ANALYSIS OF ECONOMIC AND EXPORTS STRUCTURE OF UKRAINE AND SERBIA AS COUNTRY LEVEL INDICATORS OF ECONOMIC DEVELOPMENT

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Abstract: *The structure of economy and high tech exports in Ukraine and Serbia, in comparison with Croatia, Italy, Poland, Romania and Turkey, is studied. Structural analysis of Ukrainian exports in 2007-2011 is made by technological tenor. It is shown that formulation of strategies for building and implementing regional innovation clusters is a relevant and important tool for intensifying structural change in transitional economies.*

Keywords: *innovation, restructuring of the economy, industry, exports, medium-high-technology sector, high-technology sector, technological tenor, cluster, innovation cluster, clustering strategy*

1. FOREWORD

In the globalization context, transition to the innovation-driven model of economic growth capable to entail higher competitiveness of manufactured products and services at domestic and global markets and the enhanced macroeconomic competitiveness is important for transitional economies striving to achieve the competitive edge that would match the industrially developed countries.

Successful solution of this complex objective depends on the factors like enhancement of human capital, development of economic institutes, implementation and enhancement of already available competitive advantages, creation of new competitive advantages in science and technology sector; change in scales, purposes and mechanisms of innovation processes entailing the leading growth in high tech industrial sectors along with performance enhancement in traditional economic sectors; investment in new production capacities and new economic activities etc.

In view of the above, detailed studies devoted to economic and exports structure and national priority setting in the long-term socio-economic development context become even more relevant and important for transitional economies such as Ukraine and Serbia.

2. REVIEW OF METHODOLOGIES

Extensive analyses of related issues have been made by researchers from New Independent States.

The above mentioned problems are elaborated in the New Independent States in works of Bazhal Yu.M., Bendikov M.A., Bulkin I.A., Geyets I.A., Glaziyev S., Seminozhenko V.P., Soloviyov V.P., Malitsky B.F., Maslak O.I., Melnik T., Mekh O.A., Odotyuk I.V., Pakhomov N.P., Fedulova L.I., Frolov I.E., Yakubovsky M.M. and others. Several methods were used in Ukraine in analyses of technology structure of the national manufacturing. At early 2000s, OECD methodology dated from the middle of 1980s was laid as the basis for breaking industries by R&D capacity measure into high technology, medium technology and low technology industries [1, 2]. The Institute for Economics and Forecasting of the National Academy of Sciences of Ukraine established their correspondence with the conception of technological tenors (TT) in the industry and derived measures for selected indicators of the industrial structure in 1999 for 3rd, 4th, 5th and 6th TT, and for the value added structure in the manufacturing sector in 1998-2000 for high, medium and low technologies corresponding to 5th, 4th and 3rd TT. Industries such as electrical engineering, machine-tool making, instrument-making, household device and machinery, aircraft, pharmaceutical industry, printing and publishing were classified in 5th TT.

The argument for the appropriateness of the above comparisons was convenience of analysis of economic measures reflecting technological evolution as part of broader socio-economic development at country level. As follows from the study, R&D capacity measures for 5th, 4th and 3rd TT were, respectively, 7.43%, 2.41% and 0.16%; the output in these TT was, accordingly, 4.19%, 38.18 % and 57.59%; R&D expenditure was 23.55%, 69.47% and 6.86%; the largest share in the total value added was accounted for by low tech sector (64.14% in 1998, 67.02% in 1999, and 84.05% in 2000). According to research findings and experts, 6th TT covers biotechnologies based on findings in molecular biology and gene engineering, systems of artificial intellect and global information networks.

Fedulova [4, 5] studies R&D capacity of the Ukrainian industrial output in 1998-2004 and 2001-2007, broken down by high, medium and low technology. She shows that low tech sector does prevail in the total national industrial output, and considers several factors for the low share of technologies classified in 5th TT (high tech sector). Emphasis is made on lack of regulatory mechanisms for high tech products in Ukraine.

According to Odotyuk [6], high tech sector in the manufacturing industries in Ukraine covers telecommunication, office, computer and medical equipment devices with high R&D capacity. The share of innovation expenditure in these industries in the total innovation expenditure is analyzed for the year of 2005, and the output structure of the Ukrainian manufacturing industry is measured for 1998-2007 by high, medium and low tech sectors.

It should be noted that the measures for the share of high tech sector in 1998-1999, derived by Odotyuk [6], prove to be much higher than the measures derived by Bazhal [3]. A probable reason behind these variations is that measures of R&D capacity and structure of manufacturing industry, when derived by TT criteria, are not fully applicable for international comparisons due to several distinctions in TT criteria, related with inclusion industries in TT. Several objectives to increase the output in 5th and 6th TT till 2015 are outlined by Malitsky et al. [7] when elaborating the innovation-driven model for restructuring of the Ukrainian economy.

According to the revised OECD methodology [8,9], industries grouping is made by measures of R&D capacity and technology intensiveness, with consideration for analysis of direct and indirect R&D expenditures in various industries in developed countries, numbers of researchers, engineers and technicians, value added, sales, share of each sector in the total output; the four groups of sectors by technology intensiveness are defined: high-technology; medium-high-technology; medium-low-technology; and low-technology [10-11]. Initially, high-technology industries were four: aircraft; pharmaceutical; computer and office equipment and devices; radio, TV and communication equipment; since 2001, the fifth industry was added, manufacturing of scientific (medical, precise and optical) tools. Today, this methodology has wide-scale applications across OECD for international comparisons of the industrial structure of national economies by R&D capacity, and its metadata have been used to the increasingly greater extent in New Independent States. One example can be found in Shinkarenko [12], where calculations and analysis of the industrial structure in Ukraine in 2000-2003 are made for four groups of industries by technology level and by gross value added, which are compared with analogous measures for selected OECD member states. Also, it is shown that average ratio of R&D expenditures to the gross output in the manufacturing industry of Ukraine in 2001-2004 was lower than in OECD where average ratio was 2.5% in 1991-1999. Bulkin and Denisyuk [13] classified Ukrainian industrial entities in 2008 into four groups (entities with high R&D capacity, with medium-high R&D capacity, with medium R&D capacity, with low R&D capacity), and derived the share of each industry by selected measures. Denysiuk [14] used World Bank data to analyze change in measures of economic structure in Belarus, Russia and Ukraine in 1995, 2007-2011 in comparison with selected EU member states and design a model for innovation and investment driven economic development, to intensify economic restructuring through expanding and consolidating industries associated with science & technology advancement.

Golichenko [15] derived R&D capacity of the innovative output and R&D capacity of the expenditures for technological innovations in the Russian manufacturing industry in 2000 and 2003. Bendikov and Frolov [16] argue the need for introducing a separate group, high technology sector with high R&D capacity, in the Russian industry as a factor capable to intensify innovation activities and lay the real basis for competitiveness enhancement in national and global markets. In Industrial Development Report 2009 [17], emphasis is made on change in technology structure of the global industry due to utilization of science & technology achievements. In early 90s of the past century the share of low-technology and medium-low-technology industries in the gross value added in industry was 47.6%, and the share of medium-high-technology and high-technology sectors (corresponding with output and technologies in 4^{th} and 5^{th} TT) was 33.1% and 19.3%. In 2008, the share of low-technology and medium-low-technology industries grew up to 50.2 %, whereas the share of 4^{th} and 5^{th} TT was 32.3% and 17.5%. Also, a growth in the share of output in low-technology and medium-low-technology industries in transitional economies is found, being an indication of the widening technological gap between transitional and industrially developed economies.

Objective of the study is to analyze the economic and exports structure of high tech output in Ukraine and Serbia compared with Croatia, Italy, Poland, Romania and Turkey; to compare the countries by Global Innovation Index, to analyze the exports structure in Ukraine in 2007 -2011 by TT, to justify effective ways for intensifying economic and industrial change in transitional countries.

Results and discussion

Analysis of change in the economic and exports structure in Ukraine and Serbia in comparison with Croatia, Italy, Poland, Romania and Turkey should be started with looking at their populations in 2011, GDP in 2000, 2007 and 2011 in current prices, and per capita GDP in current prices (PPC) (see Table 1).

Table1: Main indicators of selected countries

Indicator	Year	Croatia	Italy	Poland	Romania	Serbia	Turkey	Ukraine
Population, million	2011	4,4	60,6	38,1	21,4	7,4	72,2	45,6
GDP, billion.$ (current prices)	2000	21,5	1104,0	171,3	37,1	6,1	266,8	31,3
	2007	51,3	2101,6	422,1	165,9	40,1	655,9	141,21
	2010	60,9	2061,0	469,4	161,6	38,4	734,4	137,9
	2011	64,2	2245,7	531,8	185,3	46,4	763,1	162,9
GDP per capita, $ (current prices)	2010	14457	36267	13540,4	8863	6081	10522	3621
GDP per capita, $ (PPC)	2011	18338,5	30165,5	20136,0	12357,9	10663,3	14615,5	7198,9

Source: compiled by the author on the basis of World Bank data: http://data.worldbank.org/

In the globalization context, the last two indicators refer to the socio-economic performance of a country, competitive edge of its products and its current productivity that depends on science & technology advancements.

Italy leads in the selected group by the economy scale and economic performance indicators. A comparison with the group of countries that can be classified as counties with large populations shows that, for example, in 2011 GDP and GDP per capita (PPC) in Ukraine was lower by 3.26 and 2.79 than in Poland, and by 4.68 and 2.03 lower than in Turkey. GDP per capita (PPC) in Serbia in 2011 was lower than in Croatia and Romania by 1.72 and 1.16, and higher than in Ukraine by 1.48.

For a comparison of macroeconomic peculiarities in the analyzed countries in the past decade, we are going to look at selected indicators of their economic structure and average measures for countries with various incomes (see Table 2).

For each country it shows the share of GDP generated in four economic sectors that cover industries structured according to the International Standard Industrial Classification (ISIC Rev.3). Agricultural sector covers industries in ISIC divisions (1-5), which include agriculture, forestry and fishing; industrial sector covers divisions 10-45 that include mining and quarrying, manufacturing industries, construction, electricity, water and gas supply; manufacturing industries cover divisions 15-37; services sector – divisions 50-99. Because the share of GDP generated in services sector is derived by the residual principle (by deducting agriculture and industry), its measure fails to reflect properly the whole range of services including banking and financial services.

It can be seen that in Italy, which is a country with developed economy, the share of agriculture in GDP was 3% in 2000, falling down to 2% in 2007 and 2010, whereas the share of services grew up from 69% in 2009 to 73% in 2010. This country is classified as the one with high incomes by most part of averaged measures. Of the East European countries

with transitional economy (Poland, Romania), Romania featured a distinctive development path and had a high share of agriculture in GDP in 2010 (7%), with the increasing share of manufacturing (22%) and the essential increase in the share services from 36% in 2000 to 68% in 2010.

Table 2: Economic structure of selected countries in 2000, 2007 and 2010

	Agriculture			Industry			Manufacturing			Services		
	2000	2007	2010	2000	2007	2010	2000	2007	2010	2000	2007	2010
Croatia	6	7	6	29	32	27	20	21	18	65	61	67
Italy	3	2	2	28	27	25	21	18	17	69	71	73
Poland	5	4	4	32	31	32	19	18	18	63	65	65
Romania	13	9	7	36	36	26	15	22	22	36	55	68
Serbia	20	13	9	30	28	27	24	-	16	50	59	64
Turkey	11	9	10	31	28	27	23	19	18	57	63	64
Ukraine	17	8	8	36	37	31	19	23	17	47	55	61
Averaged measures for countries with various incomes												
Low	34	25	25	21	30	25	12	16	14	45	46	50
Medium	11	9	10	36	37	36	21	19	20	53	53	55
Medium low	20	13	17	34	41	31	17	24	16	46	46	52
Medium high	9	6	8	36	33	37	23	19	22	55	61	55
High	2	1	1	28	26	24	19	17	15	71	72	75

Source: compiled by the author on the basis of World Bank data: http://data.worldbank.org/

The above analysis allows for classifying these countries as countries with higher than average income. Croatia had a large share of agriculture and services in GDP. Turkey had the largest share of agriculture in GDP (nearly 10% in 2010) among the analyzed countries and a higher share of manufacturing in GDP compared with Ukraine and Serbia.

Ukraine and Serbia have undergone economic restructuring, too. An indication is the shrinking share of agriculture in GDP. A typical tendency for Ukraine was the shrinking share of industry in GDP in 2000-2010 (from 36% to 31%) and the rapidly shrinking share of manufacturing (to as low as 17% in 2010).

The share of industry in Serbian GDP fell from 30% to 27% in the same period, and share of manufacturing fell down to 16% in 2010. The share of services in Serbian GDP in 2000-2010 was 3-4% higher than in Ukraine. The analyzed measures allow for classifying both Ukraine and Serbia as countries with medium incomes.

To have a deeper grasp in the structural variations of the national economies, we are going to make a more detailed analysis of their measures of manufacturing regarded by experts as an essential source for rapid science & technology advancement, improvements in production systems and rise of new productions, as the basis for the sustainable macroeconomic performance. An essential characteristic of manufacturing is its capability to produce competitive products for domestic and global markets. Comparison of the

manufacturing performance is made using measures of high tech exports in the analyzed countries (see Table 3).

Table 3: High tech exports in selected countries, in 2007-2011

	Year	Croatia	Italy	Poland	Romania	Serbia	Turkey	Ukraine
High tech exports, % of the total exports *	2011	5,8	6,5	6,1	9,1	3,2	1,7	-
High tech exports, % of the total exports **	2007	8	6	3	3	-	2	4
	2008	8	6	4	7	-	2	3
	2009	10	7	6	9	-	2	6
	2010	9	7	7	11	-	2	4
Rating by Global Innovation Index	2010	44	35	43	50	55	65	60
	2011	42	36	44	52	46	63	63

Source: compiled by the author on the basis of *Global Innovation Index 2012 and ** Statistical Database of World Bank: http://data/world bank.org.

The analysis shows that the group of leaders by tech high manufacturing exports can include Romania, Italy, Poland and Croatia. Ukraine and Serbia can be classified in the medium group by high tech manufacturing exports, whereas Turkey has the lowest measures of such exports.

Also, Table 3 shows data on the positions of the analyzed countries by Global Innovation Index 2011 (covering 125 countries) [18] and Global Innovation Index 2012 (144 countries) [19]. These reports allow for analysis of innovation performance at country level by measures such as the performance of public institutes, innovation infrastructure, business, human capital and research. It can be seen that grouping of countries by Global Innovation Index has much correspondence with the grouping by high tech exports. This is an indication of robustness of high tech exports measure as an indicator of innovation-driven development at country level.

For more detailed analysis of exports in Ukraine, we have made calculations of scopes and shares of the Ukrainian exports by TT in the total exports on the basis of official statistics. The results are given in Table 4.

Table 4: Ukrainian exports by technological mode, in 2007-2011

Year	3rd TT	4th TM	5th TM	Total, %	Total, million $
2007	76,20	18,04	5,72	100	49296,1
2008	78,20	16,64	5,17	100	66967,3
2009	78,24	14,58	7,17	100	39695,7
2010	77,49	16,46	6,04	100	51405,2
2011	76,81	17,36	5,83	100	68394,2

Source: calculated by the author on the basis of database of the State Statistics Service of Ukraine

Calculations show that rapid reduction in the total exports in the crisis period of 2009-2010, especially in 2009, entailed 1.5 to 2.0-percent growth in the share of exports clas-

sified in 5th TT compared with pre-crisis period of 2007-2008, indicating the stability of foreign demand for products of this TT. The total Ukrainian exports in 2011 were only slightly higher than in 2008, with some positive change in the exports structure: the shrinking share of products in 3rd TT and the increasing share of products in 4th and 5th TT. Approaches to creating techno-parks, free economic zones and science parks, elaborated in Ukraine in the latest years, failed to intensify innovation activities and improve economic structure due to several reasons. We believe that economic restructuring and increasing of exports in high-technology and medium-high-technology industries (4th and 5th TT) would require political focus on strategies for regional clustering. The notion "cluster" refers to integration of components in order to have a certain function implemented. The similar meaning is associated with the notion "economic cluster": groups of successfully competing firms which integration secures for them competitive positions at the markets (sectorial, regional, national and global). According to the UN Industrial Development Organization (UNIDO), cluster is defined as a local agglomeration of enterprises engaged in manufacturing and distribution of related or supplementary products within an industrial sector or subsector. Experts also view a regional cluster as a set of firms, universities and other organizations linked with each other in a production field in a given region, where synergy is achieved through competition and cooperation between participants.

Clusters offer a new type of spatial regional organization of production and marketing and a functional chain in value added generation. Clusters enable for horizontal competition and vertical cooperation at the same time, because production processes occur in various economic entities and in various dimensions. Comparative study of regional clusters in Japan, the U.K., Germany, France, the U.S. and China, made by Japan External Trade Organization [20] outlines country specifics in clustering and efficiency of cluster-related ideas.

Current regional clusters are capable to accelerate economic growth and diversification of regional economies, to promote sustainable development of regions and enhance strategic competitiveness at regional and national level with consideration for innovation and investment components of economic development. This strategy requires efficient utilization of the available resources, and its objective should be realized by solving intermediate tactical tasks. When programs of long-term socio-economic development are implemented, special attention should be paid to building up the strategy for regional innovation clusters in industries with high R&D capacity, which offers the most effective form for competitiveness enhancement at regional and country level. Building up strategies for regional clustering is also important for Serbia and other transitional economies. The central objective of cluster policies in transitional economies is in identifying and supporting potential regional clusters, so that clusters and regions where they are located (regional clusters) could be competitive on the global scale.

3. CONCLUSION

1. It is found that Ukraine and Serbia have undergone gradual economic restructuring. One indication of this is the reduced share of agriculture and the increased share of services in GDP. The set of analyzed indicators allows for classifying Ukraine and Serbia in the group of countries with medium income. Distribution of countries by

Global Innovation Index has much in common with their distribution by high tech exports. Measures of Ukraine's and Serbia's economic and exports structure can be used as their innovation-driven development indicators.

2. The total exports of Ukraine in 2011 were just a little higher than in 2008. Yet, the author's calculations could show a positive change in the structure of Ukrainian exports, the shrinking share of products in 3rd TT and the increasing share of products in 4th and 5th TT.
3. Building up strategies for regional innovation clusters in industries with high R&D capacity is relevant and important for Ukraine and Serbia, because this should promote economic restructuring and exports of high-technology and medium-high-technology industries in both countries and enhance their competitiveness.

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