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Comparative Analysis Of Employment Sectoral Structure In European Union Countries

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In the article there are analyzed general tendencies and typology of employment sectoral structure as an indicator of economy's development process in the European Union member states (excluded Luxembourg, Bulgaria and Romania).The aim of the article is to compare and estimate Estonian economic policy's results from the structural convergence aspect in the EU.Appeared that in addition to general tendency of tertiarization the EU countries are characterized also by relatively clear and stable static typology at the beginning of 21st century. At that, it differs depending on way of classifying in some respects. Seeing basic indicators as the bases for classification – 14 shares of the branches of activities, we will reach to four groups. But applying the first two main components, which describe slightly more than a half of initial attributes from variation, there distinguish three groups of countries:

- *West and North European welfare countries with developed service economy;*
- *South European countries, where tourism economy has successfully engaged the position instead of industry;*
- *Central and East European transition countries, what have maintained relatively big manufacturing sector, but are reducing it in favor of business and as well individual services.*

Field of Research: Economics

1. Introduction

A change in a state economy's sectoral structure is natural part and also expression of development process. Consequently, from the objective of analysis there are applied different indicators for researching economy's sectoral structure: the share of economic sector in employment, added value by the sector or the share in GDP creation etc. However main development tendencies appear in all structure models. In the developed countries the first trend is 'tertiarization' - it means the change towards service economy. Fourastié (1954) was the first one who pointed attention to it. The increase in share of services can be explained by different factors. Most widespread are the hypothesis of externalization and innovation (Kulke 1998, Welsch 2000).The first of them explains increase in the share of services with development of labor division and with the fact that supporting activities of production (first of all logistical) have become independent. The second sees the reason in

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increase of knowledge capacious economy in principle, which is related with internalization and globalization, just increasing demand for knowledge capacious science-development and as well for marketing services. Detailed empirical overview is offered by OECD 2000.

The current analysis is based on employment data in 14 economic sectors from *Eurostat* database, whereby for principal clarity we have chosen three letter acronyms for each sector (see Table 1). Of course, in analyzing there has to be consider, that even if the *Eurostat* reporting has been done on uniformed principles, the concrete EU countries data may be not correctly comparable. Under the analysis are aggregated data, and changes in concrete sectors and enterprises may not adequately reflect in aggregated statistical reports. Undoubtedly, the data is affected by the fact that the countries in sample are in different economic development cycles and they have somewhat different culture of statistical reporting.

Table 1. Classification of economic sectors in analysis

Classification code in the *Eurostat* database	Economic sectors	Sector mark in analysis
A+B	Agriculture, hunting, forestry, fishing	AGR
C	Mining industry	MIN
E	Energy, gas- and water supply	EGW
D	Industry (excl. construction)	MAN
F	Construction	CON
G	Wholesale- and retail trade, repair of motor vehicles and household appliances	WRT
H	Hotels and restaurants	HOR
I	Transport, warehousing, communication	TRA
J	Financial mediation	FIN
K	Real estate, renting and business services	REB
L	Public administration and national defense, compulsory social insurance	PAD
M	Education	EDU
N	Health care and social care	HES
O	Other social and individual services	OTH

Source: *Eurostat*

The aim of current article is to compare and estimate Estonian economic policy's results in terms of structural convergence in the EU context up to the present and concretize policy goals of following years. For that purpose the following research questions are set up:

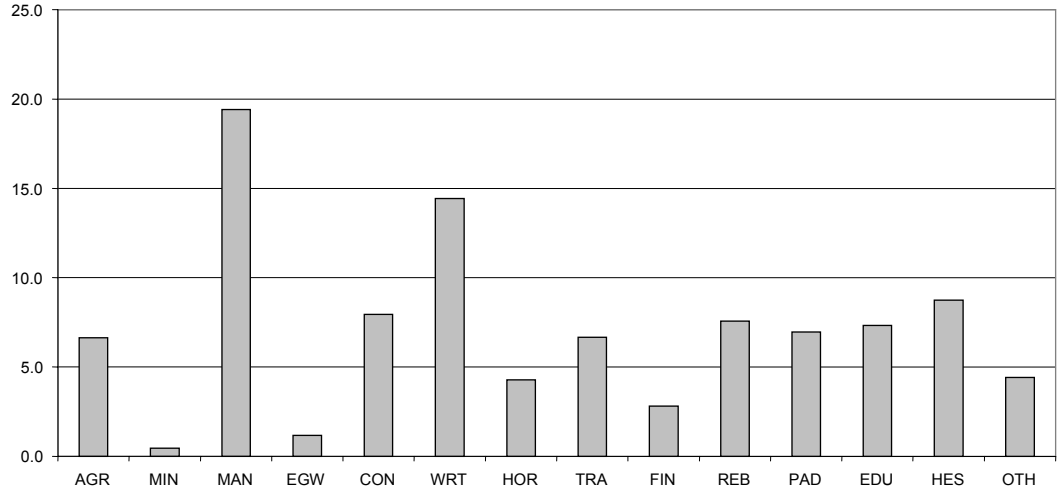
- Which changes have taken place in the economic structure of the EU countries, including in Estonia?
- Is it possible to classify countries by economic structure and its dynamics, and to which countries resembles Estonia?

- What kind of latent general indicators (components) of sectoral economic structure are possible to point out and how they can be explained?

2. Typology Of Sectoral Employment Structure On The Basis Of Individual Indicators

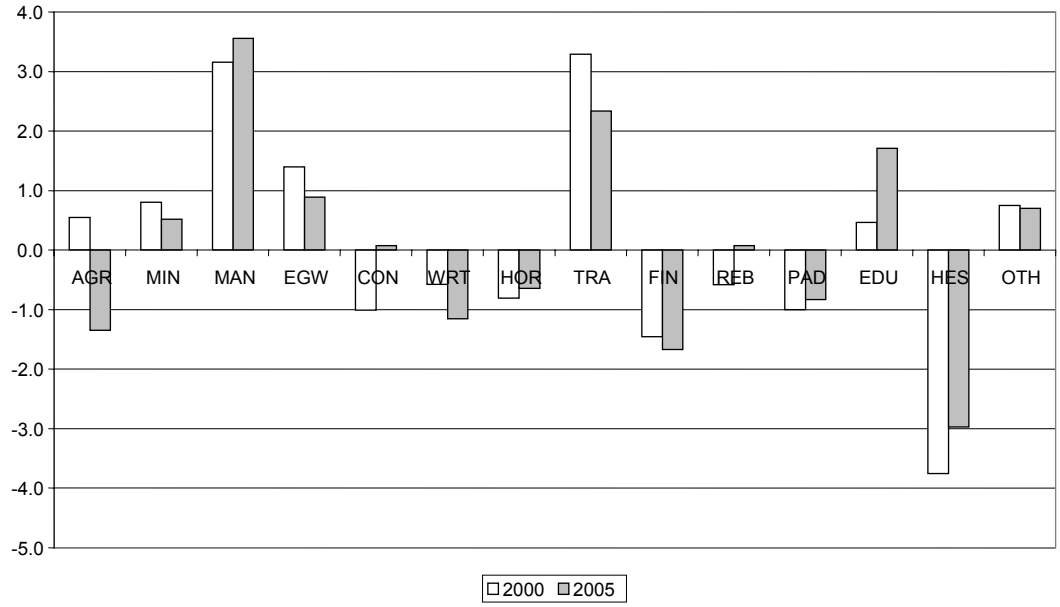
The shares of economic structure in employment on the average of EU-24 sample on data of years 2000 and 2005 are described in Figure 1. Estonian differences from the general average indicator are seen in Figure 2. Appears that services sector dominates in the EU employment data. However, from single sectors the highest ratio has still manufacturing sector (around 20%). In the services sector the highest share has wholesale and retail trade – around 15 % from the total employment. Estonia sticks out in employment structure just because the high ratio of industry and transport, and low share of health care and social services. In addition to it, we can find the same tendencies (decreasing share of agriculture and increasing share of financial mediation and real estate) in Estonian economic sectoral structure, which are characteristic for the other countries under the observation, but also contrary development tendencies in the other sectors. For example, the share of manufacturing industry has been increasing in certain extent during the period in question.

Figure 1. Average shares of economic sectors in the employment of EU-24 in years 2000 and 2005 (%)



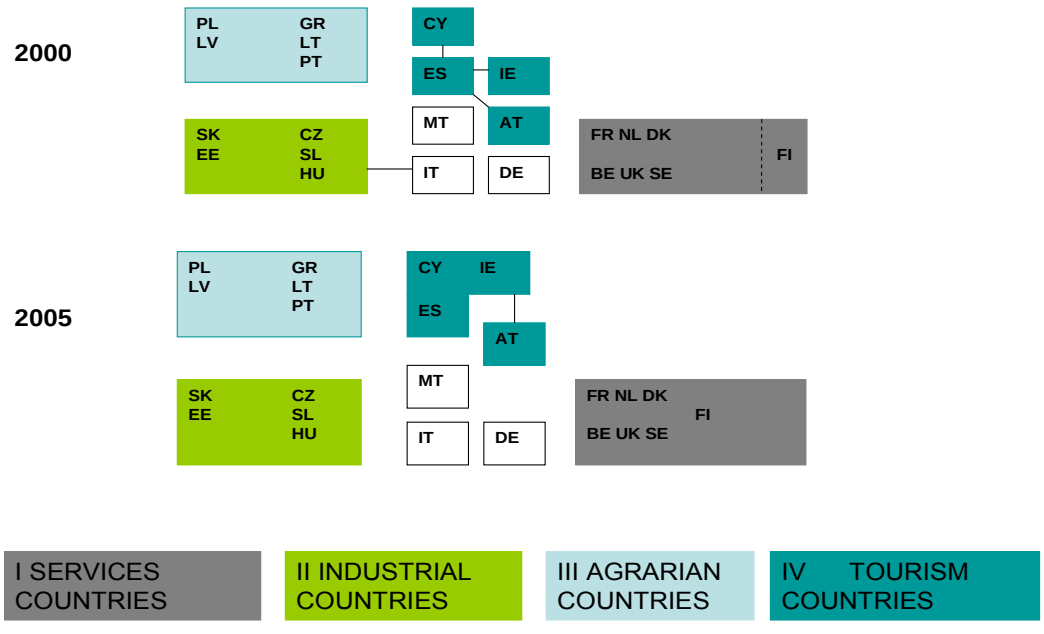
For explaining whether it is possible to classify countries by their sectoral structure and to which countries is Estonian economy similar in terms of its sectoral structure development, there has been done cluster analysis applying correlation tree method. Interstate correlations have been found on the basis of the 14 economic sectors percentage deviations by countries from corresponding economic sector average (arithmetical) percentage in sample in each year. The result is correlation matrix of 24*24.

Figure 2. Estonian differences from the general average shares of the EU-24 employment (percentage points)



In particular case, for constructing the correlation tree, there are graphically integrated countries, which have similar sectoral structure, characterized by correlation coefficient at least 0,6. If there appear groups of countries, which all members have associated connection exceeding required level then these belong to one box. The results are reported in Figure 3.

Figure 3. Sectoral typology of employment



Three stable groups differ in both years.

I. Developed welfare countries with service economy (7 countries): France, Belgium, the Netherlands, Great Britain, Denmark, Sweden, Finland.

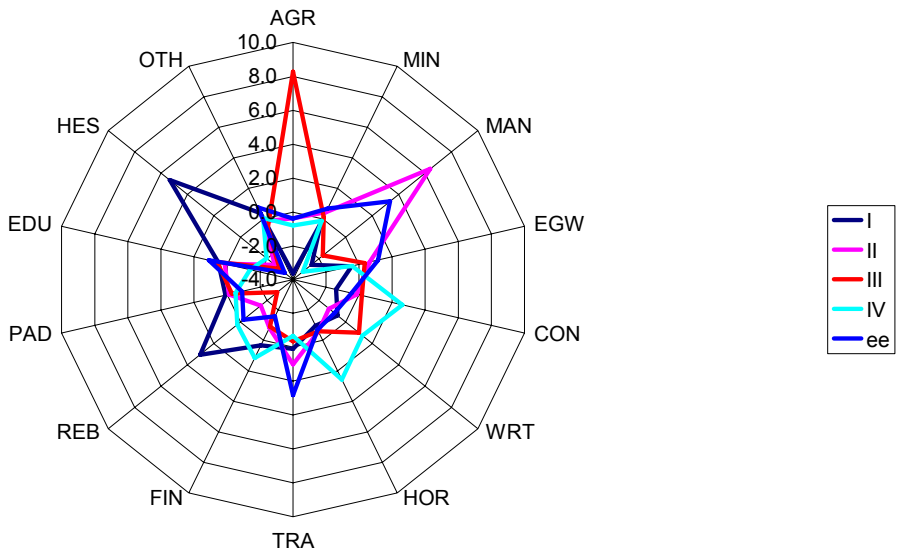
II. Industrial transition countries (5): Czech Republic, Hungary, Slovakia, Slovenia, Estonia.
III. Agrarian countries (5): Poland, Latvia, Lithuania, Portugal, Greece.

Table 2. Deviations of sectoral shares from the average of years 2000-2005 by countries and by the groups of similar countries in year 2000 and 2005

Country	AGR	MIN	MAN	EGW	CON	WRT	HOR	TRA	FIN	REB	PAD	EDU	HES	OTH
I0	-3.5	-0.3	-1.5	-0.5	-1.6	-0.6	-1.0	0.2	0.4	2.8	-0.1	0.1	5.0	0.3
I5	-3.8	-0.3	-3.8	-0.5	-1.2	-0.7	-0.9	0.0	0.3	3.3	0.2	0.9	5.7	0.4
II0	0.3	0.6	6.5	0.8	-0.6	-1.1	-0.9	1.5	-0.8	-2.2	-0.1	0.0	-2.8	-0.2
II5	-1.1	0.3	6.3	0.5	0.3	-1.4	-0.3	0.6	-0.8	-0.9	-0.2	0.3	-2.4	-0.1
III0	9.7	0.2	-1.0	0.4	-0.3	0.7	-0.7	-0.5	-0.9	-3.5	-0.6	0.6	-3.1	-0.7
III5	6.9	0.1	-2.5	0.2	0.6	1.2	-0.5	-0.2	-0.9	-2.2	-0.1	0.6	-2.8	-0.5
IV0	-0.3	-0.1	-2.2	-0.4	2.0	1.5	2.7	-0.6	1.2	-0.4	-0.4	-1.6	-2.5	-0.2
IV5	-1.3	-0.1	-4.3	-0.5	3.2	1.0	2.4	-0.7	1.1	0.8	-0.7	-1.2	-1.4	0.3
it0	-1.4	-0.2	3.8	-0.4	-0.3	1.5	-0.4	-1.0	0.3	-0.6	2.2	-0.4	-2.7	-0.2
it5	-2.5	-0.3	1.9	-0.4	0.5	0.7	0.4	-1.2	0.0	2.9	-0.3	-0.5	-1.9	0.4
de0	-4.0	0.0	3.9	-0.4	0.6	-0.2	-1.0	-1.2	0.8	0.4	1.5	-2.1	1.4	0.9
de5	-4.3	-0.1	2.6	-0.3	-1.4	0.0	-0.7	-1.3	0.8	2.1	0.9	-1.6	2.6	1.5
mt0	-4.9	0.1	3.8	1.1	-1.0	-0.2	3.0	1.1	0.8	-3.5	1.6	0.8	-1.6	-0.4
mt5	-4.6	-0.1	0.0	0.7	0.3	-0.1	4.0	1.1	1.1	-2.2	1.5	0.4	-0.8	-0.2
ee0	0.5	0.8	3.2	1.4	-1.0	-0.6	-0.8	3.3	-1.5	-0.6	-1.0	0.5	-3.8	0.8
ee5	-1.3	0.5	3.6	0.9	0.1	-1.2	-0.6	2.3	-1.7	0.1	-0.8	1.7	-3.0	0.7

The fourth (IV) group is internally little more heterogeneously formed by so-called tourism countries Spain, Cyprus, Ireland and partly also Austria, which are characterized by relatively high share of hotel services and construction in employment structure. If in year 2000 the first three of them were characterized by such heterogeneity, what did not allow to see them as homogenous group, then by year 2005 those countries were similar enough (excluded Austria). However, the transitions between the types are smooth, what is evidenced by the existence of so-called interim countries. Here we can talk about Germany and partly Italy, what are locating between the groups of industrial and service countries, and about Malta and partly Italy locating close to the tourism countries (see Table 2). The differences in terms of employment sectoral structure in given four groups of countries and Estonia's position in it may observed statically – on the basis of average deviations in year 2000 and 2005, as well dynamically – observing changes of countries positions in 2000-2005.

Figure 4. Differences of the main structural types and Estonia's position on the average in 2000-2005 (percentage points)

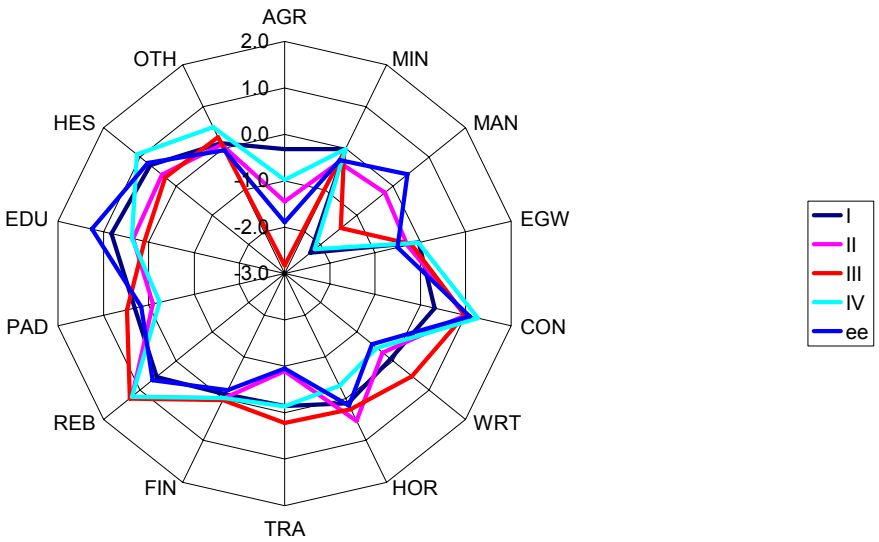


1. Observed on the average of the period (see Figure 4), the differences in employment structure between the groups of countries are obvious, because all the groups have their own peaks (the sector with the highest share in general employment). The first group of countries (I) differs first of all in health care and business services (HES, REB), the second (II) in manufacturing, the third (III) in agriculture and fourth (IV) in construction and general trade (WRT) high share in employment. Estonia belongs to the group of industrial transition countries (II group) in both years. The share of industry in employment in Estonia exceeds the EU-24 average by more than 3 percentage points and this difference has been increased by year 2005. In its own group the share of industry still stays under the average. Here Estonia's position is comparable with Germany and Italy. Estonia differs from welfare countries (I group) because lower share of health care employment. Fortunately, here is recognizable small positive trend. Estonia's constant difference among the transition countries as well in general is substantially higher share of transport and communication (TRA) in employment.

2. Observing structural changes in the course of time (see Figure 5), there is recognizable that differences between the groups are decreasing. All groups are characterized by diminishing agrarian sector in employment, whereby the biggest change is in present agrarian countries (III group) and the smallest in these countries where particular change has been taken place already earlier (I group). On the other hand, in the share of industry there are different tendencies. There has not taken place deindustrialization in industrial transition countries (II group), including Estonia, during the period under observation, but indeed this process has happen in the countries already in service economy (I group). The biggest growing sector has been construction (CON) and business services, including real estate development (REB). Especially striking is this tendency in case of backward developed South European and transition countries. Estonia sticks out in dynamics additionally to deviating from

trend of deindustrialization also with the highest positive change in ratio of education employment.

Figure 5. Variables of the shares of economic sectors in groups of countries with similar structure and in Estonia 2000-2005 (percentage points)



3. Latent Components Of Employment Sectoral Structure

Development of economic sectors is mutually densely connected and changes in one sector cause inevitably changes in the other sectors. In the sectoral structure and in its development also appear general factors of state economic development, which are common to several sectors. Consequently from that, in the second part of this study, there are analyzed correlative connections between individual indicators, which are characterizing state economic structure in the EU-24. Afterwards, are pointed out also the generalized indicators, what are characterizing the economic structure of countries, it means factors (applied factor- /component analysis), what aggregate information about inter-sectors economic connections and are mutually independent. Following is based on the data of employment in 13 economic sectors (*Eurostat* economic activities C and E are integrated into economic sector MEG). There have analyzed data of 24 countries in two years (2000 and 2005), hereby in all 48 observations. From Table 3 appears, that two groups of sectors are mutually connected having tight and positive internal connections. These groups of sectors are:

- trade, hotel services, catering and construction (WRT, HOR, CON),
- business services, health care and other services (REB, HES, OTH).

The last trio contrasts most sharply to primary sector (AGR, MEG).

Therefore, there is evidence for the base that differences in countries' sectoral structure of employment recede to smaller number of more general factors, what is possible to analyze in method of main components. The analysis indicated, that two first factors explain more than half of the total variation of origin indicators. In interpretation of factors as general components or dimensions of the structure there

is reasonable to go through three steps, analyzing connections between the origin indicators of the structure as well with the other socio-economic indicators.

Table 3. Correlative connections of the shares of economic sectors on the basis employment of EU-24 in year 2000 and 2005

	AGR	MEG	MAN	CON	WRT	HOR	TRA	FIN	REB	PAD	EDU	HES	OTH
AGR	1.00												
MEG	0.40	1.00											
MAN	-0.01	**0.51**	1.00										
CON	0.02	-0.11	-0.13	1.00									
WRT	0.23	-0.26	**-0.58**	0.34	1.00								
HOR	-0.17	-0.25	-0.27	**0.57**	**0.51**	1.00							
TRA	-0.12	**0.58**	0.20	-0.34	-0.30	-0.28	1.00						
FIN	-0.49	-0.48	-0.41	0.19	0.37	**0.56**	-0.31	1.00					
REB	**-0.66**	**-0.64**	-0.38	-0.23	-0.17	-0.11	-0.11	0.31	1.00				
PAD	-0.29	-0.06	0.00	-0.08	0.18	0.18	0.11	0.32	-0.12	1.00			
EDU	0.12	0.28	-0.08	-0.46	-0.22	-0.49	0.47	-0.39	-0.03	-0.03	1.00		
HES	**-0.54**	**-0.51**	-0.29	-0.44	-0.37	-0.38	-0.02	0.16	**0.78**	-0.14	0.17	1.00	
OTH	**-0.52**	-0.21	-0.21	-0.15	-0.11	-0.16	0.28	0.19	**0.57**	-0.11	0.17	0.44	1.00

1. **Factor loads**, which show factors' connections with the origin indicators (with the shares of sectors) after the rotation of factors in *varimax* method, are given in upper part of Table 4 and in Figure 6.

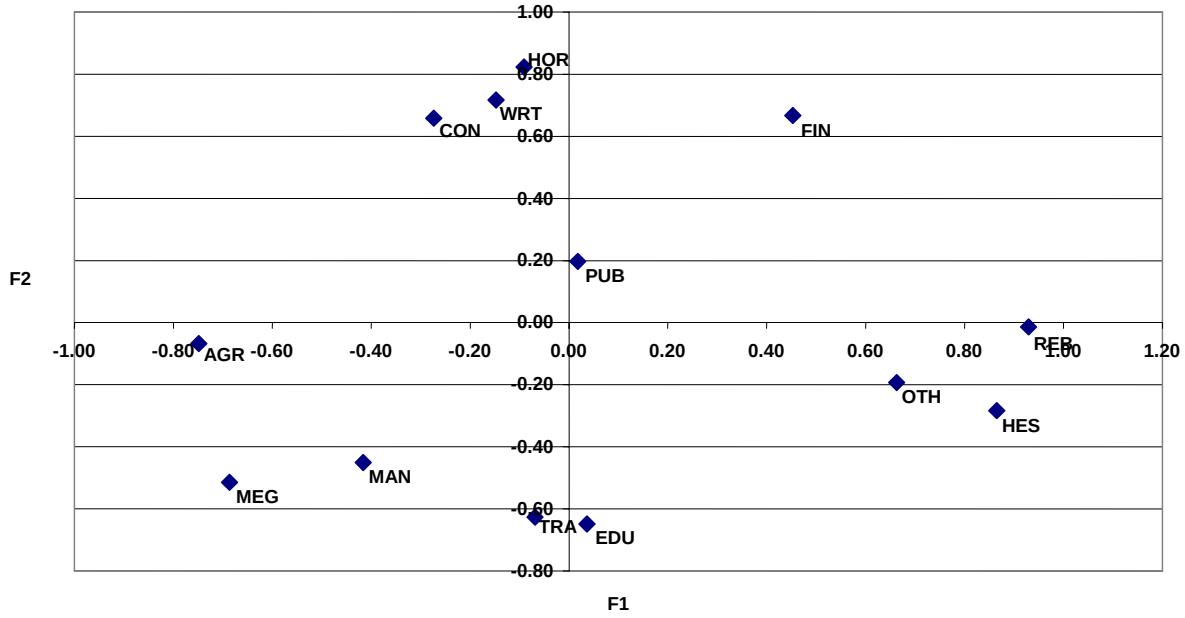
Table 4. The factor loads of main components of the employment sectoral structure in the origin indicators and their correlation with some socio-economic indicators

Sector	F1	F2
AGR	**-0.75**	-0.07
MEG	**-0.69**	-0.51
MAN	-0.42	-0.45
CON	-0.27	**0.66**
WRT	-0.15	**0.72**
HOR	-0.09	**0.82**
TRA	-0.07	**-0.63**
FIN	0.45	**0.67**
REB	**0.93**	-0.01
PAD	0.02	0.20
EDU	0.04	**-0.65**
HES	**0.86**	-0.28
OTH	**0.66**	-0.19
GDP per capita	**0.85**	0.33
Investments of enterprises (% of GDP)	**-0.57**	-0.11
Economic growth (%)	**-0.43**	-0.35
Public debt (% of GDP)	0.18	**0.50**
Inequality of income (ratio of outside quintiles)	**-0.50**	0.19
Education costs (% of GDP)	**0.45**	-0.26
R&D costs (% of GDP)	**0.81**	-0.29
High-tech export (% of export)	0.35	0.08
Working time (hours)	**-0.70**	-0.05

As we could expect on the basis of correlations, contrast **in the first main component** of employment structure manufacturing (especially primary) and service sector in general. At that, there is possible to talk about **service economy component** by the signs of factor loads. However, it is remarkable that not all spheres of service sector do associate with the first component similarly. Thus there is lacking positive connection with the shares of public administration and national defense, but also the shares of education and trade. At that is very important connection with the development of real estate and health care services. The last gives a possibility to talk about the first dimension as **welfare economy component** of sectoral structure.

The second main component contrasts 'soft' sectors of so-called **tourism economy** (positive loads of HOR and WRT) to more technical and more human capital demanding development direction, what reflects in negative loads of TRA and EDU. Because negative are also the loads of manufacturing and energy, we may name the second main component, after its reciprocation, to dimension of **technological development**.

Figure 6. Two main components of the employment sectoral structure (factor loads)



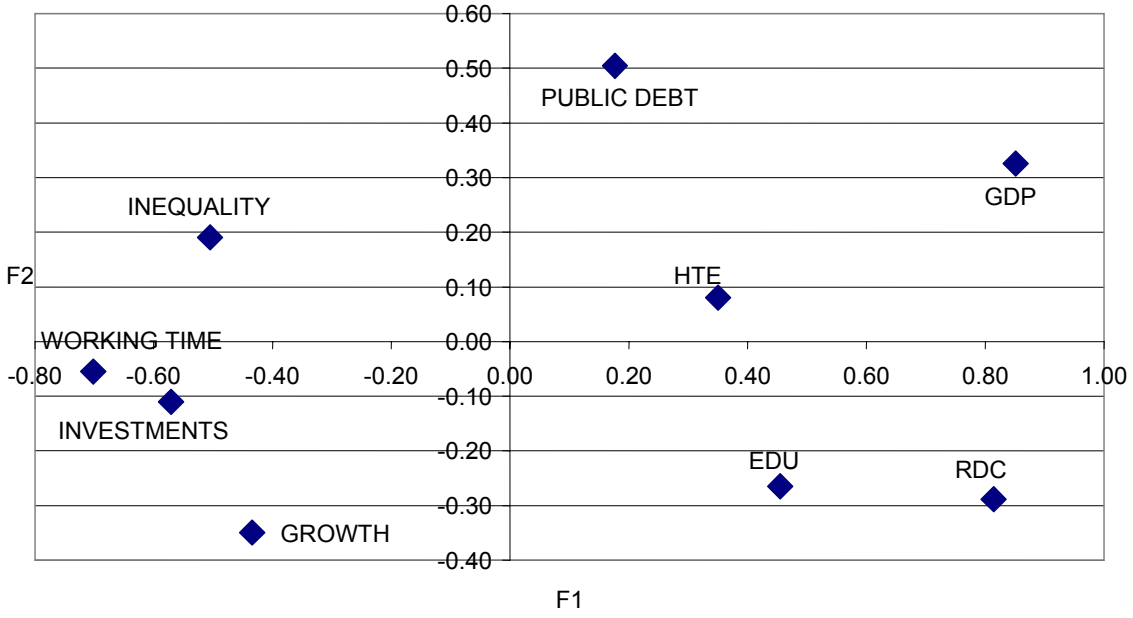
2. For interpretation the main components of sectoral structure there should avail their linkage with the other **main indicators of socio-economic development** (see the lower part of Table 4 and Figure 7):

Expectedly associates the first - welfare component with higher income level and at the same time with shorter working time *per capita*. It has strong positive connection with research and development costs and equality of income distribution, slightly more moderate is it with the share of education costs and high-tech export. Total quantity of investments and economic growth is negatively affected by this component, what talks about β-convergence in the EU – the richer countries are

developing slower. On the other hand, the second component shows strong positive connection only with size of public debt, at the same time, being moderately negatively connected with R&D and education costs as well with economic growth, but accompanying with income level.

3. In interpretation of components important role have also **factor scores**, what characterize particularities of the component by countries. Countries' position change of employment structure in the observed main components space is given in Figure 8. Here we recognize also familiar principles from the cluster analysis, but in lesser differentiated form. The countries may divide only into three groups – developed welfare countries, the South European countries and transition countries. The first and the last group of countries are clearly differentiated by the first main component, and the second group differs from the others because of relatively high level of the second component (tourism economy).

Figure 7. Correlation of the main components of the employment sectoral structure with some country's socio-economic indicators



New phenomenon is the movement of countries in factor space, which main tendency is inclination from left to right in 2000-2005, it means development towards service and welfare economy (Figure 8 and 9).

Figure 8. The movement of the EU-24 countries in the factor space on employment sectoral structure in 2000-2005 (factor scores)

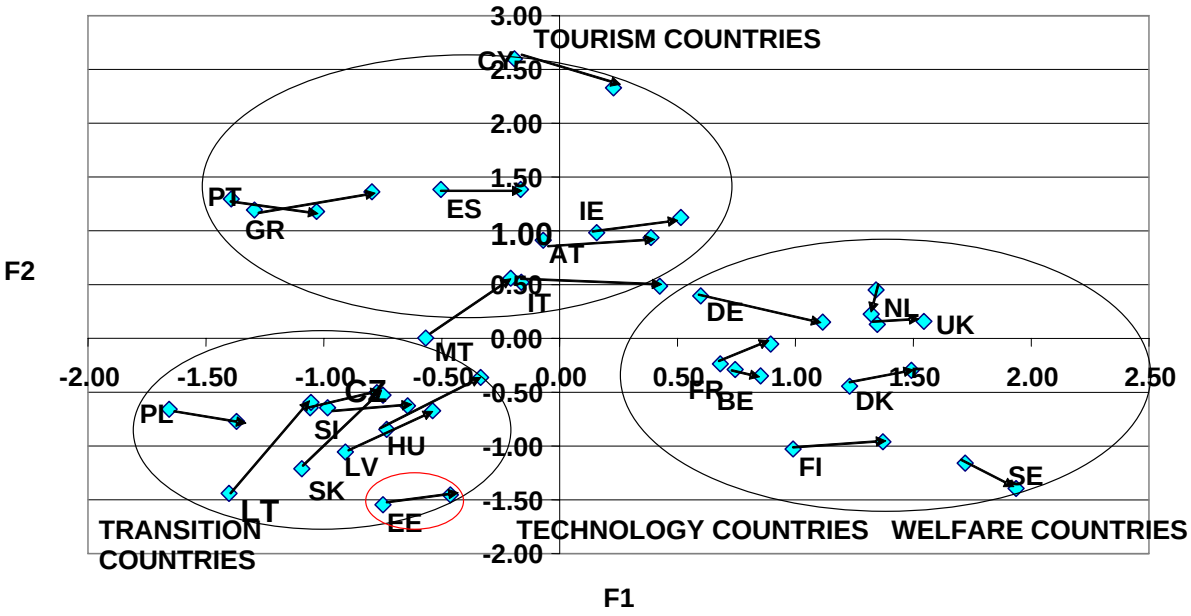
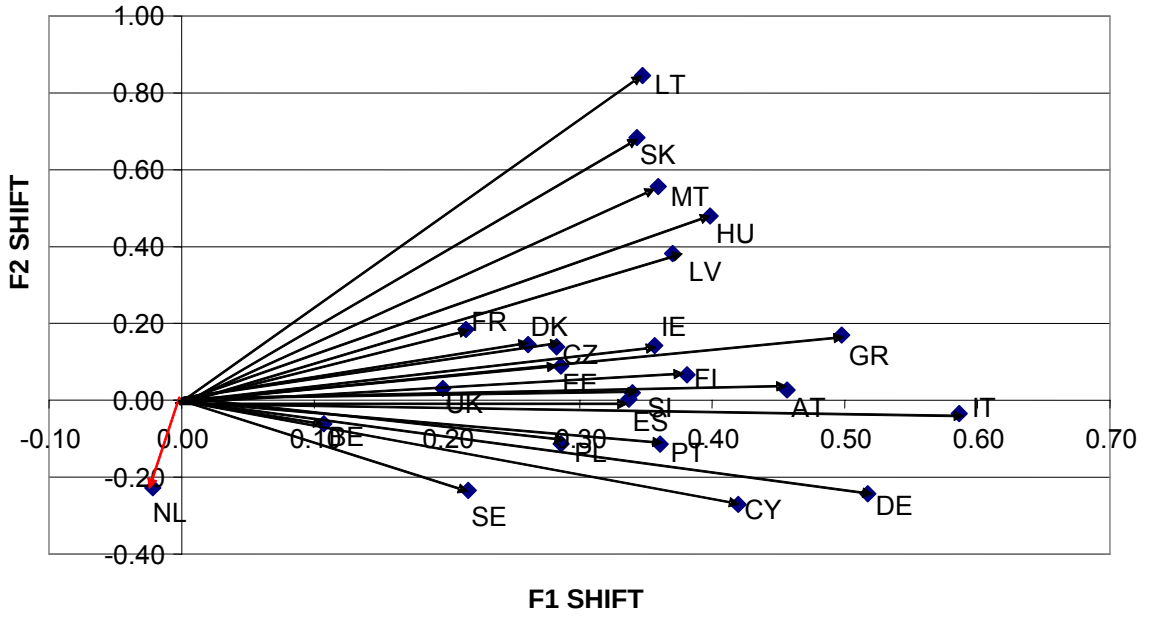


Figure 9. The shifts of employment sectoral structure in the factor space (shift of factor scores) in EU-24 countries in 2000-2005



Noticeable are also the differences compared to the cluster analysis:

- Transition countries (especially Baltic countries) differ from the South European countries to this extent that we cannot talk about the group of countries so-called agrarian countries;

- In transition countries, there is going on besides of main development trend also relative weakening of the technological component of employment on account of tourism economy (’movement up towards Cyprus’). The other countries and groups are rather stable in terms of this component.

Figure 9 shows the specialties of countries’ positions shifts without considering the initial position. As we can see, here concerning the F1 only the Netherlands ‘floats upstream’. At the same time, the F2 – trade-finance-construction complex recedes in terms of employment in the favor of technology sector in several countries, including besides the Netherlands highest in Germany and Sweden. Majority of transition countries are rather moving opposite direction (highest Lithuania and Slovakia), what may be connected also with temporary fast economic growth and restoring the infrastructure of market economy. This development has still being to such a degree moderate, that all transition countries have the F2 with negative factor scores remaining far away from tourism countries.

4. Conclusion

In the article there were analyzed general tendencies and typology of employment sectoral structure as an indicator of economy’s development process in the EU member states. Appeared that in addition to general tendency of tertiarization the EU countries are characterized also by relatively clear and stable static typology at the beginning of 21st century. At that, it differs depending on way of classifying in some respects. Seeing basic indicators as the bases for classification – 14 shares of the branch of activities, we will reach to four groups. But applying the first two main components, which describe slightly more than a half of initial attributes from variation, there distinguished three groups of countries:

- West and North European welfare countries with developed service economy;
- South European countries, where tourism economy has successfully engaged the position instead of industry;
- Central and East European transition countries, what have maintained relatively big production sector, but are reducing it in favor of business and as well individual services.

Here, compare to complete information application, disappeared the specific group of agrarian countries, where belong Greece and Portugal from Southern Europe and Latvia, Lithuania and Poland from Eastern Europe, hereby the poorest countries from both groups. Estonia’s position is specified as industrial-technological transition country, which lags far behind of services centered welfare economy, because of the share of social and individual services, but exceeds significantly the average of the set, because of technological employment, what besides it recedes relatively toughly compare to other transition countries. Especially recognizable is it in logistics and communication sector. Positively we can stress here also large share of education as sphere of activity. The estimation to the situation is dual. On the one hand, with the characteristics of representing the group of poor countries Estonia is in the half-way to service economy, on the other hand, there are notable structural advantages for transition to knowledge and innovation based development phase.

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