SECTORAL STRUCTURE AND SOCIO-ECONOMIC DEVELOPMENT: SEARCHING FOR THE RELATIONSHIP[*]

Katrin Tamm, **Helje Kaldaru**[*]

University of Tartu

Abstract

This paper provides an overview of sectoral structure and its changes in the European and Central Asian countries. In the paper we analyse the sectoral structure in both country groups and try to figure out the development trends being accompanied by these changes. The paper aims to empirically investigate the relationship between sectoral structure and socio-economic development.

One of the essential characteristics of the structural change process is the growing importance of service sector, i.e. tertiarization. The speed and mode of tertiarization can be different. First, this can lead to downsizing industry; second, in countries with high share of primary sector the process can result in downsizing agriculture, without any loss in industry share. A challenging research question for this study is whether the process of tertiarization results from the overall globalization or depends also on the socio-economic development level of a certain country.

We use the cross country data about the European Union and OECD member countries as well as Newly Independent States of former Soviet Union on socio-economic development and sectoral distribution of GDP, using data from the World Bank, the United Nations and Freedom House. The time period for analysis is 1995-2005. Data will be analysed with help of different statistical tools such as correlation, cluster, factor analysis and regression analysis.

Results of the paper indicate that sectoral structure and socio-economic development are inter-related phenomena. However, according to our sample, the causality of this relationship tends to be rather from sectoral structure to economic development, not vice versa. No statistically significant relationships between changes and socio-economic development could be found.

Key words: sectoral structure, structural change, economic development, country comparison in the Europe and Central Asia

Theme: Comparative Economic Development

---

[*] Paper has been prepared by the support of Estonian Science Foundation Grant No 7019.

[*] Katrin Tamm, Research Fellow, Institute of Business Administration
Helje Kaldaru, Professor of Microeconomics, Institute of Economics
University of Tartu, Faculty of Economics and Business Administration
Narva Road 4, 51009 Tartu, Estonia
Tel: + 372 7376 323, Fax: +372 737 6312,
E-mail: Katrin.Tamm@ut.ee, Helje.Kaldaru@ut.ee

1. Introduction

The relationship between sectoral structure and its changes and economic development of a country has received quite a reasonable attention in recent decades. For instance, Gemmell (1987) in his book “Structural Change and Economic Development. The Role of the Service Sector.” examines some aspects of the process of structural change and brings out the primary role of the service sector during that process. Empirical evidence of his study implies that service sector across both developed and less developed countries expands particularly rapidly relative to industry in the earlier and later phases of development.

According to the three-sector hypothesis, which was first introduced by Fisher (1935) and Clark (1940), a gradual shift in employment and value added from the primary to the tertiary sector is inherent in the process of economic development. Hence, structural change could be characterized as a demand phenomenon: with raising income levels, the demand for inferior goods will unavoidably decrease, while the demand for superior services will continue to grow. (Breitenfellner & Hildebrandt, 2006). As stated by Szalavetz (2002), structural change is one of the most conspicuous phenomena of economic development.

Whether measured in terms of employment or value added, most studies investigating the sectoral structure and structural changes conclude that the service sector by far dominates the economies of industrialized countries. Is this also the case in less developed countries and will the growing share of service sector automatically lead to further socio-economic development? There are a few studies focusing primarily on the relationships between structural change and economic development in the context of transition economies. For instance, Raiser et al. (2003) mention that the transition to market-based economic systems in the countries of Central and Eastern Europe and the former Soviet Union involves fundamental shifts in the allocation of resources and deep changes in the structure of production. In their study a model of economic development and structural change with technology spillovers to benchmark structural change in the transition economies and simulate the path of adjustment from central planning has been presented.

The increasing importance of the service sector raises a number of questions: Is the structural change from agriculture to industry and on to services a natural phenomenon, i.e. a by-product of the globalization process? Is the structural change from agriculture to industry and on to services

leading to the higher level of development? Is there are certain pattern of different phases that all countries must go through in their development processes?

The following specific features of our study could be brought out. First, most previous studies are focused on extracting the relationships between structural changes and socio-economic development (or economic growth), based on individual indicators (e.g. Breitenfellner & Hildebrandt, 2006; Gemmell, 1982). The present study differs from others due to its attempt to aggregate individual indicators and analyse the relationships between the two phenomena using these aggregate variables. Second, there are several studies investigating the issue among highly developed countries, especially countries of EU or OECD (Echevarria, 1997; Bachmann & Burda, 2008). In fact, there are also studies that focus on countries of Central and Eastern Europe (Landesmann, 2000; Raiser et. al, 2003), but use of a heterogeneous sample of EU and NIS countries has not been done before.

This paper aims to empirically investigate the relationship between sectoral structure and socio-economic development, using a cross country sample of the European Union (or OECD)[1] countries and Newly Independent States (NIS)[2] of former Soviet Union during the period of 1995–2005. Data was collected from the sources of the World Bank, the United Nations and Freedom House.

The sample consists of 44 European and Central Asian countries according to the classification of the World Bank. Some countries (from the EU members Malta and Cypros) are left out of analysis due to partly missing data. Countries of the sample are relatively different in terms of socio-economic development, but geographically (in some sense also culturally) closer to each other compared to the countries of other parts of the world. Therefore, the globalization processes taking place in Europe should have an impact on all countries in observation.

This study is organized as follows: Section 2 provides the framework for analysis, including conceptualization and measurement of the observable phenomena and data description; Section 3 introduces the procedure of finding aggregate indicators for analysis with help factor analysis; Section 4 investigate similarities and differences between country groups according to sectoral structure and its changes, using cluster analysis; Section 5 attempts to find relationships between

[1] Countries in European group: EU member countries, Norway, Iceland and Switzerland.

[2] Countries in Central Asian group: Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, FYR Macedonia, Georgia, Kazakhstan, Kyrgyz Republic, Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine and Uzbekistan.

indicators of sectoral structure and socio-economic development, implying correlation and regression analyses; Finally, the authors draw conclusions for the European Union member states and Newly Independent States of Former Soviet Union.

2. Sectoral Structure and Socio-Economic Development: Conceptualization, Measurement and Data

The observation that the structure of production changes during the process of development and the rise of certain sectors at the expense of others is a hallmark of modern economic growth dates back to Fourastié (1949) and Kuznets (1956). Both authors established the fall in the importance of agriculture, the rapid rise of industry and the gradual increase in the weight of services in the economy as a stylised pattern of development using historical time series data for industrialised economies. (Raiser et al 2003). According to Fourastié, the service sector is a "catch basin" for the labor force released from agriculture and industry. (Breitenfellner & Hildebrandt (2006)

The first authors who tried to test for the existence of certain development patterns using a large cross country data set were Chenery and Taylor (1968). According to their study the following stylised facts were established: (1) the share of agriculture in GDP falls as economies grow richer; (2) the share of industry in GDP rises as economies grow richer; (3) the share of services in GDP rises unambiguously as economies grow richer.

Similar view is shared in the paper of Breitenfellner & Hildebrandt (2006) where the authors sate that the process of economic development is related with systematic structural change in most countries – along with the increase of per capita income, the primary sector loses in importance, while manufacturing industry initially gains momentum but is eventually surpassed by the constantly growing service sector.

Anxo & Storrie (2001) have mentioned differences in levels of economic development as the main reason for national differences in service sector development. It is assumed in their work that, as income increases, employment shifts towards services, because of both the positive demand and the productivity bias. The positive demand bias means that, as household income rise, a growing share of that income is spent on services, once basic needs have been met.

Francois and Reinert (1996) explore in their empirical study about 15 countries that the share of value added originating in services being positively linked to the level of development.

Consequently, the research described herein can predict the following regularities: (1) the higher proportion of agriculture in value added in less developed countries; (2) the higher proportion of industry and services in value added in more developed countries.

In the literature structural change has been referred to in two ways, either changes in compositional structures (of output, employment, exports etc) or changes in behaviour such as changes in the ways how different variables relate to each other, for example output-employment relationships or FDI-import/export dynamics, etc. (Landesmann, 2000). In this paper we use the first approach.

Structural change of an economy is often understood as shifts in the GDP shares of the three main economic sectors such as agriculture, industry and services according to the classification of World Bank. In order to measure the GDP share of a sector there are three main measurement possibilities: (1) sector's focus on final or indirect production; (2) sector's share in gross value added; (3) sector's share in employment. In our paper we use the second indicator which reflects each sector's share in gross value added (GVA). Both static and dynamic indicators are used in the analyses.

The socio-economic development of a country will be estimated in this paper by four different aspects: institutional governance, rate of freedom in the society, productivity in the most general sense, and human development. These four aspects of socio-economic development will be measured by the following indicators: human development index (HDI), gross national income per capita using purchasing power parity rates (PPP GNI), rate of freedom and indicators of governance. Human development index of a country as given by the United Nations is an index combining normalized measures of life expectancy, literacy, educational attainment, and GDP per capita for countries worldwide (Human Development Report, 1997). Gross national income per capita is gross national income divided by midyear population according to United Nations definition. Rate of freedom is an indicator worked out by Freedom House and reflecting a country's political rights and civil liberties (Freedom House, 2007). Governance indicators measure six dimensions of governance (Kaufmann et al, 2007):

1. Voice and Accountability (VA) – measuring the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.
2. Political Stability and Absence of Violence (PS) – measuring perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including domestic violence and terrorism.
3. Government Effectiveness (GoE) – measuring the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.
4. Regulatory Quality (RQ) – measuring the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.
5. Rule of law (RL) – measuring the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, the police, and the courts, as well as the likelihood of crime and violence.
6. Control of Corruption (CC) – measuring the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

The listed aggregate governance indicators are based on hundreds of specific and disaggregated individual variables measuring different dimensions of governance, taken from 33 data sources provided by 30 different organizations. The data reflects the views on governance of public sector, private sector and NGO experts, as well as thousands of citizen and firm survey respondents worldwide. These data have been collected by World Bank, and by using the unobserved components model aggregate indicators from individual measures have been constructed. The resulting aggregate indicators are weighted averages of the underlying data, with weights reflecting the precision of error for the estimates of governance for each country. (Kaufmann et al, 2007)

3. Aggregate indicators for socio-economic development and sectoral structure: Results of factor analysis

Socio-economic development is a complicated phenomenon, the different sides of which could be characterized by a number of different indicators. Use of several individual indicators would make the analysis quite complicated and incomprehensive, whereby in the present study we first attempt to generalize the initial indicators to some aggregated variables which will be applied in further analysis. For the generalization procedure there are several methods available, but in our study factor analysis (method of principal components) has been chosen. This method suits very well for integrating correlating individual indicators as was the case in our data.

The variables that have been chosen for describing socio-economic development were introduced in previous section of the paper. The chosen indicators describe four different aspects of socio-economic development: institutional governance, rate of freedom in the society, productivity in the most general sense and human development. In order to get the aggregate indicator for socio-economic development, generalization procedure has been implemented either in one or two phases. First aggregate indicators based on individual variables have been found for all years of observation (1995, 2000 and 2005), which had been followed by the further aggregation procedure towards the final aggregate indicator for the whole period. The final aggregate indicators describe the general situation in the observed countries during the ten-year period, but they do not allow us to evaluate dynamics of the processes. As the purpose of the paper is to not only focus on the static, but also dynamic side of the relationships, in some cases annual growth rates of indicators will be used to characterize the process dynamics.

First the aggregate indicators of governance for each year have been found with help of principal component analysis (see results in Table 1).

Table 1 shows that all initial indicators (i.e. six dimensions of governance as explained above) were strongly related to the aggregate indicator of governance as the explained variance exceeded 90%. Results of KMO test imply the technical appropriateness of the initial indicators for aggregation by the method of principal component. Due to the fact that there is a very high correlation between all six dimensions of governance, there is no sense to use them separately. Therefore, aggregated indicator will be applied in the further analysis.

Table 1 Extraction of the aggregate indicator for governance by factor analysis

Initial indicator	1995		2000		2005	
	Loads[3]	Extraction[4]	Loads	Extraction	Loads	Extraction
VA	0.962	0.925	0.957	0.917	0.973	0.946
PS	0,879	0.773	0.931	0.867	0.911	0.829
GoE	0.961	0.924	0.987	0.975	0.990	0.981
RQ	0,926	0.857	0.963	0.927	0.966	0.933
RL	0.986	0.973	0.986	0.971	0.988	0.976
CC	0.963	0.928	0.976	0.952	0.972	0.945
KMO[5]		0.873		0.876		0.872
% of Variance[6]		89.7		93.5		93.5

Component scores[7] about different years of observation have been brought out in Appendix 1. As relationships between initial and aggregate indicators are all positive, the high positive component score indicates to better governance than in average in the sample.

Aggregating the aggregated indicators for different years the final indicators for governance of the whole period can be created (see Table 2).

Table 2 Extraction of the final aggregate indicator for governance by factor analysis

Initial indicator	Loads	Extraction
Gover95	0.988	0.977
Gover00	0.997	0.993
Gover05	0.990	0.980
KMO		0.717
% of Variance		98.3

Component scores for governance (Gover) given in Appendix 1 will be further used in the analysis as the final aggregate indicators for governance.

Socio-economic development of a country is definitely related with political rights and civil liberties. These have been measured by Freedom House on a one-to-seven scale, with one representing the highest degree and seven the lowest degree of freedom. In Appendix 2 the given initial indicators of freedom have been summarized over different years of observation. After

[3] Correlation coefficient between initial and aggregate indicator

[4] Information in the aggregate indicator reflected by the initial indicator

[5] Kaiser-Meyer-Olkin Measure of Sampling Adequacy (>0,7 middling, >0,8 meritorius)

[6] Total variance explained

[7] Mean equals zero. Component scores show the difference from mean in positive or negativev direction in standard deviation

that the aggregate indicator for rate of freedom (FDH) has been found by factor analysis (see Table 3). Here the higher indicator implies the poorer position, thus for better comparison with other indicators the aggregate values have been multiplied by minus one (i.e. factor direction has been changed).

Table 3 Extraction of the aggregate indicator for the rate of freedom by factor analysis

Initial indicator	Loads	Extraction
FDH95	0.971	0.943
FDH00	0.989	0.978
FDH05	0.981	0.962
KMO		0.747
% of Variance		96.1

As a general indicator for productivity PPP GNI per capita will be used. Values of individual years have been found a logarithm for. Based on these logarithm values aggregate indicator for productivity will be created by principal component analysis (see Table 4).

Table 4 Extraction of the aggregate indicator for productivity (PPP GNI) by factor analysis

Initial indicator	Loads	Extraction
lnGNI95	0.992	0.983
lnGNI00	0.996	0.992
lnGNI05	0.995	0.990
KMO		0.775
% of Variance		98.9

Individual values for different years and component scores of the aggregate indicator have been presented in Appendix 3.

The most general indicator for socio-economic development is Human Development Index (HDI). Aggregating the initial indicators with help of factor analysis the resulted aggregate indicator characterizes the situation during the whole observation period (see Table 5). Component scores for the aggregate indicator of human development can be found in Appendix 4.

Table 5 Extraction of the aggregate indicator for HDI by factor analysis

Initial indicator	Loads	Extraction
HDI95	0.986	0.972
HDI00	0.992	0.985
HDI05	0.989	0.978
KMO		0.777
% of Variance		97.8

We suppose that all created indicators describe different sides of socio-economic development, thus there should be high correlations between these indicators. Whether the hypothesis holds or not, can be verified with help of correlation analysis. The correlation coefficients given in Appendix 5 confirm the strong positive relationships as they remain within the range of 0.847 and 0.979. Due to the high correlations one can switch to an even more aggregated (overall) indicator of development which reflects the different sides of initial indicators (see Table 6).

Table 6 Extraction of the final indicator for socio-economic development by factor analysis

Initial indicator	Loads	Extraction
Gover	0.983	0.967
FDH	0.936	0.876
GNI	0.970	0.941
HDI	0.977	0.954
KMO		0.764
% of Variance		93.4

In further analysis the general indicator for socio-economic development (DEV) component scores for observed countries will be used (Appendix 6).

In order to get the aggregate indicators for sectoral structure, the similar procedure has been conducted for sector shares. In our study, three economic sectors are distinguished according to the definition of World Bank: agricultural, industrial and services sector. Results of extraction are presented in Table 7. As can be seen from Table 7, both the share of agricultural sector and services sector in producing gross value added very well converged to the aggregate indicators as in both cases more than 90% of variance has been described by the aggregate indicators. Shares of industrial sector in gross value added fluctuate more during the observed period, thus only 80.5% of the total variance has been explained by the aggregate indicator. The result of KMO test gave the poorest results in latter case, amounting only to 0.612 which, however indicates that the initial indicators suit for generalizing with help of principal component analysis on the

mediocre level. Nevertheless, while interpreting the results this aspect has to be taken into consideration.

Table 7 Extraction of the aggregate indicators for sectoral structure by factor analysis

Initial indicators	Share of agriculture in GVA		Share of industry in GVA		Share of services in GVA	
	Loads	Extraction	Loads	Extraction	Loads	Extraction
1995	0.964	0.929	0.832	0.692	0.973	0.874
2000	0,990	0.980	0.964	0.930	0.911	0.958
2005	0.986	0.972	0.891	0.794	0.990	0.913
KMO		0.734		0.612		0.710
% of Variance		96.0		80.5		91.4

4. Classification of countries according to sectoral structure and its changes: Results of cluster analysis

The aim of cluster analysis is to classify the objects according to their similarity. In present analysis, both similarities in sectoral structures and their changes in different countries and country groups are to be found. In order to group countries, k-means cluster analysis has been applied.

To find similarities of sectoral structure, the observed countries have been classified according to sector shares in gross value added (see Appendix 7). As the first result of cluster analysis, three groups have been formed. Average indicators in different clusters and respective countries are given in Appendix 7.

In the first cluster there are countries with the primary focus on agricultural output, where the high share of agriculture in creating gross value added contrasts to the low share of services in the economy. However, the average share of agriculture has been decreased during the observed period from 42.6% to 23.4%. At the same time, share of services has increased from 30.4% to 50.4%. Remarkably, the share of industry has not practically changed, contributing by about 27% to the gross value added within the whole period of observation.

The second cluster integrates industrial countries, in which the share of agriculture has remained on average level of the sample and share of services did not exceed the average. In this group, sectoral structure has not changed remarkably. The share of agriculture has decreased from 12.4% to 7.1% and share of services has increased from 51.9% to 57%. Similarly to the first

cluster, the share of industry has not showed almost any change, remaining on the level of 35–36%.

In the third cluster there are countries that represent the notably higher share of services in sectoral structure compared to other groups. Within the observed period of time, this difference has even increased from 66.4% to 71.6%. At the same time, the share of agriculture which was already marginal in the beginning of the period, has decreased from 4.5% to 2.5%. In this cluster we can also notice the tendency of slight deindustrialization as industry has lost some of its importance (decrease from 29.3% to 25.9%).

An interesting result for us is that country clusters differ from each other according to the level of socio-economic development. It is known from literature that the lower share of agriculture and the higher share of services indicate to a more developed economy. The countries of the second cluster that show the highest share of industry, are lagging behind the average of the sample, but are more developed than those belonging to the first cluster. In the third cluster, the share of industry is even lower than in agricultural countries. Hence, the results seem to confirm the general regularity of structural change implying to the industrialization process of less developed countries on account of agricultural production and the tertiarization process of more developed countries while cutting down the industry.

In order to control the validity of the above mentioned regularity in case of our sample, sector shares and their relative growth rates will be analysed within different clusters. Results of this analysis are presented in the following Table 8.

As the first indicator, relation between the shares of industry and agriculture is under consideration. It is seen from the results that the later year and the more developed cluster shows higher industry shares compared to agriculture. It is noteworthy that the relation between cluster 3 and cluster 1 has not practically changed during the observable period. Thus, the displacement of agriculture by the industry has taken place by almost invariable speed. Within the observed period, the relation between industry and agriculture has grown 1.5 to 1.7 times to the benefit of industry.

Table 8 Relative importance of sectors in different country clusters

Relations of sector shares	Cluster 1	Cluster 2	Cluster 3	Relation Cluster 3 / Cluster 1
Industry/Agriculture95	0.681	4.608	9.964	14.6
Industry/Agriculture00	0.966	6.386	11.843	12.2
Industry/Agriculture05	1.180	6.838	14.895	12.6
Relation Ind/Agr 05/95	1.7	1.5	1.5	
Services/Agriculture95	0.758	6.775	23.115	30.5
Services/Agriculture00	1.555	9.547	31.708	20.3
Services/Agriculture05	2.276	11.288	45.149	19.8
Relation Serv/Agr 05/95	3.0	1.7	2.0	
Services/Industry95	1.246	1.486	2.306	1.8
Services/Industry00	1.758	1.587	2.602	1.5
Services/Industry05	2.154	1.689	2.876	1.3
Relation Serv/Ind 05/95	1.7	1.1	1.3	

Secondly we have examined the relation between services and agriculture and the most important result here is that share of services on account of agricultural products have increased the most in the cluster of less developed countries. Thereby the biggest change has taken place during 1995–2000. According to this indicator, sectoral structure of different country groups seems to converge, because in less developed countries the share of services has grown faster.

As the third indicator, relation between services and industry will be taken into consideration. Table indicates that the ratio is higher in the cluster of more developed countries. It can also be seen that the ratio has increased in all clusters during the observed period. Nevertheless, the rate of increase remains on lower level compared to other two relation indicators. Notwithstanding the converging process of the indicators of the first and the third cluster, there are still differences. In the cluster of industrial countries the relation between services and industry has almost not changed. As a conclusion of the above analysis one can say that there is a tendency for sectoral structure of countries in different developmental levels to converge over time, but at the same time, the phenomenon of deindustrialization cannot be verified explicitly.

As a second step of cluster analysis, the similarities of countries according to structural changes will be analysed. Countries have been classified according to the changes in different sector shares in gross value added during 1995–2000 and 2000–2005 as well as the whole period of observation, 1995-2005. The average indicators of these changes are presented in Appendix 8.

Compared to previous analysis, the countries have been re-grouped. In the first cluster, the share of services has almost doubled (growth 1.95 times), on account of both agriculture and industry. These countries are characterized by high share of agricultural sector, while shares of industry and services remain below the average of the sample. Thus, these countries can be considered as less developed.

In the second and the third cluster very different countries have been integrated, both according to sectoral structure and the developmental level. In the second cluster which is characterized by an increase of services by 111% during the observed period, aggregate indicators of sectoral structure and development are around the average of the sample.

The third cluster countries show the decreasing share of agriculture, but as the share has been low already in the beginning of the period, this has not generated essential changes in industry and service shares. Level of socio-economic development is slightly above the average level of the whole sample.

Based on the cluster analysis we can conclude that although sectoral structure and socio-economic development seem to be related, the structural changes are not directly influenced by the developmental level of a country. Notwithstanding the existing bilateral relationship between those two phenomena, we therefore hypothesize that the direction of relationship tends to be from sectoral structure to development.

5. Relationships between socio-economic development and sectoral structure: Results of correlation and regression analyses

The results of cluster analysis indicate to the existence of relationship between sectoral structure and socio-economic development of a country. In this section we attempt to explain the characteristics (direction and strength) of these relationships. In order to describe the socio-economic development, the aggregate development indicator (DEV) will be used. Sectoral

structure will be measured by the aggregate indicators of sector shares (AGR, IND and SERV) which have been created in the second section of the paper.

First we will analyse the relationships based on correlation matrix (see Table 9). As a result of correlation analysis it turned out that the aggregate indicator for agricultural sector share was strongly, but negatively related with the aggregate indicators of service share and development. Nevertheless, the relationship with the share of industry was not statistically significant. The negative relationships between industry and service shares are weaker. The highest positive correlation appeared between the share of services and development level, however, the statistically significant relationship between industry share and development could not be brought out.

Hence, correlation analysis confirmed the expected outcome: the countries with high share of agriculture and those with high share of services differ considerably in respect of socio-economic development, while in countries with high share of industry no clear relationship evolved.

Table 9 Correlation matrix of the aggregated indicators for sectoral structure and socio-economic development

	AGR	IND	SERV
IND	–0.095		
SERV	–0.839**	–0.458**	
DEV	–0.864**	–0.205	0.879**

** Correlation is significant at the 0.01 level (2-tailed)

In further analysis, the shape of relationship will be taken into consideration. We will not determine the direction of the relationship as a certain direction is presumed. Although there is apparently a two-way relationship between sectoral structure and developmental level, we suppose that sectoral structure has a stronger impact on socio-economic development than *vice versa*. This conclusion was drawn in result of cluster analysis.

On the following Figures 1–3**,** two-dimensional allocation of countries according to various aggregate indicators is presented. Vertical axis reflects the component scores of socio-economic development, whereas horizontal axes reflect the component scores for respective sector shares (aggregate indicators AGR, IND and SERV). Countries split into four sectors according to the means of respective component scores. For clearer observation of Figures, the countries of EU

and OECD have been marked by lowercase letters, while the countries of NIS are marked with uppercase letters.

Figure 1 reflects that according to the development level, division of countries is relatively distinct, taking account the fact that all NIS countries remain below the average development level and others above the development level. Among EU and OECD countries there are only Latvia, Croatia, Romania and Bulgaria that not reach the average - however, their backwardness is not remarkable.

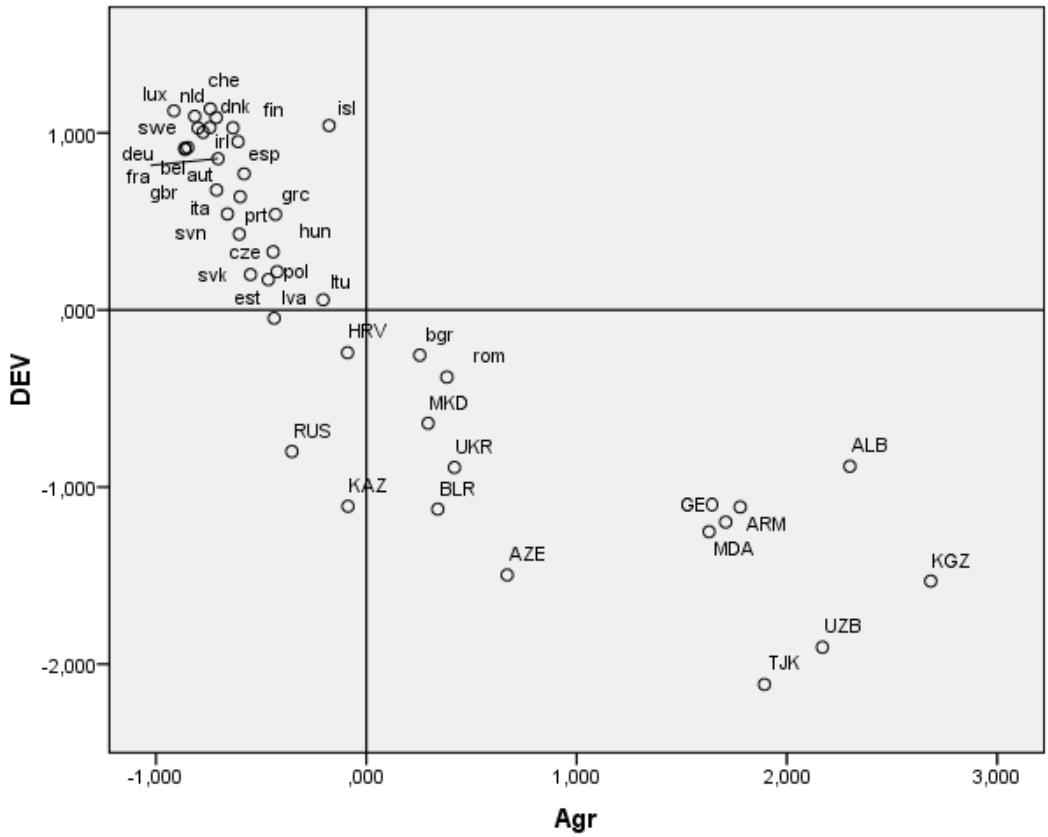

Figure 1 Allocation of countries according to socio-economic development and share of agriculture in GVA

Figure 1 implies that the share of agriculture in creation of GVA is related to the development level of a country. In more developed countries the share of agriculture is below the average, while in countries with lower development level the share of agriculture exceeds the average. In latter case the only exceptions are Russia, Kazakhstan, Croatia and Latvia. Among the relatively homogeneous group of more developed countries, Iceland and Lithuania differ from others with their relatively high share of agriculture in the economy. It is worth noting here that one of the sub-sectors of agriculture is fishing which has a strong impact on Iceland’s economy because of

specific natural preconditions. The reason for Lithuania to show a relatively high agricultural share results probably from the Soviet heritage and implies that the changes in Lithuanian economic structure lag behind the other Baltic States.

Based on visual examination one can hypothesize that there could exist either linear or quadratic regressive relationships between the share of agriculture and socio-economic development. This hypothesis will be tested later.

Regarding the industry share and its relation to socio-economic development the emerging picture is relatively mixed (see Figure 2).

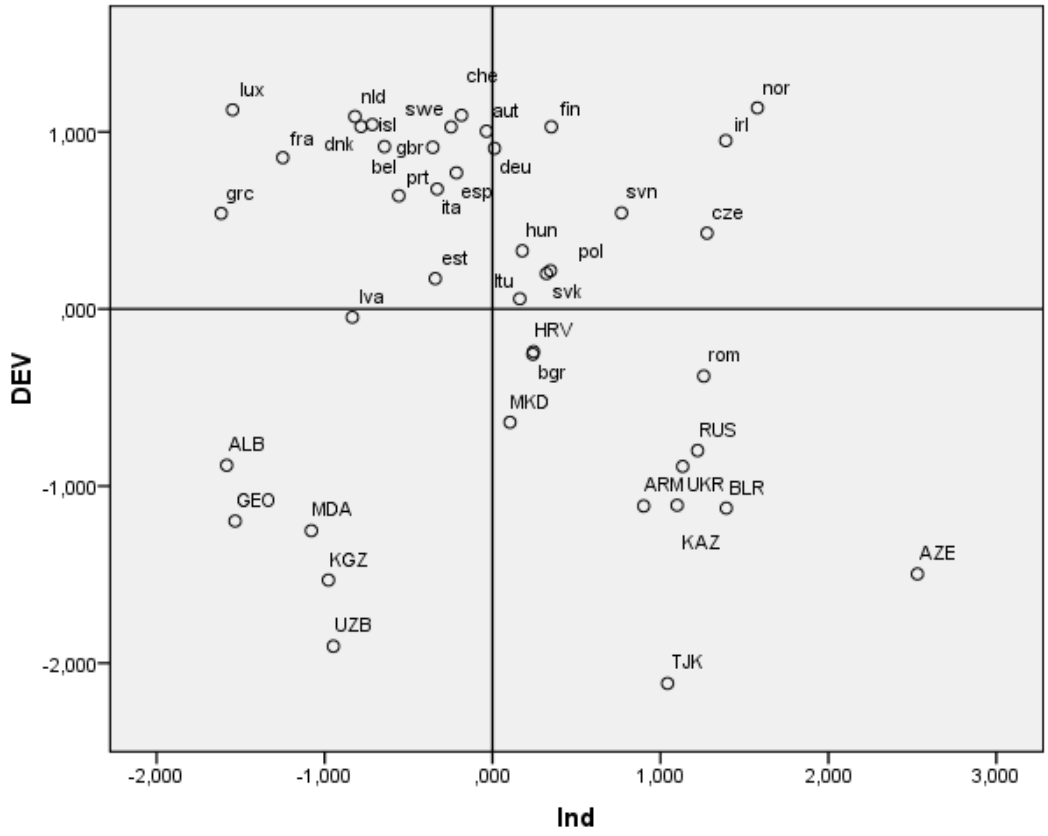

Figure 2 Allocation of countries according to socio-economic development and share of industry in GVA

It could first be seen that among more developed countries, share of industry indicators differ less than within the countries with lower development level. The share of industry is quite high (and relatively comparable) in highly developed countries such as Norway and Ireland as well as in countries with much lower development level such as Belarus, Russian Federation and Ukraine. Azerbaijan holds the highest share of industry, meanwhile being one of the least

developed economies in the sample. In the group of more developed countries, Luxembourg, Greece and France contrast to other group members according to their much lower share of industry.

The relationship between industry share and development level is definitely not linear as was indicated by the correlation analysis as well as the visual examination of the Figure 2. Existence of a quadratic regressive relationship is possible as the countries of average level of socio-economic development seem to have higher industry shares. We will test this later.

An explicit relationship between sectoral structure and socio-economic development can be best drawn about the share of services and its relation to level of development. The same could be supposed according to the results of correlation analysis. Figure 3 shows that within countries with lower level of development the relative importance of service sector is modest, too.

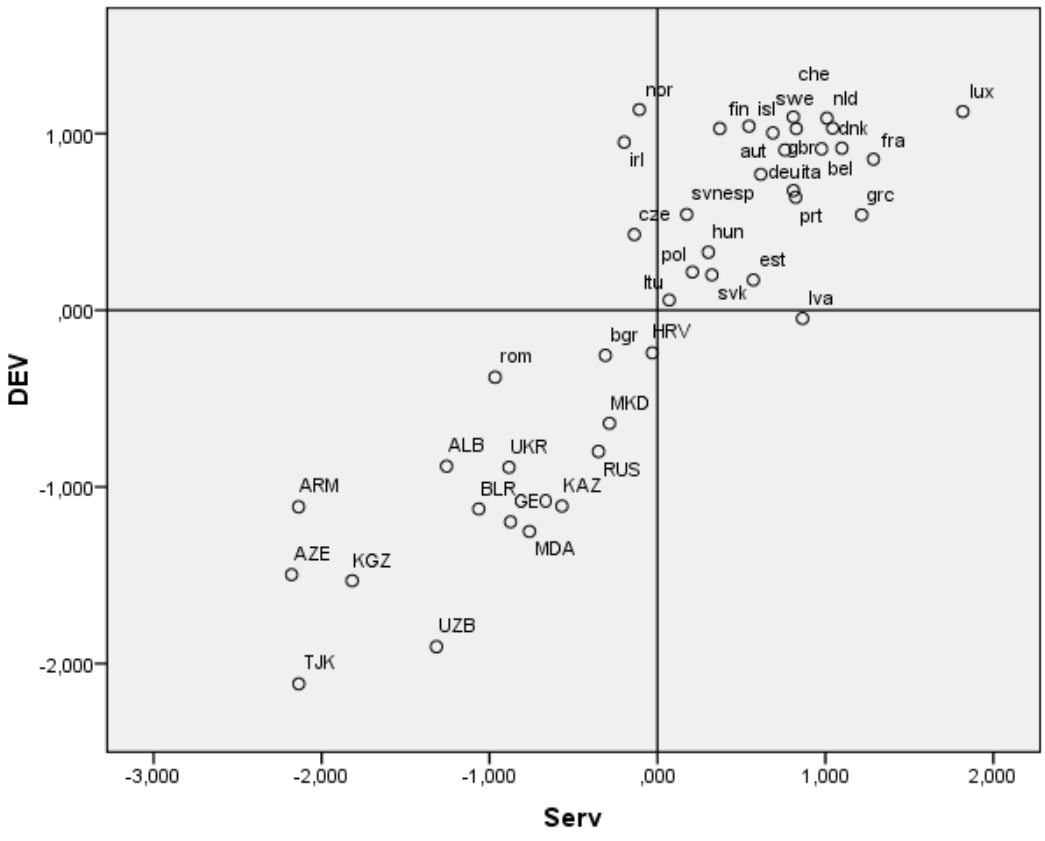

Figure 3 Allocation of countries according to socio-economic development and share of services in GVA

Among more developed countries Norway, Ireland and Czech Republic differ from the rest belonging to the same group. Among countries with an averagely lower development level, Latvia is the only economy where service sector exceeds the average, probably caused by the high share of transport services. Luxembourg, Greece and France where share of industry was relatively low, belong to the countries with the highest share of services.

Among less developed countries there are both those having agriculture on the important position of the economic structure (Kyrgyz Republic, Albania and Uzbekistan) and those showing the high share of industry instead of services (Belarus, Russian Federation and Ukraine).

In order to determine the shape of relationship between socio-economic development and sectoral shares, the regression analysis will be accomplished. The dependent variable in the regressions is aggregated indicator of development (DEV). The results of regressions using aggregated indicator share of sectors (AGR, IND, SERV) as explanatory variables, are reported in Table 10. For every variable, two models have been found: linear regression and quadratic regression including constant in equation.

Table 10 Regression models for estimating the relationship between socio-economic development and sectoral structure

	Independent variables: Sector share in GVA					
	Agriculture		Industry		Services	
Model	Linear	Quadratic	Linear	Quadratic	Linear	Quadratic
AGR	–0.834	–1.319				
$(AGR)^2$		0.362				
IND			–0.200	–0.122		
$(IND)^2$				–0.254		
SERV					0.848	0.825
$(SERV)^2$						–0.037
Constant	0.340	–0,331	0.045	0.292	0.044	0.081
R^2	0.747	0.847	0.042	0.133	0.773	0.774
Significance	0.00	0.00	0.19	0.06	0.00	0.00

The results of regression analysis imply that four out of six models were statistically significant at the 1 percent level. The best is quadratic model for agriculture, explaining 84.7% of the variance of initial indicators. The two models for service sector show equal explanatory power, allowing us to conclude that the relationship between service sector share and development level is equally described both with help of linear and quadratic models. Among the models for

agricultural sector, the quadratic model seems to have a higher explanatory power compared to the linear model. Industry sector models are statistically insignificant and express relatively low explanatory power. However, quadratic model is statistically significant at the 6 percent level. Due to the low R^2 the model cannot be used for prediction purposes, but nevertheless, it confirms the expected regularity stating that share of industry is (at least as a tendency) higher in countries of average development level.

As a final challenging research question, we are eager to investigate whether the level of socio-economic development had any influence on structural change. In order to study this, the growth rates of sector shares during 1995-2005 have taken into consideration. First the correlation analysis has been implemented and results are presented in Table 11.

Table 11 Correlation matrix of the growth rates of sector shares and socio-economic development

Growth rates of sector shares	DEV
Agr0595	0.054
Ind0595	–0.370*
Serv0595	–0,446**

** Correlation is significant at the 0.01 level (2-tailed)

Table 11 implies that on higher development level growth rate of services and industry tends to be slower compared to lower development levels. Nevertheless, the correlation coefficient of industry growth is relatively weak and only slightly reliable. At the same time, any relationship between development level and growth of agricultural sector could be elicited.

Controlling for the possible existence of a non-linear relationship between development level and growth rates of sector shares the respective regression analyses have been conducted. All models turned out to be statistically insignificant and explained just some percentage points of the total variance. The implemented regression analyses confirm the result of cluster analysis – sectoral structure and socio-economic development level are related to each other, but no relationship between structural changes and development level can be brought out.

Thus it is possible to draw the conclusion about the possible impact chain as follows: technological process having a global nature, has an influence on sectoral structure of every country in the world, because due to technology development it is necessary to change the

priorities and do new things. This will lead to productivity change, improvement of knowledge and skills, there is also the need to change education and institutional systems and this will finally guide to economic development.

6. Conclusions

Our empirical findings support the claim that tertiarization is an issue both in highly and poorly developed countries. As a result of cluster analysis we can see that countries with higher share of agriculture tend to be less developed, while countries showing higher share of services are more developed. Nevertheless, the claim about higher share of industry and its relation to higher development could not be confirmed by our sample.

Consequently, we can see the following regularity: the higher share of value added is given by services, the smaller is the share of agriculture and the higher development level. Thus, the relationships between sectoral structure and socio-economic development can be brought out. Hence, the results seem to confirm the general regularity of structural change implying to the industrialization process of less developed countries on account of agricultural production and the tertiarization process of more developed countries while cutting down the industry.

It is also worth mentioning that according to the cluster analysis, sectoral structure of different country groups seems to converge, because in less developed countries the share of services has grown faster. However, the phenomenon of deindustrialization could not be verified explicitly.

Based on the cluster analysis we can conclude that although sectoral structure and socio-economic development seem to be related, the structural changes are not directly influenced by the developmental level of a country. Notwithstanding the existing bilateral relationship between those two phenomena, we therefore hypothesize that the direction of relationship tends to be from sectoral structure to development.

Although there is apparently a two-way relationship between sectoral structure and developmental level, we suppose that sectoral structure has a stronger impact on socio-economic development than *vice versa*. This conclusion was drawn in result of cluster analysis.

Correlation analysis confirmed the expected outcome: the countries with high share of agriculture and those with high share of services differ considerably in respect of socio-economic development, while in countries with high share of industry no clear relationship evolved.

The implemented regression analyses confirm the result of cluster analysis – sectoral structure and socio-economic development level are related to each other, but no relationship between structural changes and development level could be brought out.

Thus it is possible to draw the conclusion about the possible impact chain as follows: technological process having a global nature, has an influence on sectoral structure of every country in the world, because due to technology development it is necessary to change the priorities and do new things. This will lead to productivity change, improvement of knowledge and skills, there is also the need to change education and institutional systems and this will finally guide to economic development.

As a matter of fact, the contrary causal relationship is also worth of investigation in the future as there are studies confirming that structural change follows economic development, but this would presume a more homogenous sample of countries.

References

Anxo, D., Storrie, D. (2001) The Job Creation Potential of the Service Sector in Europe: *Final Report 2000, European Commission, Employment Observatory Research Network, Luxembourg: Office for Official Publications of the European Communities.*

Bachmann, R., Burda, M. (2008) Sectoral Transformation, Turbulence and Labor Market Dynamics in Germany, *IZA Discussion Paper* No 3324/2008, January.

Breitenfellner, A., Hildebrandt, A. (2006) High Employment with Low Productivity? The Service Sector as a Determinant of Economic Development, *Monetary Policy & The Economy Quarterly*, 1, pp. 110-135.

Echevarria, C. (1997) Changes in Sectoral Composition Associated with Economic Growth, *International Economic Review*, Vol. 38, No. 2, pp. 431-452.

Francois, J.F., Reinert, K.A. (1996) The Role of Services in the Structure of Production and Trade: Stylized Facts from Cross-Country Analysis, *Asia-Pacific Economic Review*, Vol. 2(1).

Freedom in the World (2007) Freedom House (http:// www.freedomhouse.org/template.cfm?page=15)

Gemmell, N. (1982) Economic Development and Structural Change: The Role of the Service Sector, *Journal of Development Studies*, Vol 19, Issue 1, pp. 37-66.

Gemmell, N. (1986) Structural Change and Economic Development. The Role of the Service Sector, Basingstoke: Macmillan, 216 p.

Human Development Report (1997) United Nations

Human Development Report (2002) United Nations

Human Development Report (2007) United Nations

Kaufmann, D., Kraay, A., Mastruzzi, M. (2007) Governance Matters VI: Aggregate and Individual Governance Indicators 1996-2006, *World Bank Policy Research Working Paper* 4280.

Landesmann, M. (2000) Structural Change in the Transition Economies, 1989-1999, *Economic Survey of Europe*, No. 2/3, pp. 95-123.

Raiser, M., Schaffer, M., Schuchhardt, J. (2003) Benchmarking Structural Change in Transition, *IZA Discussion Paper* No. 727, 49 p.

Szalavetz, A. (2002) The Tertiarization of Manufacturing Industry or the Role of ICT in the Second Phase of Restructuring, *The 'New Economy' and Old Problems. Prospects for Fast Growth in Transition Economies*, March 14-15, Warsaw

World Development Indicators (2007) The World Bank Group (http://ddp-ext.worldbank.org/ext/DDPQQ/showReport.do?method=showReport)

Appendix 1. Component scores for governance

No	Abbr	Country	Gover95	Gover00	Gover05	Gover
1.	ALB	Albania	-0.483	-0.832	-0.964	-0.762
2.	ARM	Armenia	-0.975	-1.051	-0.753	-0.940
3.	AZE	Azerbaijan	-1.334	-1.333	-1.342	-1.347
4.	aut	Austria	1.140	1.106	1.034	1.103
5.	BLR	Belarus	-1.463	-1.391	-1.472	-1.454
6.	bel	Belgium	0.886	0.834	0.805	0.849
7.	BIH	Bosnia and ...	-0.917	-0.969	-0.891	-0.934
8.	bgr	Bulgaria	-0.669	-0.256	-0.236	-0.391
9.	HRV	Croatia	-0.642	-0.239	-0.139	-0.341
10.	cze	Czech Republic	0.443	0.167	0.328	0.312
11.	dnk	Denmark	1.205	1.166	1.242	1.215
12.	est	Estonia	0.259	0.380	0.488	0.376
13.	fin	Finland	1.203	1.316	1.363	1.306
14.	fra	France	0.779	0.712	0.664	0.725
15.	MKD	FYR Macedonia	-0.644	-0.970	-0.876	-0.841
16.	GEO	Georgia	-1.216	-1.205	-0.983	-1.142
17.	deu	Germany	1.102	1.081	0.940	1.052
18.	grc	Greece	0.226	0.334	0.193	0.256
19.	hun	Hungary	0.317	0.418	0.375	0.373
20.	isl	Iceland	0.845	1.214	1.402	1.162
21.	irl	Ireland	1.012	1.049	1.022	1.039
22.	ita	Italy	0.332	0.400	0.132	0.291
23.	KAZ	Kazakhstan	-1.112	-1.058	-1.058	-1.083
24.	KGZ	Kyrgyz Rep	-0.794	-1.121	-1.392	-1.115
25.	lva	Latvia	-0.173	0.030	0.206	0.016
26.	ltu	Lithuania	-0.080	0.049	0.288	0.082
27.	lux	Luxembourg	1.122	1.275	1.089	1.177
28.	MDA	Moldova	-0.523	-0.830	-1.077	-0.818
29.	nld	Netherlands	1.240	1.282	1.108	1.221
30.	nor	Norway	1.250	0.955	1.190	1.141
31.	pol	Poland	0.241	0.172	0.033	0.149
32.	prt	Portugal	0.770	0.678	0.629	0.699
33.	rom	Romania	-0.500	-0.539	-0.449	-0.503
34.	RUS	Russian Fed	-1.101	-1.177	-1.121	-1.141
35.	svk	Slovakia	-0.004	-0.079	0.302	0.072
36.	svn	Slovenia	0.539	0.294	0.421	0.420
37.	esp	Spain	0.608	0.791	0.579	0.666
38.	swe	Sweden	1.208	1.172	1.149	1.186
39.	che	Switzerland	1.288	1.275	1.221	1.273
40.	TJK	Tajikistan	-2.344	-1.810	-1.570	-1.915
41.	TKM	Turkmenistan	-1.771	-1.562	-1.855	-1.743
42.	UKR	Ukraine	-0.904	-1.106	-0.897	-0.977
43.	gbr	United Kingdom	1.100	1.083	0.875	1.029
44.	UZB	Uzbekistan	-1.468	-1.707	-2.006	-1.745

Source: Authors' calculations based on Kaufmann et al (2007) survey data

Appendix 2. Component scores for political rights and civil liberties

No	Abbr	Country	Freedom House Indicator			Component scores
			FDH95	FDH00	FDH05	FDH
1.	ALB	Albania	7	9	6	-0.607
2.	ARM	Armenia	8	8	9	-0.868
3.	AZE	Azerbaijan	12	11	11	-1.676
4.	aut	Austria	2	2	2	0.835
5.	BLR	Belarus	10	12	13	-1.767
6.	bel	Belgium	2	3	2	0.742
7.	BIH	Bosnia and ...	12	9	7	-1.139
8.	bgr	Bulgaria	4	5	3	0.292
9.	HRV	Croatia	8	5	4	-0.151
10.	cze	Czech Republic	3	3	2	0.654
11.	dnk	Denmark	2	2	2	0.835
12.	est	Estonia	4	3	2	0.565
13.	fin	Finland	2	2	2	0.835
14.	fra	France	3	3	2	0.654
15.	MKD	FYR Macedonia	7	7	6	-0.423
16.	GEO	Georgia	9	8	6	-0.693
17.	deu	Germany	3	3	2	0.654
18.	grc	Greece	4	4	3	0.384
19.	hun	Hungary	3	3	2	0.654
20.	isl	Iceland	2	2	2	0.835
21.	irl	Ireland	2	2	2	0.835
22.	ita	Italy	3	3	2	0.654
23.	KAZ	Kazakhstan	11	11	11	-1.587
24.	KGZ	Kyrgyz Rep	8	11	9	-1.145
25.	lva	Latvia	4	3	2	0.565
26.	ltu	Lithuania	3	3	2	0.654
27.	lux	Luxembourg	2	2	2	0.835
28.	MDA	Moldova	8	6	7	-0.507
29.	nld	Netherlands	2	2	2	0.835
30.	nor	Norway	2	2	2	0.835
31.	pol	Poland	3	3	2	0.654
32.	prt	Portugal	2	2	2	0.835
33.	rom	Romania	7	4	4	0.030
34.	RUS	Russian Fed	7	10	11	-1.140
35.	svk	Slovakia	5	3	2	0.476
36.	svn	Slovenia	3	3	2	0.654
37.	esp	Spain	3	3	2	0.654
38.	swe	Sweden	2	2	2	0.835
39.	che	Switzerland	2	2	2	0.835
40.	TJK	Tajikistan	14	12	11	-1.946
41.	TKM	Turkmenistan	14	14	14	-2.394
42.	UKR	Ukraine	7	8	5	-0.427
43.	gbr	United Kingdom	3	3	2	0.654
44.	UZB	Uzbekistan	14	13	14	-2.302

Source: Authors' calculations based on survey *Freedom in the World* (Freedom House, 2007)

Appendix 3. Component scores for general productivity (GNI)

No	Abbr	Country	ln GNI			Component scores
			lnGNI95	lnGNI00	lnGNI05	GNI
1.	ALB	Albania	7.90	8.27	8.63	-0.914
2.	ARM	Armenia	7.24	7.64	8.34	-1.348
3.	AZE	Azerbaijan	7.34	7.66	8.30	-1.316
4.	aut	Austria	10.03	10.25	10.43	1.046
5.	BLR	Belarus	8.14	8.54	9.06	-0.682
6.	bel	Belgium	10.01	10.22	10.37	0.988
7.	BIH	Bosnia and ...	7.04	8.47	8.73	-1.100
8.	bgr	Bulgaria	8.61	8.70	9.15	-0.467
9.	HRV	Croatia	8.83	9.10	9.46	-0.191
10.	cze	Czech Republic	9.44	9.58	9.87	0.305
11.	dnk	Denmark	10.04	10.23	10.43	1.047
12.	est	Estonia	8.77	9.14	9.67	-0.125
13.	fin	Finland	9.76	10.08	10.33	0.833
14.	fra	France	9.96	10.17	10.34	0.929
15.	MKD	FYR Macedonia	8.52	8.72	8.90	-0.539
16.	GEO	Georgia	7.16	7.68	8.16	-1.378
17.	deu	Germany	9.99	10.17	10.33	0.931
18.	grc	Greece	9.77	9.97	10.27	0.757
19.	hun	Hungary	9.07	9.34	9.68	0.036
20.	isl	Iceland	9.90	10.18	10.44	0.995
21.	irl	Ireland	9.66	10.11	10.39	0.855
22.	ita	Italy	9.91	10.10	10.23	0.814
23.	KAZ	Kazakhstan	8.20	8.41	8.97	-0.721
24.	KGZ	Kyrgyz Rep	6.89	7.13	7.42	-1.678
25.	lva	Latvia	8.53	8.94	9.47	-0.330
26.	ltu	Lithuania	8.70	8.96	9.48	-0.267
27.	lux	Luxembourg	10.54	10.79	10.95	1.935
28.	MDA	Moldova	7.13	7.18	7.80	-1.569
29.	nld	Netherlands	10.06	10.58	10.46	1.185
30.	nor	Norway	10.32	10.56	10.77	1.566
31.	pol	Poland	8.87	9.23	9.48	-0.132
32.	prt	Portugal	9.51	9.75	9.87	0.383
33.	rom	Romania	8.68	8.70	9.11	-0.453
34.	RUS	Russian Fed	8.76	8.91	9.36	-0.303
35.	svk	Slovakia	9.07	9.31	9.63	0.007
36.	svn	Slovenia	9.45	9.74	10.01	0.429
37.	esp	Spain	9.74	10.00	10.20	0.711
38.	swe	Sweden	9.89	10.15	10.37	0.928
39.	che	Switzerland	10.20	10.41	10.56	1.268
40.	TJK	Tajikistan	6.73	6.71	7.27	-1.865
41.	TKM	Turkmenistan	7.76	8.28	8.29	-0.992
42.	UKR	Ukraine	8.06	8.06	8.62	-0.932
43.	gbr	United Kingdom	9.90	10.12	10.38	0.924
44.	UZB	Uzbekistan	7.08	7.27	7.60	-1.567

Source: Authors' calculations based on data from *Human Development Report 1997, Human Development Report 2002 and Human Development Report 2007.*

Appendix 4. Component scores for human development (HDI)

No	Abbr	Country	Human Development Index			Component scores
			HDI95	HDI00	HDI05	HDI
1.	ALB	Albania	0.656	0.733	0.801	-1.088
2.	ARM	Armenia	0.674	0.754	0.775	-1.052
3.	AZE	Azerbaijan	0.623	0.741	0.746	-1.355
4.	aut	Austria	0.933	0.926	0.948	1.008
5.	BLR	Belarus	0.783	0.788	0.804	-0.505
6.	bel	Belgium	0.933	0.939	0.946	1.053
7.	BIH	Bosnia and ...			0.803	
8.	bgr	Bulgaria	0.789	0.779	0.824	-0.449
9.	HRV	Croatia	0.759	0.809	0.85	-0.313
10.	cze	Czech Republic	0.884	0.849	0.891	0.348
11.	dnk	Denmark	0.928	0.926	0.949	0.998
12.	est	Estonia	0.758	0.826	0.86	-0.210
13.	fin	Finland	0.942	0.93	0.952	1.064
14.	fra	France	0.946	0.928	0.952	1.067
15.	MKD	FYR Macedonia	0.749	0.772	0.801	-0.675
16.	GEO	Georgia	0.633	0.748	0.754	-1.269
17.	deu	Germany	0.925	0.925	0.935	0.933
18.	grc	Greece	0.924	0.885	0.926	0.735
19.	hun	Hungary	0.857	0.835	0.874	0.152
20.	isl	Iceland	0.942	0.936	0.968	1.148
21.	irl	Ireland	0.93	0.925	0.959	1.037
22.	ita	Italy	0.922	0.913	0.941	0.899
23.	KAZ	Kazakhstan	0.695	0.75	0.794	-0.939
24.	KGZ	Kyrgyz Rep	0.633	0.712	0.696	-1.633
25.	lva	Latvia	0.704	0.8	0.855	-0.482
26.	ltu	Lithuania	0.75	0.808	0.862	-0.297
27.	lux	Luxembourg	0.9	0.925	0.944	0.898
28.	MDA	Moldova	0.61	0.701	0.708	-1.695
29.	nld	Netherlands	0.941	0.935	0.953	1.085
30.	nor	Norway	0.943	0.942	0.968	1.175
31.	pol	Poland	0.851	0.833	0.87	0.113
32.	prt	Portugal	0.892	0.88	0.897	0.517
33.	rom	Romania	0.767	0.775	0.813	-0.568
34.	RUS	Russian Fed	0.769	0.781	0.802	-0.579
35.	svk	Slovakia	0.875	0.835	0.863	0.161
36.	svn	Slovenia	0.887	0.879	0.917	0.575
37.	esp	Spain	0.935	0.913	0.949	0.965
38.	swe	Sweden	0.936	0.941	0.956	1.107
39.	che	Switzerland	0.93	0.928	0.955	1.034
40.	TJK	Tajikistan	0.575	0.667	0.673	-2.060
41.	TKM	Turkmenistan	0.66	0.741	0.713	-1.377
42.	UKR	Ukraine	0.665	0.748	0.788	-1.052
43.	gbr	United Kingdom	0.932	0.928	0.946	1.006
44.	UZB	Uzbekistan	0.659	0.727	0.702	-1.478

Source: Authors' calculations based on United Nations' data from *Human Development Report 1997, Human Development Report 2002 and Human Development Report 2007*.

Appendix 5. Correlation matrix for aggregate indicators of socio-economic development

		Gover	FDH	GNI	HDI
Gover	Pearson Correlation	1,000	0,931**	0,928**	0,945**
	Sig. (2-tailed)		,000	,000	,000
	N	44	44	44	43
FDH	Pearson Correlation	,931**	1,000	,847**	,851**
	Sig. (2-tailed)	,000		,000	,000
	N	44	44	44	43
GNI	Pearson Correlation	,928**	,847**	1,000	,979**
	Sig. (2-tailed)	,000	,000		,000
	N	44	44	44	43
HDI	Pearson Correlation	,945**	,851**	,979**	1,000
	Sig. (2-tailed)	,000	,000	,000	
	N	43	43	43	43

**. Correlation is significant at the 0.01 level (2-tailed).

Appendix 6. Component scores for aggregate indicators of structural change and socio-economic development

No	Abbr	Country	Agriculture	Industry	Service	Development
1.	ALB	Albania	2.299	-1.583	-1.256	-0.883
2.	ARM	Armenia	1.778	0.900	-2.137	-1.113
3.	AZE	Azerbaijan	0.670	2.530	-2.179	-1.497
4.	aut	Austria	-0.776	-0.036	0.687	1.004
5.	BLR	Belarus	0.340	1.392	-1.064	-1.125
6.	bel	Belgium	-0.849	-0.644	1.098	0.917
7.	BIH	Bosnia and ...	0.332	-0.939	0.181	
8.	bgr	Bulgaria	0.254	0.240	-0.310	-0.256
9.	HRV	Croatia	-0.089	0.244	-0.031	-0.241
10.	cze	Czech Republic	-0.604	1.277	-0.138	0.428
11.	dnk	Denmark	-0.744	-0.783	1.043	1.030
12.	est	Estonia	-0.466	-0.341	0.571	0.171
13.	fin	Finland	-0.634	0.350	0.371	1.028
14.	fra	France	-0.705	-1.249	1.286	0.854
15.	MKD	FYR Macedonia	0.294	0.104	-0.286	-0.640
16.	GEO	Georgia	1.709	-1.533	-0.875	-1.198
17.	deu	Germany	-0.862	0.011	0.759	0.907
18.	grc	Greece	-0.432	-1.616	1.216	0.540
19.	hun	Hungary	-0.443	0.177	0.303	0.328
20.	isl	Iceland	-0.177	-0.716	0.545	1.042
21.	irl	Ireland	-0.610	1.389	-0.198	0.951
22.	ita	Italy	-0.712	-0.330	0.810	0.677
23.	KAZ	Kazakhstan	-0.087	1.099	-0.569	-1.109
24.	KGZ	Kyrgyz Rep	2.684	-0.977	-1.818	-1.531
25.	lva	Latvia	-0.438	-0.835	0.864	-0.047
26.	ltu	Lithuania	-0.205	0.162	0.070	0.057
27.	lux	Luxembourg	-0.915	-1.548	1.818	1.125
28.	MDA	Moldova	1.630	-1.079	-0.762	-1.252
29.	nld	Netherlands	-0.714	-0.819	1.009	1.087
30.	nor	Norway	-0.742	1.577	-0.108	1.136
31.	pol	Poland	-0.424	0.345	0.208	0.216
32.	prt	Portugal	-0.600	-0.558	0.823	0.639
33.	rom	Romania	0.383	1.258	-0.967	-0.379
34.	RUS	Russian Fed	-0.354	1.221	-0.351	-0.799
35.	svk	Slovakia	-0.551	0.321	0.324	0.200
36.	svn	Slovenia	-0.660	0.768	0.174	0.542
37.	esp	Spain	-0.581	-0.215	0.615	0.769
38.	swe	Sweden	-0.800	-0.247	0.827	1.028
39.	che	Switzerland	-0.816	-0.185	0.809	1.094
40.	TJK	Tajikistan	1.893	1.042	-2.136	-2.114
41.	TKM	Turkmenistan				-1.705
42.	UKR	Ukraine	0.419	1.132	-0.884	-0.890
43.	gbr	United Kingdom	-0.863	-0.356	0.977	0.913
44.	UZB	Uzbekistan	2.169	-0.948	-1.316	-1.905

Source: Authors' calculations based on different sources of datasets

Appendix 7. Country clusters according to sectoral structure

		Cluster 1	Cluster 2	Cluster 3
Final claster centers	agr95	42.6	12.4	4.5
	ind95	27.0	35.7	29.3
	serv95	30.4	51.9	66.4
	agr00	29.1	9.2	3.3
	ind00	27.4	36.0	27.4
	serv00	43.4	54.8	69.3
	agr05	23.4	7.1	2.5
	ind05	26.3	35.9	25.9
	serv05	50.4	57.0	71.6
Country		Albania Armenia Georgia Kyrgyz Rep Moldova Tajikistan Uzbekistan	Azerbaijan Belarus Bosnia and ... Bulgaria Croatia Czech Republic FYR Macedonia Ireland Kazakhstan Lithuania Norway Poland Romania Russian Fed Slovenia Ukraine	Austria Belgium Denmark Estonia Finland France Germany Greece Hungary Iceland Italy Latvia Luxembourg Netherlands Portugal Slovakia Spain Sweden Switzerland United Kingdom
Means	Agr	2.023	–0,068	–0.654
	Ind	–0.597	0,862	–0.481
	Serv	–1.471	–0.403	0.838
	DEV	–1.428	–0.240	0.765

Source: Authors' calculations based on World Bank report *World Development Indicators*

Appendix 8. Country clusters according to structural changes in the economy

		Cluster 1	Cluster 2	Cluster 3
Final claster centers	agr0095	0.622	0.903	0.681
	ind0095	0.952	0.995	0.987
	serv0095	1.702	1.023	1.067
	agr0500	0.780	0.893	0.748
	ind0500	0.968	0.929	0.993
	serv0500	1.156	1.087	1.017
	agr0595	0.483	0.788	0.506
	ind0595	0.953	0.916	0.987
	serv0595	1.949	1.111	1.085
Country		Albania Georgia Moldova Romania Tajikistan	Belgium Bulgaria Croatia Finland France FYR Macedonia Germany Italy Kyrgyz Rep Norway Russian Fed Slovakia Spain Uzbekistan Ukraine	Armenia Azerbaijan Austria Belarus Bosnia and ... Czech Republic Denmark Estonia Greece Hungary Iceland Ireland Kazakhstan Latvia Lithuania Luxembourg Netherlands Poland Portugal Slovenia Sweden Switzerland United Kingdom
Means	Agr	1.583	–0.017	–0.333
	Ind	–0.379	0.056	0.046
	Serv	–1.199	0.011	0.254
	DEV	–1.165	0.015	0.332

Source: Authors' calculations based on World Bank report *World Development Indicators*