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SIMILARITY AND CONVERGENCE OF EXPORT STRUCTURES OF TRANSITIONAL ECONOMIES AND EU15: CASE OF SERBIA

This paper analyzes the level of conformity between the export structure of 7 countries of the Central and Eastern Europe (CEE) and the EU15 in the period from 2001 to 2011. The obtained results suggest that the process of structural convergence is a time consuming one and that it takes place during the integration process, i.e., mostly before the country's accession to the EU. Moreover, there is a significant difference in the level, dynamics and trends in terms of change in the commodity export structure of Serbia and other CEE countries. The specific situation in Serbia is characterized by the lower level of the conformity coefficient, as well as the absence of the convergence trend, which points to the low level and slow pace of structural changes in Serbia.

Keywords: *commodity export structure, convergence, integration, the EU.*

JEL: *F14, F15.*

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ЗАГАЛЬНІ РИСИ І ОЗНАКИ КОНВЕРГЕНЦІЇ СТРУКТУРИ ЕКСПОРТУ КРАЇН ІЗ ПЕРЕХІДНОЮ ЕКОНОМІКОЮ І КРАЇН ЄС-15: НА ПРИКЛАДІ СЕРБІЇ

У статті проаналізовано міру відповідності між структурою експорту 7 країн Центральної і Східної Європи (ЦСЄ) і країн ЄС-15 у період із 2001 по 2011 рік. Отримані результати показали, що процес структурної конвергенції розтягнутий в часі і що вона відбувається разом із процесом інтеграції, тобто, в основному до вступу країни в ЄС. Крім того, існує значна різниця в рівні, динаміці і тенденціях змін товарної структури експорту Сербії та інших країн ЦСЄ. Ситуація в Сербії характеризується зниженням коефіцієнта відповідності, а також відсутністю тенденцій конвергенції, що вказує на низький рівень і повільний темп структурних змін у Сербії.

Ключові слова: *товарна структура експорту, конвергенція, інтеграція, ЄС.*

Таб. 2. Рис. 1. Літ. 13.

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ОБЩИЕ ЧЕРТЫ И ПРИЗНАКИ КОНВЕРГЕНЦИИ СТРУКТУРЫ ЭКСПОРТА СТРАН С ПЕРЕХОДНОЙ ЭКОНОМИКОЙ И СТРАН ЕС-15: НА ПРИМЕРЕ СЕРБИИ

В данной статье анализируется степень соответствия между структурой экспорта 7 стран Центральной и Восточной Европы (ЦВЕ) и стран ЕС-15 в период с 2001 по 2011 год. Полученные результаты показывают, что процесс структурной конвергенции растянут во времени и что она происходит вместе с процессом интеграции, то есть, в основном до вступления страны в ЕС. Кроме того, существует значительная разница в уровне, динамике и тенденциях изменений в товарной структуре экспорта Сербии и других стран ЦВЕ. Ситуация в Сербии характеризуется снижением коэффициента соответствия, а также отсутствием тенденций конвергенции, что указывает на низкий уровень и медленный темп структурных изменений в Сербии.

Ключевые слова: *товарная структура экспорта, конвергенция, интеграция, ЕС.*

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Introduction. This research aims to determine the kind of similarity of export structures of the selected transition countries with the export structures of the EU-15, special attention will be given to Serbia.

In terms of the convergence of trade structure in the countries that have entered the integration process, 2 questions can be asked: Is it possible to achieve the convergence of trade patterns spontaneously by removing trade barriers and by increasing trade flows between countries? and whether the similarity achieved in this process is at all desirable?

As far as the answer to the first question is concerned, theoretical findings allow both possibilities, i.e. the removal of trade barriers and increase in trade flows between the member countries can lead to both convergence and divergence of trade structures. Usually, when small countries are concerned, the intention is to make the most of the existing comparative advantage in only several sectors, due to increased international trade intensity, these countries can be "pushed" towards the polarization of their export structures. At the same time, one can come across highly integrated economies that do not base their trade on the comparative advantage, but rather on the economy of scale, which contributes to the growth of the intra-industry trade and the creation of similar trade structures. Previous EU enlargements confirmed the theoretical assumptions — the increase in similarities, as well as differences, in terms of trade structures were observed. The so-called "southern enlargement" of the EU has given quite different results. Let us, for example, look at the following examples. Portugal has significantly changed its export structure by getting closer to the EU average, however Greece has not reached any convergence in the trade structure, while Spain, which at the time was very close to achieving the export structure of the EU, slightly diverged from it in the meantime.

Due to the aforementioned facts, it can be concluded that even in case of those countries that are still on the road to the EU membership (such as Serbia), it is difficult to predict in what manner their accession to the EU would affect the convergence of their export structures. The experience of transition countries of the Central and Eastern Europe, which joined the EU, can help us solve the mentioned puzzle - and this is precisely the subject of this paper. The initial hypothesis of this research is that the structure of Serbian commodity exports (as well as export structure of other transition economies) became more similar to the commodity export structure of developed European countries in the period from 2001 to 2011.

Also, for the second question, whether the similarity of production structures is at all desirable, there is also no single answer. Generally speaking, the costs of adjustment are lower when the integration process includes countries relatively similar. This finding is particularly important when the process of integration is lifted to a higher level and goes beyond trade agreements (as in the case with the EU). In this case, the convergence in production and trade can significantly simplify and improve further integration processes. With the similarity between countries increases the possibility they will be subjected to joint (simultaneous) shocks. Greater similarity of production structures will result in an increase in the correlation of business cycles. This means that macroeconomic and industrial policy will be more effective. For this reason, the question of similarity of production and trade structures in the CEE countries is

extremely important in the context of not only the EU accession, but also the accession to the EMU. In order to establish an optimum currency area, countries have to be exposed to symmetric shocks, while their growth patterns should be based on similar monetary policies. The similarity of production structure allows at least the slightest theoretical possibility to achieve factor price equalization through trade. Even where all requirements that lead to the equalization of factor prices are not met, trade between similar countries will lessen their difference. Convergence in factor prices implies that the incentives for factor mobility will be reduced. In the context of the last EU enlargement, this would relieve the concerns regarding the potential migrations that are expected from the CEE countries to the old member states (which is one of the main issues on the EU enlargement agenda) (De Benedictis and Tajoli, 2004).

Thus, it can be said that the similarity of trade patterns of the member countries can be very significant for the more comprehensive integration processes. Higher level of similarity should result in (Crespo and Fontoura, 2005):

- lessening of the need for industrial reallocation;
- facilitation of monetary policy coordination and definition of other common policies;
- increased resistance to asymmetric shocks;
- accelerated convergence of factor prices;
- reduced pressure of migration flows to the EU.

A Review of the Literature. The interest of researchers in the convergence of foreign trade structure among European countries has particularly become popular after the beginning of the transition, i.e. it is associated with the process of rapid and intense reorientation of foreign trade flows in the Central and Eastern Europe, as well as the progress of these countries on their road to the EU membership.

Landesmann's (2000) has shown that the trade structure of the CEE countries with the EU-12 in 1989 represented the typical structure of underdeveloped countries — the share of labor-intensive industries was above average, the share of capital and research intensive industries was below average and the presence of energy intensive industries was above average. Over time, various changes have taken place in the export structure of the CEE countries to the EU, as well as in the revealed indicators of the comparative advantage in different categories of industry. Landesmann and Sehrer (2003) arrived to the similar conclusions while analyzing the trade structure and trade specialization trends in the CEE countries in the period from 1995 to 2000 (the comparison was made with the export structure of the North European countries). In that period, increased presence of labor-intensive export industries was observed in Bulgaria, Romania, Latvia and Lithuania. At the same time, in some countries (Hungary especially), large presence of labor-intensive industries compared to more advanced EU countries has drastically decreased. The CEE countries had a significant deficit in technology-intensive industries in 1995. Meanwhile, this deficit was turned into surplus in Hungary and Estonia, while in some countries it fell significantly. At the same time, in Bulgaria, Romania, Latvia and Lithuania this deficit has remained at a fairly high level.

The obtained results indicated the strong differentiation present in the CEE countries. While some countries have drastically reduced or completely abandoned

inter-industrial specialization in the labor-intensive and low-skill industries, thus making a breakthrough towards technology-intensive and high-skill industries, other countries clearly show that, at least for now, the structure of their specialization remains "locked "in labor-intensive and low-skill sectors. In addition to increasing inter-industrial trade, the growth of intra-industry trade with the EU was characteristic for more developed CEE countries — the Czech Republic, Slovenia and Hungary (which is in favor of raising the quality of a successful product - product differentiation and achievement of the economy of scale). Thus, if the countries exploited a high potential for productivity growth (or improving product quality) in those industries where the initial technological gaps (or gaps in the quality of products) are quite large, they were able to achieve significantly better results in terms of convergence of their export structures (Landesmann and Sehrer, 2003).

Damian, Rojec, and Ferjancic (2008) found that since the beginning of the transition process export structure of transition countries experienced significant structural changes in terms of increasing the share of medium and high skills and technology intensive production and the decrease in the share of primary products, labor-intensive and resource-based products and low skills and technology-intensive production. The export structure of the CEE countries shows tendency of gradual convergence with the export structure of the EU-15. Despite the absence of the optimal economic structure, numerous studies on structural changes in exports of the CEE countries have proven that structural improvement positively affects export performance. Artupane, Djankov, and Hoekman (1997), Hoekman and Djankov (1996) and Kamiski and Ng (2001) found a strong link between the export performance of the CEE countries and the growth of the vertical intra-industrial trade with the EU. This increase is also associated with the growing integration of transition countries into the production and marketing networks of the EU companies. Dulleck et al. (2004) claim that the CEE countries have successfully improved their quality of exports. The structure of their exports is gravitating towards the high-tech industries and the unit value of exports has increased in almost all industries and quality segments. However, while 5 countries of the Central Europe (the Czech Republic, Hungary, Poland, Slovakia and Slovenia) have a chance to be successful in terms of a strong enhancement of the quality of their exports in line with all 3 dimensions, Bulgaria, Romania and the Baltic countries tend to increase specialization in low quality segments of the high-tech industry (Damijan, Rojec, and Ferjancic, 2008).

De Benedictis and Tajoli (2004) have shown that the convergence of export structures of selected countries (Poland, Hungary, Romania and Bulgaria) to a more advanced export structure of the EU was a long process, which is still underway. Although in this period (1989-2000), all 4 countries recorded significantly greater changes in the structure of exports to the EU than the changes of the EU export structure, the full convergence did not take place. Similarly to "the southern enlargement of the EU", different results were achieved — so that throughout the mentioned period the export structure of Poland and Hungary became more similar to the structure of the EU exports, while in Romania, the process just started in the last years of the period, and in the case of Bulgaria divergence occurred.

Popko and Tkachuk (2007) confirmed significant differences in achieving trade convergence concerning the transition countries. On one side, we have Hungary,

Poland and the Czech Republic as countries with the best results in terms of trade convergence, while on the other side we have totally opposite results, like in Ukraine, for example. According to their findings, it is interesting to mention the case of Slovenia whose trade structure almost did not converge throughout the mentioned period.

In his research Nikolic (2010) measured the level of qualitative changes of the overall Serbian foreign trade structure in the period from 1999 to 2009 and compared it with the selected countries in order to determine whether there were some improvements in the structure of Serbian exports in the mentioned period, i.e. whether it has become more similar to the structure of exports of the most developed countries. In addition to the comparison with the most developed countries, Nikolic also compared Serbian exports with some transition countries in order to observe the progress of Serbia in relation to the countries at the similar level of development. The significant decrease in the similarity of the export structure of Serbia with the one in developed countries was recorded in 2000 compared to the situation in 1990. This decline is not surprising given the isolation of the country during the nineties, the devastation of the domestic industrial base and destruction of the export-oriented industries. Opening of the country to the world and signing of the autonomous trade preferences agreement contributed to improving the quality of exports in 2001, as well as increase in the similarity coefficient. However, the following year was marked both by increases and decreases in the similarity coefficient, and only since 2006 the slow but constant growth of observed coefficients has been recorded. However, one must be worried by the fact that in the observed period the comparisons show that the structure of Serbian exports was more unfavorable than that of other more developed transitional countries.

Research methodology and data. It is possible to use several different mathematical formulas in the analysis of structural similarities: Finger-Kreinin similarity index (complementarity coefficient), Cosine similarity index, Euclid's index, Bray-Curtis's method, Spearman's rank correlation coefficient, inverse (modified) integrated similarity indicator and specialization coefficient or coefficient of conformity (Petrovic, 2005). The last one will be used in this paper.

The coefficient of conformity is calculated according to the formula:

$$C_c = \frac{\Sigma_{i=1}^{n} X_{ij} X_{ik}}{\sqrt{\Sigma_{i=1}^{n} X_{ij}^{\ 2} \Sigma_{i=1}^{n} X_{ik}^{\ 2}}}$$

where the symbols have the following meaning:

X_{ij} stands for the share of exports of the product *i* in total exports of the products of the country *j*, and

X_{ik} stands for the share of exports of the product *i* in total exports of the products of the country *k*.

The value of this coefficient ranges from 0 to 1. In the case of full participation of the same product groups in the export of the observed countries, the value of correlation coefficient is 1. In the case where the export structures of 2 countries differ to the extent to where product groups that make the export structure of one country

do not appear in the export of other country, the value of this coefficient will be 0. In practice, the extreme values of the coefficient of conformity never appear in the case of export structure analysis, while the obtained value is interpreted relatively, by making comparisons between the countries.

Application of the coefficient of conformity indicates the degree of conformance between the structures, but does not allow for the testing of statistical significance of differences in terms of the degree of conformance. This is why the degree of conformance of export structures will be calculated in this paper by using simple linear correlation coefficient. The correlation coefficient indicates the degree, direction and strength of the quantitative conformity between the 2 phenomena, while the coefficient of determination represents the ratio between the explained and the total variability (Jovetic, 2007). The value of the simple linear correlation coefficient equals 1, if both structures have the same values of the relative data. However, its statistical significance depends on the value of the coefficient and the value of its variance.

The explained methodology will be used in this paper in order compare the degree of conformance concerning the export structure of 7 countries of the CEE (Serbia, Poland, Hungary, the Czech Republic, Slovakia, Slovenia and Bulgaria) and the EU15 (Germany, France, Italy, the Netherlands, Belgium, Luxembourg, the United Kingdom, Ireland, Denmark, Greece, Spain, Portugal, Austria, Finland and Sweden). Comparative analysis of the position of Serbia and other observed transition countries will represent the special aspect of the analysis.

The Standard International Trade Classification (SITC) Revision 3 was used in order to classify all products into 10 main groups, which are further broken down to the 3-digit level of aggregation. Data on the value of exports by product category are taken from Eurostat's COMEXT database for the EU member states and from the Statistical Yearbook of Serbia provided by the Statistical Office of the Republic of Serbia.

The Results. Compliance of the export structure of European transition countries with the EU15 export structure.

Based on the available data, the coefficient of conformity was calculated for the export structure of 7 CEEC and the export structure of the EU15 in the period from 2001 to 2011. The results are presented in Table 1.

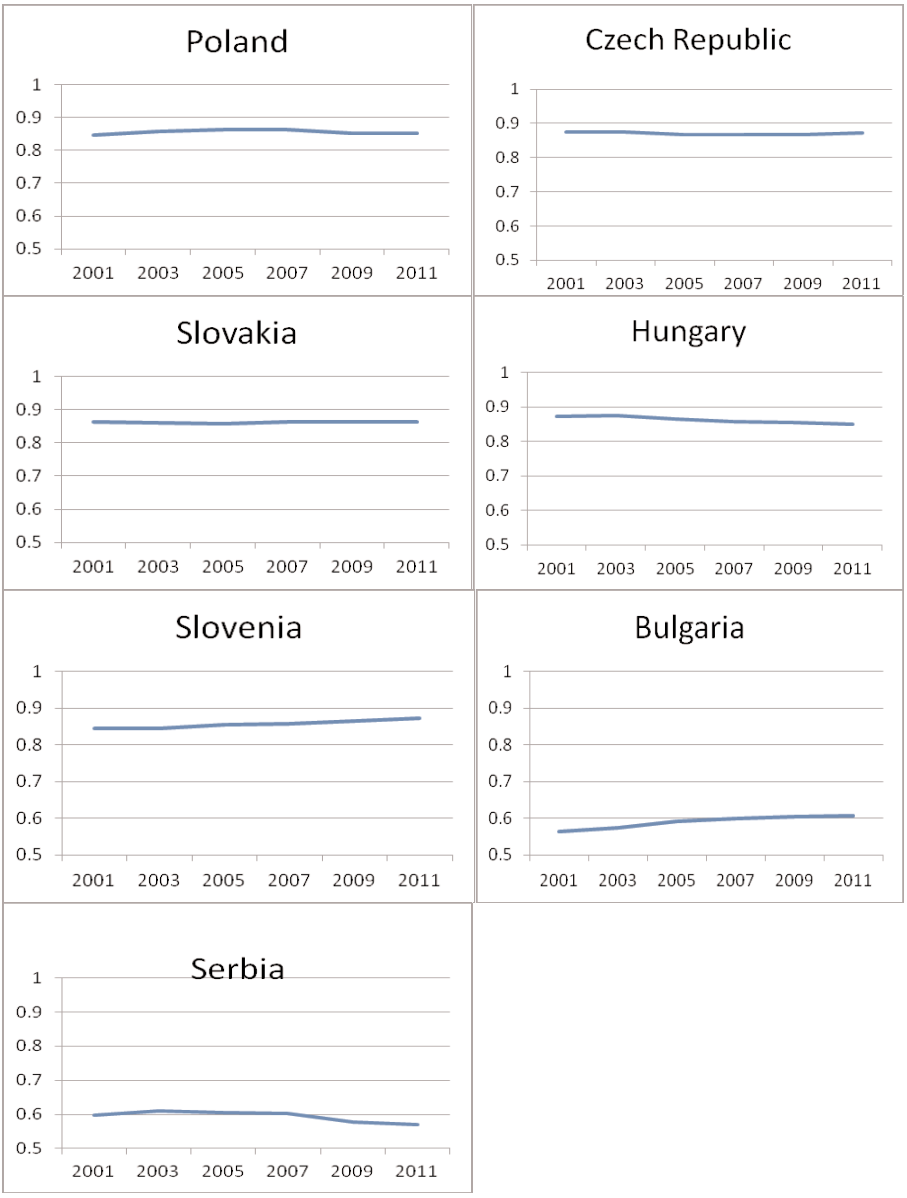
Table 1. **Coefficient of conformance of the export structure of the CEEC and EU15**

	2001	2003	2005	2007	2009	2011
Poland	0.848	0.858	0.863	0.864	0.852	0.852
Czech R.	0.874	0.875	0.868	0.867	0.868	0.872
Slovakia	0.863	0.86	0.858	0.862	0.862	0.862
Hungary	0.873	0.874	0.865	0.858	0.854	0.851
Slovenia	0.844	0.845	0.856	0.857	0.865	0.872
Bulgaria	0.565	0.574	0.592	0.599	0.605	0.606
Serbia	0.598	0.609	0.605	0.603	0.578	0.569

Source: Authors' own calculation.

Table 1 shows that in 2011 Poland, the Czech Republic, Slovakia, Slovenia and Hungary have the average coefficients of over 0.85, indicating a very high conformity between the export structures in these countries and those in the EU15. Bulgaria lags

behind with the 0.60 coefficient, and Serbia comes last with the coefficient of 0.57. This result was expected, concerning the success of the transition processes and the progress towards the EU membership in the observed countries.



Source: Authors' own calculation.

Chart 1. **Changes in the coefficient of conformity in terms of the export structure of the CEEC and the EU15 in the period from 2001 to 2011**

The degree of conformance of the export structures increased in 2011 as compared to 2001 in the case of Poland, Slovenia and Bulgaria, while it stagnated in the

case of the Czech Republic and Slovakia. As far as Serbia and Hungary are concerned, the degree of conformance decreased.

During the observed period that lasted for 12 years, there is relatively little change in the value of the coefficient of conformance regarding the export structure, except Bulgaria. This result suggests that changes in the export sector do not occur in a short period of time, thus changes in this field must be seen as objectives which require long-term strategy in order to be reached. Trends in terms of change of the coefficient of conformance of export structures of the CEEC and the EU15 can be clearly seen in Chart 1.

It is interesting to note that the degree of conformity in the case of export structure of those countries that became the EU member countries in 2004 (Poland, Czech Republic, Slovakia, Hungary and Slovenia) did not increase after, but before their accession to the EU. Furthermore, after 2004 there is a relative stagnation in higher values of the coefficient of conformity. This supports the view that structural coherence of the economy, and hence exports, is a good indicator of the country's readiness to join the EU and to endure competitive pressures of the common market. The example of Bulgaria shows that structural adjustments occured in the accession process. Pronounced trend of increase in the coefficient of conformity for this country is evident from the beginning of the period (since 2001), while the EU membership received in 2007 did not cause changes in the ongoing trend.

The comparative analysis of the structural compliance of export with the structure of the EU15 exports: Serbia vs. other transition countries

As compared to Poland, the Czech Republic, Slovakia, Hungary and Slovenia, Bulgaria and Serbia have significantly lower coefficients of conformity of export structures with those of the EU15 during the entire period observed (see Table 1 and Chart 1). From the point of the delayed transition in Serbia and the country's lagging behind on the road to the EU accession, it is interesting to compare the position of Serbia and other observed transition countries. Several conclusions point to the difficult position of Serbia. First, in the last observed year (2011) coefficient of conformity with the EU15 export structure for Serbia (0.569) was lower than in all other countries at the beginning of the observed period (2001), except for Bulgaria, in which case the values are almost identical (Table 1). Secondly, only Serbia and Hungary showed the divergence in the structure of exports to the EU15 in the observed period. Serbia's coefficient of conformity was 0.598 in 2001 while in 2011 it fell to 0.569, which makes this decrease significantly higher than in the case of Hungary (in which the coefficient of conformity of 0.873 in 2001 fell to 0.851 in 2011).

Taking into account the coefficient of conformity of export structures, as well as general economic indicators and the size of the economy, as well as the fact that among other transitional countries Bulgaria has most recently joined the EU, it seems the best solution to compare Serbian export structure with Bulgarian one. Several conclusions can be made from the data in Table 1. First, at the beginning of the period (2001) Serbian export structure was more similar to the EU15 one (the coefficient of conformity was 0.598), than it was the case with the structure of exports of Bulgaria (0.565). Second, the structure of exports of Bulgaria consistently converged to the EU15 export structure during the entire period, while in the case of Serbia diverging trend was recorded. Third, in the last observed year (2011), the coefficient of con-

formity was about 10% higher in the case of Bulgaria than in the case of Serbia (0.606 for Bulgaria compared to 0.569 for Serbia).

In order to determine the statistical significance of the observed differences in the export structure between Serbia and Bulgaria, the average Pearson's correlation coefficient was calculated for the export structure of Bulgaria and the EU in the period 2001-2011, as well as the average Pearson's correlation coefficient of the export structure of Serbia and the EU in the same period. The calculation was followed by testing the statistical significance of their differences.

The average coefficient of quantitative conformity of export structure of Bulgaria and that of the EU over the entire period is 0.40, and the average coefficient of the quantitative conformity of the export structure of Serbia and the EU in the same period was 0.44. The resulting statistics in terms of testing the difference between the two correlation coefficients is 0.23. Bearing in mind that the critical threshold value of the test is 1.96 (at the risk of 0.05), the null hypothesis on the equality of the coefficients of correlation is accepted, i.e. it can be concluded that there is no statistically significant difference between the export structure of Bulgaria and the export structure of Serbia in the given period. This conclusion supports the thesis that the time that Serbia wasted in the transition process can be compensated, and that Serbia still has a chance to catch up with other transition countries in the region. We arrive to the same conclusion if the correlation coefficients are calculated only for the last year of the observed period, and not for the entire period.

Poor Serbian export structure requires detailed sectoral analysis, in order to detect its "sore spots". In Table 2, the comparison of export structures of Serbia and the EU15 for 2011 is given according to the main SITC sectors.

Table 2. **The structure of exports of Serbia and the EU15 in 2011, according to SITC, %**

Sector of SITS	0	1	2	3	4	5	6	7	8	9
EU15	6.06	1.40	2.42	5.34	0.33	15.78	15.17	40.49	11.04	1.98
Serbia	17.31	1.23	4.42	3.66	0.96	11.02	35.58	9.88	15.68	0.27

Source: Authors' own calculations.

The sectors that have significantly high shares in exports of the EU15 countries in Serbian export are chemicals and related products, and machinery and transport equipment. It is particularly these 2 sectors that are the classic example of technology-intensive sectors, and their low share in Serbian exports indicate poorly developed technological base and outdated manufacturing technology, which is why Serbian industry cannot successfully compete at European and world market. In this context, the development of these sectors should be the priority in terms of adjusting Serbian economy on its way to the EU membership. The sectors that currently have a significantly larger share in Serbian exports than in exports of the EU15 are food and live animals, and manufactured goods classified chiefly by materials.

Conclusion. The issue of compliance of the production and export structure of the economy is of particular importance for the countries that are in the integration process, as is the case of the EU. Theoretical considerations suggest that the similarity of trade structures of the member countries can be quite significant for further

integration, since this can result in reducing the need for industrial reallocation, facilitating of foreign trade, monetary and other economic policies, increased resistance to asymmetric shocks, convergence of factor prices and reduced pressure of migration flows.

The convergence of economic and export structures, according to the abovementioned facts, can be understood as a precondition for deeper economic integration and the capability of the economy to withstand competitive pressure on the expanded market. On the other hand, economic integration and increased competition lead to the relocation of production, thus changes in the structure of exports can be seen as the consequence of integration.

This paper presents the results of the analysis referring to the changes in the structure of exports of 7 European transition countries in the period from 2000 to 2011 (Poland, the Czech Republic, Slovakia, Hungary, Slovenia, Bulgaria and Serbia). The observed period includes the period before and after the accession of Poland, the Czech Republic, Slovakia, Hungary, Slovenia and Bulgaria to the European Union, and the results may be useful in analyzing the dynamics of change in export structure and the effect of the EU membership on it.

The results of the analysis show that the average coefficient of conformity for the export structure of the CEE (Poland, the Czech Republic, Slovakia, Slovenia and Hungary) in 2011 amounted to over 0.85, indicating very high compatibility between the export structure of these countries and the EU15. As it was expected, according to the level of economic development and achieved success in transition reforms, the value of the mentioned coefficient has declined in the cases of Bulgaria (0.60), and Serbia (0.57) which is at the very bottom of the list of the observed countries.

Poland, Serbia and Bulgaria recorded a slight increase in coefficient of conformity in 2011 in terms of export structure, while in the case of the Czech Republic and Slovakia it remained the same. However, in the case of Hungary and Serbia the value of this coefficient decreased. This result is not surprising in the case of Central European countries, since the changes in economic structure and its convergence to the EU 15 structure largely took place in the first decade of transition, i.e. in the 1990s. There is a problem in the case of Serbia, because the observed period at the same time represents the first decade of more significant transitional processes in the country, and the results do not show the presence of major structural changes. Moreover, there was a slight divergence in the export structure compared with the EU15.

Another important conclusion refers to the rate of change in the structure of exports. During the observed period that lasted for 12 years, there is relatively little change in the export structure in terms of coefficient of conformity for all the countries, except Bulgaria.

As far as the EU membership is concerned, this membership does not bring significant changes in the structure of exports by itself, i.e. structural changes are an integral part of the overall process of European economic integration, whereby the simple act of joining the EU has not led to changes in the dynamics and trends of the coefficient of structural conformity of exports. The example of Bulgaria clearly shows that structural adjustments occur during the accession process. Notable trend related to the increase of the coefficient of conformity for this country is evident from the

very beginning of the observed period (since 2001). This further indicates a difficult position of Serbia, because unlike the export structures of all the other countries analyzed, changes in Serbian export structure did not go in the direction of the convergence to the EU15 export structure. The only thing that can be considered encouraging is the fact of no statistically significant difference in the export commodity structure of Serbia and Bulgaria, i.e. it is never too late to implement structural changes, despite Serbia's delayed transition.

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