_{ij} = {}_0E_{ij} \cdot (r_{ij} - r_{iG}) \quad (5)$$

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

while:

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

$$r_{ij} = \frac{{}_1E_{ij} - {}_0E_{ij}}{{}_0E_{ij}} \quad (6)$$

$$r_{iG} = \frac{{}_1E_{iG} - {}_0E_{iG}}{{}_0E_{iG}} \quad (7)$$

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

$$r_G = \frac{{}_1E_G - {}_0E_G}{{}_0E_G} \quad (8)$$

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 (1) is:

$$d_{ij} = {}_0E_{ij} \cdot r_G + {}_0E_{ij} \cdot (r_{iG} - r_G) + {}_0E_{ij} \cdot (r_{ij} - r_{iG}) \quad (9)$$

It follows from the equation (9) 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

the competitive position effect is sometimes called the differential shift or regional share – thus the name shift and share analysis

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 (9), (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 is 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 (9) is only the identity and not a behavioral relationship.

In 70-ties of the previous century two aspects of a classical formula of the shift–share equation were verified, it means: weights – ${}_0E_{ij}$ and connected effects of structural changes and of a competitive position. There was introduced a new category ${}_0\hat{E}_{ij}$ defined as a phenomenon value that would have the object j in the variant i if the phenomenon structure were the same as the global (national) structure. So that is a hypothetical level of the phenomenon category i in the object j resulting from projection of the national structure of the phenomenon on the object. Thus, the formula of ${}_0\hat{E}_{ij}$ is:

$${}_0\hat{E}_{ij} = {}_0E_j \cdot \left(\frac{{}_0E_{iG}}{{}_0E_G} \right) \quad (10)$$

where: ${}_0E_j$ – the total phenomenon level in the object j at the initial moment of the analysis.

The replacement of the category ${}_0E_{ij}$ with the expected value ${}_0\hat{E}_{ij}$ in the effect of the competitiveness position impact (5) clears it of the influence of all local structural changes. In a new version it is as follows:

$$\hat{c}_{ij} = {}_0\hat{E}_{ij} \cdot (r_{ij} - r_{iG}) \quad (11)$$

The remaining unexplained part of changes of the phenomenon ($d_{ij} - g_{ij} - m_{ij} - \hat{c}_{ij}$) is called an allocation effect (a_{ij}) expressed as:

$$a_{ij} = ({}_0E_{ij} - {}_0\hat{E}_{ij}) \cdot (r_{ij} - r_{iG}) \quad (12)$$

however:

$$c_{ij} = \hat{c}_{ij} + a_{ij} \quad (13)$$

This fourth, new element of the shift–share equation (a_{ij}) shows if the object j is specialized (in the sense of concentration) in these phenomenon variants (${}_0E_{ij} - {}_0\hat{E}_{ij}$) where it achieves bigger competitiveness advantages ($r_{ij} - r_{iG}$). 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 (${}_0E_{ij} - {}_0\hat{E}_{ij}$) and competitiveness advantages ($r_{ij} - r_{iG}$). 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	
			<i>Specialization</i>	<i>Competitive Advantage</i>
			${}_0E_{ij} - {}_0\hat{E}_{ij}$	$r_{ij} - r_{iG}$
1	Competitive disadvantage, specialized	–	+	–
2	Competitive disadvantage, not specialized	+	–	–
3	Competitive advantage, not specialized	–	–	+
4	Competitive advantage, specialized	+	+	+

Source: Own study.

Finally the modified equation of the shift–share analysis has the formula:

$$d_{ij} = {}_0E_{ij} \cdot r_G + {}_0E_{ij} \cdot (r_{iG} - r_G) + {}_0\hat{E}_{ij} \cdot (r_{ij} - r_{iG}) + ({}_0E_{ij} - {}_0\hat{E}_{ij}) \cdot (r_{ij} - r_{iG}) \quad (14)$$

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 preferable situations both characteristics have the same sign which means:

1° for signs „+” (code =4) the object is attractive in 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).

In not preferable situations both characteristics have opposite signs.

The equation (14) still does not take into account structural changes of the phenomenon in the analyzed period. However it is worth noting that weights of the basic period ${}_0E_{ij}$ are used in the effect of allocation as the difference between the real and hypothetic level of the phenomenon. The question of the adequate choice of weights is a very important problem of the allocation effect evaluation. It can be stated that the replacement of weights from the basic year with weights from the final year (${}_0E_{ij}$ with ${}_1E_{ij}$) in all elements of the equation (14) may cause a change of the allocation effect and consequently the change of interpretation due to changes in the phenomenon structure in the analyzed period. Empirically it may happen that the object is not specialized in the initial year of the analysis (${}_0E_{ij} - {}_0\hat{E}_{ij} < 0$) but it becomes specialized in the final year (${}_1E_{ij} - {}_1\hat{E}_{ij} > 0$). As the sign of the formula ($r_{ij} - r_{iG}$) 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 from 1 to 2 if

$$r_{ij} - r_{iG} < 0 \text{ and } {}_0E_{ij} - {}_0\hat{E}_{ij} > 0, \text{ but } {}_1E_{ij} - {}_1\hat{E}_{ij} < 0 \quad (15)$$

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

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

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

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

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

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

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 THE EU COUNTRIES AND IN POLAND – PRESENTATION, ANALYSIS, AND EVALUATION

3.1. The level, structure, and dynamic of phenomenon based on source materials

Data based on source materials referring to the employment in 27 EU–countries and in Poland in the years 1997–2008 point at the existence of divergence in tendencies of their changes (Fig. 1).

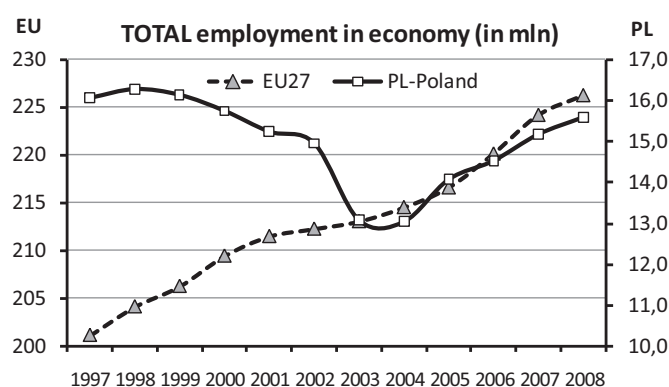


Fig.1. The level of the employment (in mln.) in 27 countries and in Poland in the years 1997–2008

Source: Own study based on <http://epp.eurostat.ec.europa.eu>

There is an opposite direction of the illustrated tendency of changes for Poland in comparison with EU–countries before Poland's accession to the EU. After the short-term stability (years 2003 and 2004), since 2004 there is a clear correction of a trend in Poland and its transformation into an opposite, coherent with an EU–direction. It happens so, because of strong perturbations, that took place in the Polish labour market, and because of variable in time tendencies in changes of the employment Fig. 2.



Fig. 2. The employment rate in 27 EU–countries and in Poland in the years 1997–2008

Source: Own study based on EUROSTAT data [See Fig.1]

Tendencies of the employment level and the employment rate became convergent after Poland's accession to the EU. In this context there appears a question referring to adjustment processes of the Polish labour market to EU–markets in the formulation of the sectoral employment structure. There is a partly answer to this question in tendencies of changes in time of the employment rates (in %) according to the three–sectoral division of 27 economies of the EU and Poland. To illustrate better this question there were transformed data based on source into absolute values of the employment with the maintenance of the total comparability of the compared economies division.

Consequently in the industry sector there are diametrically different directions of changes in indices of the employees share in Poland and in EU–countries. The increasing trend in Poland is accompanied by the declining tendency in EU–countries – see Fig. 3.

Generally tendencies of changes in the employees number in the industry sector are convergent in both subjects. After the declining phase (1997–2004) the employment grows but it does not reach the level from the initial year (1997) and it is lower in 2008 (decrease by 0.7%). At the same time it exceeds this level slightly (by 2.4%).

In the agricultural sector the turning point of differences in tendencies of changes of the employment share index in Poland and EU–countries is marked for 2003. Since that year there is a clear convergence in compared economies – see Fig. 4.

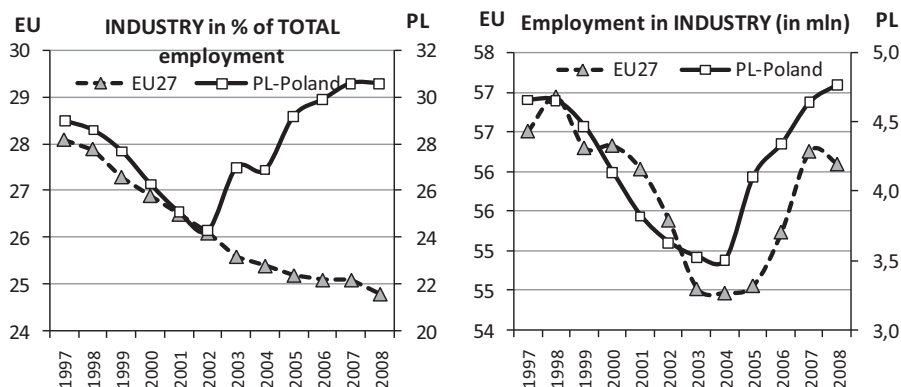


Fig. 3. The indices (%) and the level of employment (in mln) in industry in 27 EU–countries and in Poland in the period 1997–2008³

Source: Own study based on EUROSTAT data.

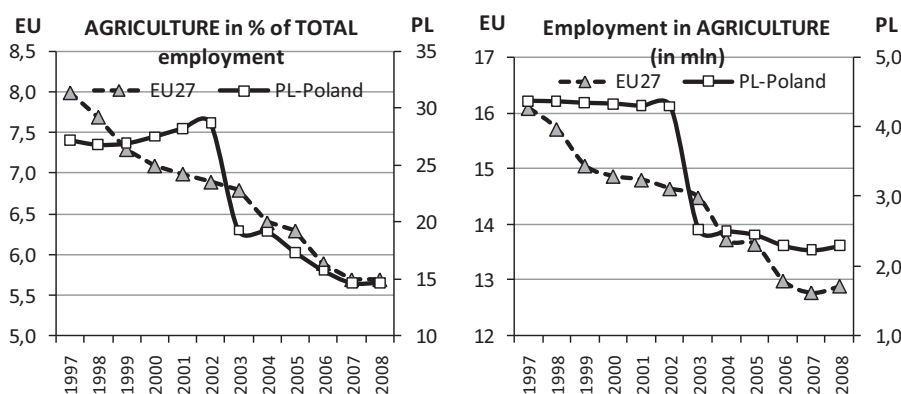


Fig. 4. The indices (%) and the level of the employment (in mln) in agriculture in 27 EU–countries and in Poland in the period 1997–2008

Source: Own study based on EUROSTAT data.

Differences in changes of the employment shares index are followed by levels of the employment in agriculture in time in Poland and in EU–countries.

³ The attentive reader notices easily two Y-axes of each presented graph (Fig. 3 – Fig. 5): the main (left)-for EU-countries and the auxiliary (right) –for Poland. The purpose of the application of a various scaling of these axes is the presenting of differences in tendencies of the phenomenon changes, and not in the levels. This aspect of differences, though visually difficult, is readable. – Fig. 3 – Fig. 9 are the authors' paper on the base of the Eurostat-data.

Since 1997 there is observed a systematic declining trend of the employment level in agriculture in EU–countries. It decreases substantially in last year of the analysis (by 19.9%). However in Poland in the years 1997–2008 a considerably bigger decrease is noted in agriculture (by 47.6%) but it results from a one–period change of the phenomenon at the threshold of years 2002/2003 (by 41.2%).

There are generally convergent, though with some variations, regularities of the employment share index and the employment level trends in services in time in compared subjects. Both characteristics point out a clear tendency of the increase in Poland and in EU–countries – see Fig. 5.

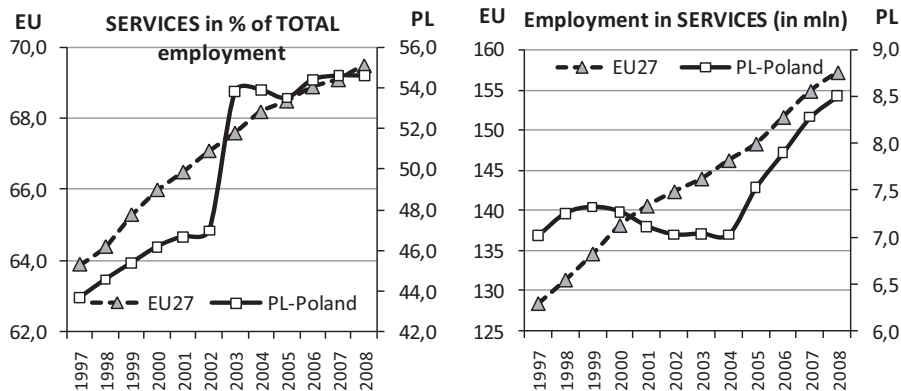


Fig.5. The indices and the employment level (in mln) in services in 27 EU–countries and in Poland in the period 1997–2008

Source: Own study based on EUROSTAT data.

Similar is the increase of the employment in services in EU–countries (by 22.3%) and in Poland (by 21.2%). However, the annual rate of the employment increase in services in EU–countries is a bit higher than in Poland (1.85% against 1.76%). Nevertheless this adequate, clearly dynamically, increasing trend in Poland occurs in the period 2004–2008 with a medium–yearly increase rate that amounts to 4.89% (against to 1.82% in EU).

In the commentary summing up this introductory stage of the analysis is necessary to lay much stress on clear advantageous tendencies of changes in Poland leading to its modernization. The employees share in Poland decreases in agriculture and increases in services, at the same time the employment share in industry increases (Fig. 6).

The analysis of trends of these basic statistical measures in time let notice that Poland's position deviates from the expected one in comparison with the regularities typical of the EU. In the context of indices the distance between

Poland and the EU according to the three-sectoral division remains still substantial. Nevertheless it is worth noting that from 2004 there are positive changes of hitherto trends in Poland towards its modernization (Fig. 6).

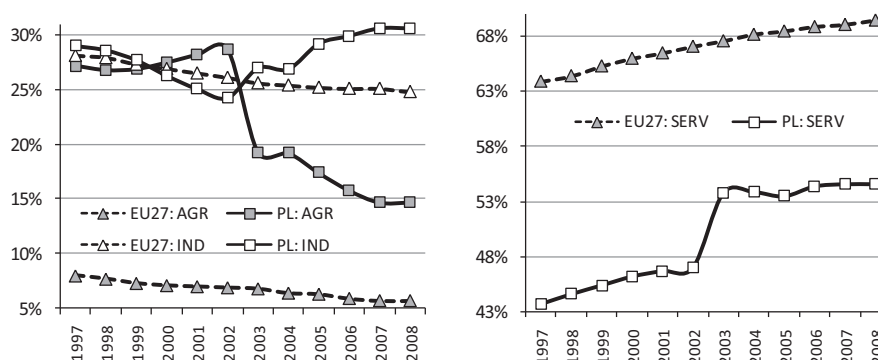


Fig.6. The employees share in 27 EU–countries and in Poland according to the three–sectoral division of the economy in the period 1997–2008
Source: Own study based on EUROSTAT data.

Classical one–basic indices of the dynamics according to distinguished economy sectors are other simple measures showing differences in rates of analyzed regularities changes in the EU and in Poland. It is vital to choose the base of reference. Considering the first year as the base of the analysis may complicate the picture of changes and the explicitness of conclusions, especially for Poland (Fig. 7).

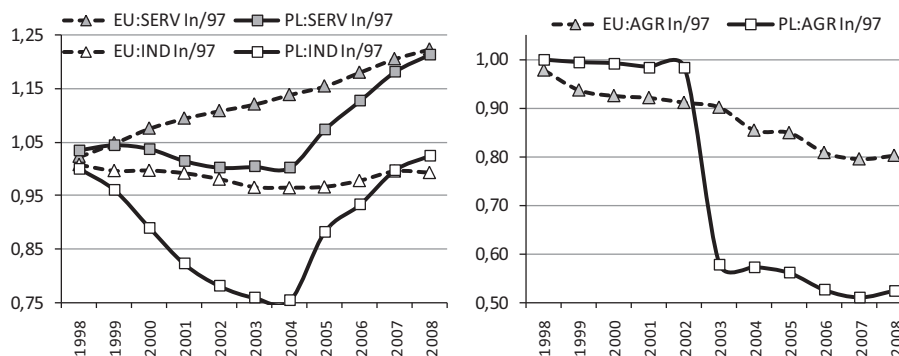


Fig.7. One–basic indices of the employment dynamics in 27 EU–countries and in Poland according to the three–sectoral division of the economy in the period 1997–2008

Source: Own study based on EUROSTAT data.

There is a clear and explicit in interpretation visualization of indices of the employment dynamics in a short term with the reference base to 2003 (Fig. 8).

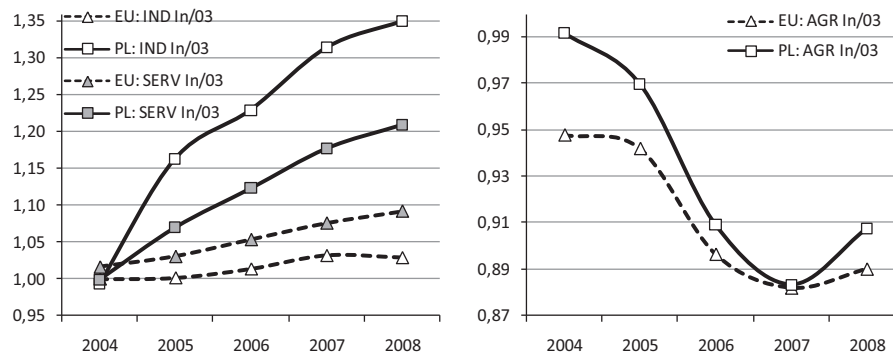


Fig.8. One–basic indices of the employment dynamics in 27 EU–countries and in Poland according to the three–sectoral division of the economy in the period 2004–2008

Source: Own study based on EUROSTAT data.

The regularities, illustrated in figure 8, confirm completely the advantageous for Poland convergence of tendencies of changes occurring in the sectoral employment in Poland and in EU–countries with a clear indication of the considerable differences in change rates (clearly more advantageous for services in Poland: medium–yearly 4.9% against 1.8%). Consequently they point at the need to intensify further the Polish economy modernization, oriented to shifts among sectors. It seems that the excess, in relation to the EU, medium–yearly employment increase rate in the Polish industry does not result from intersectoral shifts. But it results from an intensive absorption of free work resources, especially from the unemployment. The absorption is an effect of positive entrepreneurs expectations and optimistic perspectives for the improvement of economic situation owing to European cooperation.

To sum up, it must be concluded that the theory by C. Clark was verified. It can be stated that this theory is confirmed in all EU–countries together but the theory is not confirmed for tendencies of changes of adequate employees quotients in distinguished sectors of Polish economy. That remark refers to anisotropic relations of the employees number in the Polish industry and services in particular sub periods. (compare Fig. 9 with Fig. 3 and Fig. 4).

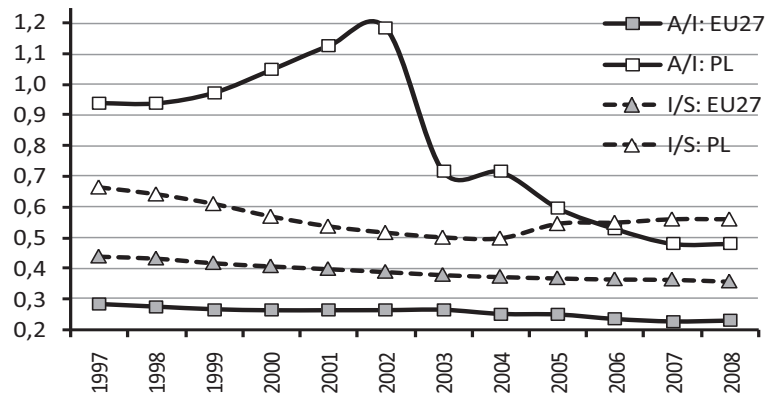


Fig.9. The quotients of the employees number in agriculture and industry (A/I), in industry and services (I/S) in 27 EU-countries and in Poland in the period 1997–2008

Source: Own study based on EUROSTAT data

Since 2004, instead of an expected one, there is noted an increasing tendency of the employment in industry (medium-yearly by 7.9%) compensating excessively the hitherto decrease (medium-yearly by 4.5%). Meanwhile the employment in services increased in both sub periods with a clear indication of the intensification of the increase rate in the years 2004–2008 (from 0.04% to the level 4.9% medium-yearly). And it is visible that the increase of the employment in services appeared to be too weak in relation to the increase of the employment in industry in order that the discussed quotient measure of the sectoral transformation confirmed clearly the changes of Polish economy towards its complex modernization.

It seems that the presented analysis of tendencies of changes in the employment sectoral structure in Poland points at its vital transformation against the background of EU-countries with much stress on Poland's adjustment processes towards the economies of EU-countries and the modernization. Nevertheless if the simple measures of the modernization process are only the values of quotients of employees analyzed in pairs sectors of agriculture and industry or industry and services, the evaluation of changes in the sectoral employment structure in time is not explicit and not in all aspects advantageous.

3.2. Allocation and stability regional structures of employed based on shift-share technique

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

In the light of the data from the 2000 and 2008 it is known that there was the dynamic increase of the employment level in EU–countries only in services (13.7%) – see Fig. 5. It was accompanied by the dynamic decrease of the employment in agriculture (13,3%)– see Fig. 4. In industry there was noted a clear stagnation of changes with a small increase (0.4%). At the same time changes in Poland are deeper because the increase of the employment in services was a little higher than in EU–countries (17.0%), the considerably deeper decrease in agriculture (47.1%) and the increase (not the decrease) of the employment in industry (15.2%).

The presentation of the shift-share technique is selective due to its many results. It is restricted to some exemplary settings and general conclusions that result from all fragmentary counting.

The base of generalizations is 25 separate (for countries) evaluation settings of components of the decomposed real change of the employment in the period 2000–2008. Therefore exemplary full information about the decomposition of the employment changes in Poland and EU–countries is presented in table 2.

The values of components of the decomposed increase of the employment for particular countries bring a lot of information about changes of examined regularities.

In case of Poland the sums of the line PL-Poland describe the general character of the employment changes. Therefore if the changes of the employment were subordinated to EU-regularities ($r_{G=EU}$), the employment would increase by 1216 thousand people and not, as it was really (there is noted the decrease by 175 this people). In turn the excessively leveling negative effect of structural changes points at over and above average employment shares in delayed sectors in relation to the development of the EU (caused by the negative difference of the sectoral and global rate $r_{i,EU} - r_{UE} < 0$). There are mainly agriculture and to a smaller degree industry. The negative effect of the competitiveness position means also that the employment in Poland increased slower than the effect of the impact of sectoral changes or the sectoral employment structure could indicate ($r_{ij} - r_{i,EU} < 0$). The Polish agriculture is an unstuck, uncompetitive and delayed sector that reduces excessively the competitiveness of services and industry analyzed together. The standardization

of the Polish employment structure by the EU–structure (the projection of the EU–structure on the Polish structure) indicates that the Polish economy could compete with other economies globally (the pure effect of competitiveness is positive and high) if not the strong negative allocation effect.

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

SECTOR of Economy	Change in Employ- ment	Components of Employment Change						
		Global Growth	Sectoral – Mix	Competitive Effect		Allocation		
Country	d_{ij}			g_{ij}	m_{ij}	c_{ij}	\hat{c}_{ij}	Effect a_{ij}
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 value and sign of this effect mean that even under the fulfilled criterion of the sufficient rate of changes in services ($r_{SER,PL} > r_{SER,EU}$) there is the insufficient level of the employment in this sector in comparison to the expected standard (${}_0E_{SER,PL} < {}_0\hat{E}_{SER,PL}$). The main cause for the lack of adaptation of the sectoral employment structure in Polish economy to the EU–standard is yet attributed to the agriculture. The agriculture is characterized by the excess level and the insufficient rate of employment changes (${}_0E_{AGR,PL} > {}_0\hat{E}_{AGR,PL}$ and $r_{AGR,PL} < r_{AGR,EU}$), and to a certain degree by the lack of adaptation in industry.

It is worth to note that the components of the decomposed employment change may be a subject of the sectoral analysis in each country (object).

Therefore in case of the Polish industry they mean only that the increase of the employment (+ 628 thousand) in the years 2000–2008 is decomposed almost to a half into a positive effect of the global impact (+ 320 thousand), leveled a bit excessively by the negative effect of the impact of sectoral structural changes (– 320.5 thousand) and the high positive effect of the impact of the local competitiveness position (+ 628.9 thousand). In turn the local competitiveness position is dominated by its pure effect (deprived of the impact of local structural changes on the level + 631.5 thousand) accompanied by the small negative effect of the employment allocation (– 2,6 thousand). Just as in the whole economy, the negative effect of the structure impact points at the over and above average employment shares in the delayed industry sector, considering the rate of changes, in relation to the EU–development ($r_{IND,EU} < r_{EU}$). However the positive effect of the competitiveness position means that the employment in the Polish industry increased faster than the effect of structural changes impact and the local sectoral employment structure could indicate ($r_{IND,PL} > r_{IND,EU}$). Though the small but negative allocation effect accompanied by the positive evaluation of the Polish industry competitiveness points at the lack of the level specialization that means the lack of the employment in relation to the expected employment (structural EU–normative).

The regularities in the Polish agriculture are different than the observed in the industry. Despite the differences of the scale they are generally convergent to the regularities of the Polish economy as a whole but the total effect of the lack of the agriculture competitiveness advantage is dominated by the negative allocation effect. That means that the employment in agriculture increased slower than it was indicated by the local sectoral employment structure ($r_{AGR,PL} - r_{AGR,EU} < 0$), however this tendency was accompanied by the disadvantageous phenomenon of the specialization level (which is known from the allocation symbol code=1). The theoretically preferable effect of the sectoral employment specialization in the Polish agriculture means its excessive concentration and the overgrowth of the level and relation to the expected EU–standard.

The increase of the employment is only decomposed into all positive effects of the global and structural impact and the impact of the local competitiveness position in services in Poland. Nevertheless after the decomposition of the effect of the local competitiveness with regard to the EU–standard of the employment level in services it appears that the relative high advantageous pure competitiveness effect is leveled in $\frac{1}{3}$ by the negative allocation effect of the employment. That results from its insufficient level in relation to the expected level (${}_0E_{SERV,PL} < {}_0\hat{E}_{SERV,PL}$) despite to the fulfilled criterium of the sufficient advantage of the employment changes rate in services in Poland in relation to the EU ($r_{SERV,PL} > r_{SERV,EU}$). And just as in industry the negative allocation effect

in services, accompanied by the positive competitiveness evaluation, points at the clear lack of specialization that means the lack of the employment level in services in Poland in relation to the EU.

An important element of the conducted research in the period 2000–2008 are the values of allocation codes, mainly their change in particular objects determined by the connection of the sectoral effects of structural changes with the competitiveness position.

On the basis of the first criterion of the codes value it appears that 14 countries are attractive with regard to the employment specialization level (higher than the expected) and the competitiveness (the rate of changes is higher than the EU standard). However the analyzed attractiveness of EU countries is territorially differentiated and not decomposed regularly in sectors. Only 2 countries, in services – Cyprus and Luxemburg, indicate the coherence of specialization and competitiveness attributes (code 1 = 4); in agriculture – 5 countries – Bulgaria, Ireland, Austria, Portugal and Slovenia; while in regard to the industrialization there is a group of 10 countries – Bulgaria (once more), Czech Republic, Estonia, Ireland (once more), Spain, Italy, Lithuania, Slovenia (once more), Slovakia and Finland. Poland does not belong to this group. (see Tab.1) Poland does not belong to the group of 12 countries with a hypothetical perspective for attractiveness (code 1 = 2) in all sectors as well. In services and industry the Polish economy is located among countries with the not specialized level, though among competitive countries, in regard to the rate of the employment changes, adequately in the 11- and 15-elements group (code 1 = 3). However the Polish economy, in agriculture, with a characteristic overgrowth of the employment level, is located among 6 countries, in this among 5 countries from Eastern Europe (Estonia, Lithuania, Latvia, Hungary) and Greece.

In the light of the second criterion of code changes – sensitiveness of the allocation sign (connected with the change of the comparisons base of employment levels from the initial period to the final period) it is known that there are not observed changes of codes in services in all EU–countries. The stagnation proves that no one of EU–countries changes its hypothetical status quo in coherence categories of the specialization evaluation of the employment and competitiveness level in services. However in industry there are noted positive changes of the allocation codes (3 → 4) only in two EU–countries (Poland and Latvia), consequently the advantageous changes in the regional employment structure. Hypothetically, these both economies take the advantage of competitiveness (code 1 = 3) and gain attractiveness in the light of the evaluation of the allocation effect (the sign of the code 2) because the positive effects of the employment specialization and the local competitiveness positions of both countries appear to be coherent (due to the proper restructuring: ${}_1E_{IND,PL} > {}_1\hat{E}_{IND,PL}$ and ${}_1E_{IND,LV} > {}_1\hat{E}_{IND,LV}$).

The characteristics of the employment allocation in agriculture of EU-countries is quite different from the presented above. Only agriculture of three countries gain attractiveness in the light of the second code. As the hypothetical evaluations of the employment specialization appear to be coherent with the local competitiveness positions only in these countries. But only for the Finnish agriculture both attributes of the employment allocation are positive ($3 \rightarrow 4$) which means the employment specialization ${}_1E_{AGRI,FI} > {}_1\hat{E}_{AGRI,FI}$ and competitiveness in the Finnish agriculture ($r_{AGRI,FI} > r_{AGRI,FI}$), while both characteristics of allocation are negative ($1 \rightarrow 2$) for the agriculture of Estonia and Hungary (${}_1E_{AGRI,EE} < {}_1\hat{E}_{AGRI,EE}$ and $r_{AGRI,EE} < r_{AGRI,EE}$ and ${}_1E_{AGRI,HU} > {}_1\hat{E}_{AGRI,HU}$ and $r_{AGRI,HU} > r_{AGRI,HU}$). This sector in both countries is characterized by the lack of specialization of the employment level and the competitive disadvantage which locates the agriculture of Estonia and Hungary in the group of prerevolutionary countries, with good perspectives for changes, if only the thrived rate of the employment changes evokes the growth of its level, sufficient to beat the saturation threshold.

The presented results of the employment research, by shift-share technique, seem to show the clear weakness of labour markets changes in the EU in time. It appears that, from the point of view of changes in sectoral employment structures, the Union, represented by 25 countries, is a not elastic group that submits weakly to structural changes among sectors in the analyzed period.

The intersectoral allocation of the employment refers to not many countries (only 5 economies among 75 possible) with the whole excluding of services. It is worth noting that the structural shifts appear to be stricte positive in only 3 countries (the Finnish agriculture, Polish and Latish industry are characterized by the status of specialization and competitiveness).

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 subperiod, 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.

In economies of Finland, Estonia and Hungary the structural changes of the sectoral employment took place only in the second period, in Latvia – in the first

period while the Polish industry is characterized by two different processes in time. In the first stage (2000–2003) the uncompetitive Polish industry ($r_{IND,PL} < r_{IND,EU}$) gained attractiveness (presented by the positive change of the allocation codes (1 → 2)) in categories of the prospective development losing however the attribute of specialization (${}_1E_{IND,PL} < {}_1\hat{E}_{IND,PL}$). In the next period (2004–2008) the not specialized and uncompetitive Polish industry used the hypothetical chance of changes and grew attractive (code 1 = 4) both due to the specialization (${}_0E_{IND,PL} > {}_0\hat{E}_{IND,PL}$) and the competitiveness position ($r_{IND,PL} > r_{IND,EU}$) which is confirmed in the evaluation of the sensitiveness of the allocation effect, expressed in the second code (code 2 = 4; ${}_1E_{IND,PL} > {}_1\hat{E}_{IND,PL}$ and $r_{IND,PL} < r_{IND,EU}$). Table 3 illustrates some more detailed data proving the conducted research from the point of view of this evaluation.

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

Country	2000 – 2008				Country	2000 – 2003				Country	2004 – 2008			
	AGRICULT.		INDUSTRY			AGRICULT.		INDUSTRY			AGRICULT.		INDUSTRY	
	code 1	code 2	code 1	code 2		code 1	code 2	code 1	code 2		code 1	code 2	code 1	code 2
PL	1	1	PL	3	4	PL	1	1	PL	1	1	PL	4	4
FI	3	4	LV	3	4	ES	3	4	LV	3	4	FI	3	4
EE	1	2				CY	3	4				HU	1	2
HU	1	2										EE	1	2
												ES	1	2
												CY	1	2

Source: Own study based on EUROSTAT data.

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 does not require the shorter but the longer time horizon and making more detailed the division of the economy. Its sectoral division seems too general to be the adequate statistical material that can show changes in the shares shifts among the analyzed structure units, using the shift–share technique.

4. CONCLUSIONS

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 between of the Polish economy and the EU-economies analyzed together. Poland's accession to the EU stimulated animators of the Polish social-economic life to implement and intensify the adjustment processes. The consequence of this accession is the incoherence of changes in the 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 the EU-tendencies but not all relative characteristics (shares expressed in percentage). The research revealed the opposite direction of changes tendencies of the employees share in the Polish and EU-industry just after Poland's accession.

In turn the research of the allocation and stability of the employment structures in the three-sectoral formula of EU-economies, done by the shift-share technique, revealed the clear stagnation of the expected changes. The 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 the Poland's accession to the EU. The Polish industry appears to be attractive in the period 2004–2008 due 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 the Polish modernization process seems to be ambivalent. The used analysis instruments confirmed some aspects of modernization but the complexity the process of structural changes requires the more detailed statistical material. The sectoral division of the employment appeared too 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, especially after 2004.

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ZMIANY W SEKTOROWEJ STRUKTURZE ZATRUDNIENIA W POLSCE NA TLE KRAJÓW UE

Przedmiotem opracowania jest diagnostyka i ocena przeobrażeń w sektorowej strukturze zatrudnienia w krajach UE w czasie. Na tym tle eksponowane są zmiany w GN Polski w okresie 1997–2008. Dla zilustrowania i empirycznej weryfikacji teorii trzech sektorów A. Fishera, C. Clarka i J. Fourastie zorientowanej na ocenę procesu modernizacji unijnych gospodarek wykorzystane zostały klasyczne narzędzia analizy statystycznej oraz mało znana w Polsce, a popularna w USA, technika pomiaru sektorowych zmian strukturalnych w czasie, jaką jest technika przesunięć udziałów (shift-share).

Słowa kluczowe: sektorowa struktura zatrudnienia, dekompozycja zmian, Unia Europejska, technika shift-share.