Vladimir Mićić[1]
Ljubodrag Savić[2]
Dragana Radičić[3]

JEL: L6, L16, L25, O14
DOI:10.5937/industrija46-15594
UDC: 330.341.4:338.45(497.11)
005.591.5:338.32
Original Scientific Paper

The Level of Production Specialization – Serbia and the New EU Member States[4]

Article history:
Received:6 November 2017
Sent for revision: 21 November 2017
Received in revised form: 26 December 2017
Accepted: 26 December 2017
Available online: 20 March 2018

Abstract: *The paper examines the level and changes in production specialization (diversification) characteristic of the manufacturing industry of Serbia and the member states that joined the EU in 2004 and after. The authors aim to analyze the direction of structural changes in Serbia's manufacturing industry and make comparison with the situation in the new EU member states, as well as determine whether those changes that show the same trends as GDP per capita movements are characterized by specialization growth, especially in terms of medium-high and high technology manufacturing activities. Industrial sector specialization index is used to determine the level of specialization of manufacturing industry production sectors and activities. Changes in specialization are analyzed by observing the changes in the mentioned index over a five-year period. The level of specialization of manufacturing sector is compared to the level of GDP per capita and its growth rate. In order to analyze the level of specialization of industry sectors and activities in Bulgaria, the Czech Republic, Estonia, Hungary, Lithuania, Romania, Slovakia, Slovenia and Serbia, the comparison method was used. The results of the research indicate that the direction of structural changes in Serbian manufacturing industry does not follow the usual pattern, i.e., the lower level of GDP per capita results in a higher level of production specialization, while the lower level of specialization and smaller*

[1] University of Kragujevac, Faculty of Economics, micicv@kg.ac.rs
[2] Belgrade University, Faculty of Economics,
[3] dragana@yahoo.com
[4] This paper is the result of research on the Project No. 179065 which is funded by the Ministry of Education, Science, and Technological Development of the Republic of Serbia

number of activities leads to low technology intensity of production, which is not the case with the new EU member states.

***Keywords**: structural changes, specialization of production, diversification, manufacturing industry*

Nivo proizvodne specijalizacije - Srbija i nove članice EU

***Apstrakt**: U radu je analiziran nivo i kretanje proizvodne specijalizacije (diversifikacije) prerađivačke industrije Srbije i članica EU primljenih od 2004. Cilj rada je da pokaže pravac strukturnih promena srpske pređivačke industrije i da ih uporedi sa novim članicama EU, da li su one u skladu sa nivoom BDP per capita praćene rastom specijalizacije, posebno u oblastima sa srednje višom i višom tehnološkom intenzivnošću proizvodnje. U radu se za potrebe analize nivoa proizvodne specijalizacije sektora i oblasti prerađivačke industrije koristi Indeks specijalizacije industrijskog sektora. Promene u specijalizaciji anliziraju se promenom ovog indeksa tokom petogodišnjih perioda. Nivo specijalizacije prerađivačkog sektora dovodi se u vezu sa nivoom BDP per capita i stopama njegovog rasta. Za poređenje nivoa specijalizacije sektora i oblasti industrija Mađarske, Češke, Poljske, Slovenije Slovačke, Estonije, Litvanije, Bugarske, Rumunije i Srbije primenjen je metod komparacije. Rezultati istraživanja ukazuju da pravac strukturnih promena srpske prerđivačke industrije ne prati obrazac, da niži nivo BDP per capita uslovljava viši nivo proizvodne specijalizacije, dok nizak nivo njene specijalizacije i mali broj oblasti uslovljavaju nisku tehnološku intenzivnost proizvodnje, što nije pravilo kod članica EU.*

***Ključne reči**: strukturne promene, proizvodna specijalizacija, diversifikacija, prerađivačka industrija*

1. Introduction

Important elements of structural changes and economic development strategies, in addition to industrialization and deindustrialization, are production specialization and its opposite process - diversification (Foster-McGregor, Kaba & Szirmai, 2015). Changes in the level of specialization/diversification provide information on the potential, volatility and duration of growth episodes, the level of productivity and its growth rate, competitiveness and exports. Different authors and different studies offer different opinions on the role and the place of production specialization and diversification in economic development. Generally, it is considered that specialization increases productivity and competitiveness, while production

diversification opens new possibilities and makes industry able to successfully address difficulties.

The paper examines the level and trends relating to specialization/diversification of production, sectors and activities of the manufacturing industry of Serbia and the new EU member states in the period 2000-2015. The aim is to identify the direction of structural changes in Serbian manufacturing industry and to compare them with those in the EU member states, i.e., to find out whether the structural changes that show similar trends to the level of GDP per capita growth are characterized by specialization growth, especially in areas of medium-high and high technology intensity. The paper builds on the hypothesis that the level of specialization influences the onset of new and productive activities in the manufacturing industry of Serbia and the new EU member states.

The paper is significant for the industrial policy-makers, since, based on information the paper provides, they can more precisely determine the best path to sustainable economic growth, by implementing advantages of specialization and diversification, particularly in Serbia, which is characterized by a low GDPpc level. In this respect, it is very important to ensure the simultaneous development of propulsive production structure with a greater share of “Industry 4.0” and smart production specialization. Their compatibility should consolidate the effects of “smart” industrial, educational and innovative policies, in order to encourage investments in the development of technologically innovative products and ensure greater inclusion of production activities based on knowledge- and technology-intensive solutions.

The value and originality of this paper is that it analyzes the achieved level and the shift in the extent of production specialization, as well as the intensity and number of areas in which a certain manufacturing sector specializes, while the majority of research in this field has been focused on the effects of export specialization and diversification on economic development.

The scientific contribution of the paper is in determining whether the existing forms of structural changes in Serbian manufacturing industry are timely and whether they keep up with particular trends and patterns related to structural changes in the new EU member states. The main limitation of the paper is that the old EU member states (especially those with developed and large manufacturing industries) were not included in the analysis, as well as the lack of certain data on the new EU member states in the observed period. For the purposes of this research, indicators of the relative production specialization were used, while the indicators of the absolute production specialization were not analyzed.

2. Overview of the Literature

Countries specialize in production activities based on comparative advantage, available factors and resources, production costs and labor productivity (Aiginger & Rossi-Hansberg, 2006). Specialization is explained by transport costs, trade barriers, concentration of production, economic integration, and technological innovation (Aiginger, Boeheim, Gugler, Pfaffermayr, & Schnitzer, 1999). Economies of scale, location, agglomeration, market size and demand, all affect the production specialization. Therefore, specialization, either vertical or horizontal one, is the result of spatial agglomeration and dispersion of activities (Krugman & Venables, 1996).

In terms of manufacturing industry, specialization boosts productivity, competitiveness and exports. Diversified structure of the manufacturing industry provides more opportunities for networking and spillover, thus, technological changes and productivity growth in this sector can have a positive effect on the development of other sectors. Countries with high specialization and concentration of activities in the manufacturing industry are less able to sustain growth over longer periods of time than countries with greater diversification (Subramanian, 2007). Based on the findings of the relevant research, it is evident that, in some cases, too much specialization makes an economy vulnerable to external shocks and changes in the terms of trade, meaning that an economy requires a broader range of manufacturing activities (Osakwe, 2007). At lower levels of development and GDP per capita (GDPpc), diversification reduces volatility and makes it possible to sustain growth over longer periods of time (UNIDO, 2015).

The structural change theories emphasize the role of manufacturing industry structure in economic development, as some manufacturing activities have higher productivity levels and growth potential; this means that larger share of such manufacturing activities enhances overall growth, and vice versa (UNIDO, 2015). The comparative advantage theories suggest that the narrow specialization of production and exports enhances the economic development, while other theories argue that economic development implies the diversification of production and exports (Kaulich, 2012).

It is believed that diversification of manufacturing industry represents an essential form of structural changes and development of underdeveloped and developing countries, in particular, due to the fact that the products manufactured by this sector have a significant share in exports (Subramanian, 2007). In terms of developing countries, there is a positive relationship between diversification and GDPpc levels, as these countries are interested in diversifying their production and export structure, which makes their industry and economy grow more rapidly. Countries which have a high GDPpc achieve more benefits if they specialize, especially in the field of high-tech and

knowledge-intensive production (Kaulich, 2012), which points to the conclusion that production and export specialization are linked to sophistication of production. Therefore, at low and medium GDPpc levels, there is a positive relationship between the degree of production diversification and GDPpc level, while at higher GDPpc levels, there is generally a positive relationship between the degree of production specialization and GDPpc level, however, in this particular case, there is also a positive relationship between concentration and GDPpc level (Imbs & Wacziarg, 2003; UNIDO, 2015). For all countries, except for those with highly sophisticated manufacturing industry, industrial development involves specialization and concentration in a relatively narrow range of highly productive activities (Hausmann & Rodrik, 2003).

Various empirical studies related to specialization and diversification have produced different results due to their design, i.e., application of different relative and absolute specialization indicators and length of time series (Kaulich, 2012; Russu, 2015). Therefore, some studies confirm the existence U-curve in terms of production structure, while other identify U-curve with regard to the export structure. In addition, some studies have shown that diversification advances at higher GDPpc levels instead of specialization.

The analyses examine U-curve relationship between GDPpc and production specialization, i.e., diversification (Imbs & Wacziarg, 2003; Kaulich, 2012). The same relationship and the same shape of the curve applies to GDPpc and export specialization (Klinger & Lederman, 2006). Economies that have low GDPpc specialize in a smaller number of production activities, however, the number of these activities increase with the growth of GDPpc. At a higher level GDPpc and development, specialization, again, comes to dominate (UNIDO, 2015). There are also studies that oppose the existence of the U-curve relationship between GDPpc and specialization, and indicate that this relationship can better be described by an L-curve (Kaulich, 2012).

Research in the field of production specialization in the EU member states shows that this process is rapidly advancing; in addition, it has been established that the level of specialization and the size of manufacturing industry are not correlated. Furthermore, the opinion is that the specialization and diversification of the manufacturing industry, in general, is neither good nor bad (DGEI, 2011). One of the studies shows that in the period after 2000, the larger EU countries showed a lower level of specialization in the manufacturing sector compared to the EU average, while smaller countries showed a higher level of specialization. In larger countries, specialization has increased in the manufacturing sectors that produce cars, food, machinery and chemicals, while smaller countries tend to be more specialized in fast-growing and capital-intensive industries (Aiginger & Davies, 2004).

Efforts to achieve increase in industrial competitiveness, as well as the impact of the global economic crisis on the EU member states, called for changes in the manufacturing industry structure. The global economic crisis has shown that those member states - both large and small ones – that focused their industrial policy on creating a more diversified production structure and manufacturing activities, achieved better economic performance (Russ, 2015).

The concept of smart (manufacturing) specialization is rapidly gaining in importance across the EU. This concept emerged as a result of the analysis of various factors that affected the size of the transatlantic (US-EU) productivity gap, especially in terms of the quality and the knowledge economy (Van Ark, O' Mahony & Timmer, 2008). Although this concept has been around for quite a while, and has nothing to do with a planned doctrine, it is much more developed and implemented as a policy and a process in practice, than explained in theory. (Foray, 2011). In terms of theory, smart specialization is defined as an innovative concept which highlights the vertical prioritization principle to favor certain technologies, fields and population of firms and defines a method for identifying desirable areas for intervention policy innovation (Foray & Goenaga, 2013).

Smart specialization in industry is about vertical intervention and selection of preferred manufacturing activities that will get priority and be favored, particularly from the point of concentration of resources. In addition to being based on the process of entrepreneurial discovery, smart specialization also builds on the implementation of smart government policies (Foray, 2011). It includes "smart" (innovative) policies and "smart" industrial and education policy. In this way, smart specialization encourages investments in R&D and product innovation, entrepreneurship and people specializing in innovative production. The process of smart (manufacturing) specialization is not exactly the same and uniform for all industries; in terms of small countries it implies prioritizing and identifying profitable production niches.

From the EU perspective, smart specialization represents a strategic approach to economic development through targeted support and investments in knowledge, research, technological development and innovation as the key national and regional priorities. At the foundation of the process of smart specialization is the application technological innovation in those areas and activities of manufacturing industry, which have strength and comparative advantage (Clar, 2015). The priority task of the EU member states is the technology modernization and introduction of new innovative technologies in the manufacturing industry, in order to maximize the generated value added and the level of competitiveness.

Smart specialization encourages and accelerates structural changes in manufacturing industry (McCann & Ortega-Argilés, 2015). Such concept of specialization is harmonized with the Industry 4.0 concept, due to

complementarity of their goals. Clusters and business networks are important means of smart specialization implementation, since they also represent the means of investment projects implementation (Jakopin, E. 2017).

3. Research Methodology and data

A large number of absolute and relative specialization and diversification indices is used in different empirical research (Palan, 2010). For the purpose of the analysis of the specialization of the manufacturing industry sectors and activities, the research presented in this paper applied *Industrial sector specialization index* (*S* index), although this index has certain limitations (DGEI, 2011). As an indicator of the relative production specialization of a country's industry, this index compares the share of some part of the industry (sector or activity) of one country with the share of the same part of the industry (sector or activity) in a group of countries or an economic integration. It is calculated as follows:

$$S_{i,j} = \frac{\dfrac{GVA_{i,j}}{\sum_{j} GVA_{i,j}}}{\dfrac{GVA_{EU,j}}{\sum_{j} GVA_{EU,j}}} \quad (1)$$

Where: $S_{i,j}$ – Industrial sector specialization index, *GVA* – gross value added; *i* – country; and *j* – manufacturing industry sector or production activity.

The *S* index compares the share of GVA of a sector (C) or an activity of the manufacturing industry (C10-C33) in total GVA of an observed country with the share of GVA of manufacturing industry or an activity in the total GVA of the EU-28. A value of 1 for a sector or an activity shows the equal share of that sector or activity in the respective country and in the EU-28 as well. When the value of the *S* index exceeds 1, this points to a higher level of specialization, while the values lower than 1 indicate the lower level of country's specialization relating to the analyzed manufacturing activity. A higher value also indicates higher level of specialization compared to the EU-28 average and vice versa.

One of the possible ways to analyze specialization is to monitor changes in its intensity instead of the degree of specialization (Foster-McGregor et al., 2015). More precisely, here, the change in intensity of specialization of certain sectors and activities is analyzed, as well as their respective growth or decline over several five-year periods. Such relations and movements are very important, since manufacturing industries (as well as the economies) that are

becoming more specialized and less diversified, show certain slowdown in terms of the growth rate.

The scope of the sectors and activities of the manufacturing industry corresponds to the definition of the industry developed by statistical classification NACE Rev. 2 which includes 64 divisions. The present research also draws on the OECD classification of manufacturing activities by level of technological intensity. In this respect, the manufacturing industry activities, according to the NACE Rev. 2 are classified into four groups: (1) *high-technology* (C21 and C26); *medium-high technology* (C20 and C27-30); (3) *medium-low-technology* (C19, C22-25, and C33) and (4) *low-technology* (C10 -18 and C31-32) (De-Miguel- Molina et al., 2012).

In terms of the analysis and measurements of the manufacturing industry specialization of the nine new EU member states, for which the data on their GVA in the period 200-2015 is available, the authors used data published by the Eurostat. Serbia's manufacturing industry specialization was analyzed based on the GVA data published by the Statistical Office of the Republic of Serbia (SORS).

4. Research results

Table 1 shows the share and the dynamics of change in the share of manufacturing industry in GVA in the period 2000-2015.

Table 1. The share and the dynamics of change in the share of the manufacturing sector in GVA

	2000.	2005.	2010.	2015.	+/-
EU28	18,5	16,7	15,3	15,9	-2,6
Czech R.	26,0	25,6	22,9	26,8	+0,8
Hungary	22,8	22,3	21,9	24,6	+1,8
Slovenia	24,4	22,9	19,2	23,2	-1,2
Slovakia	23,9	23,3	20,7	22,5	-1,4
Romania	22,1	23,6	24,4	22,0	-0,1
Poland	17,3	17,8	16,8	19,7	+2,4
Lithuania	17,2	17,3	17,1	19,3	+2,1
Bulgaria	14,0	16,4	14,5	15,8	+1,8
Estonia	16,9	16,6	15,9	15,8	-1,1
Serbia	23,6	14,4	13,6	15,6	-8,0

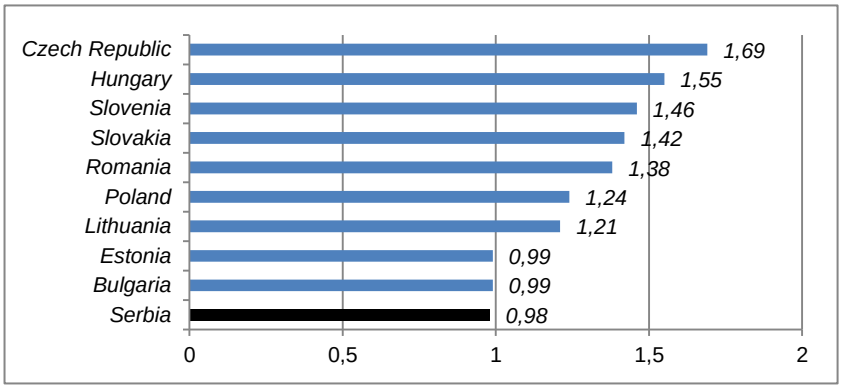
Source: Authors' calculations based on Eurostat and SORS data

As for the group of the new EU member states, the manufacturing industry has a prominent role in the Czech Republic and Hungary, which recorded the increase in the share of this sector in the total GVA in the observed period due to their commitment to develop a solid industrial base. In Lithuania and

Poland, manufacturing industry has a slightly smaller share compared to the aforementioned two countries, however, Poland's and Lithuania's manufacturing industries achieved the most dynamic growth in terms of the GVA structure. Slovakia, Slovenia and Romania, despite a decrease in the share of manufacturing industry in total GVA in the observed period, still have the share of the manufacturing industry in GVA which exceeds the EU-28 average. Only Estonia, which recorded a decline and Bulgaria, which recorded certain growth, are slightly below the EU-28 average. The manufacturing industry in Serbia, although close to the EU-28 average, suffered a huge decline; the reduction of its share in GVA has led to premature deindustrialization of the country.

Chart 1. shows Industrial sector specialization index of Serbia and the new EU member states in 2015. That is, it illustrates the level of specialization of the manufacturing sectors by depicting their shares in the observed economies in relation to the respective shares of same sectors in the EU-28 economy. Corresponding to the level and the dynamics of change of the manufacturing industry share in the GVA, the countries which had the largest share of the manufacturing industry in total GVA, also had the highest values of the *S* index and the highest level of specialization (the Czech Republic and Hungary), while the countries with the smallest share of manufacturing industry in total GVA (Estonia and Bulgaria) had the lowest values of the *S* index and also the lowest levels of specialization.

Chart 1. Serbia's and the EU member states rankings based on S index values, 2015



Source: Authors' calculations based on Eurostat and SORS data

Serbia's Industrial sector specialization index *S* is lower than one, which is not only below the EU-28 average, but also below the observed EU member states average (Table 2). Please note, that this does not necessarily mean

that the country's manufacturing activities are diversification-oriented, nor it can produce a reliable answer to the question whether such situation is either good or bad one. To get the real picture, one must look at the dynamics of change in the level of specialization in the observed period, which must be of sufficient length for the trends, directions and volatility of specialization to be clearly detectible, i.e., long enough to identify the number of activities of manufacturing sector in which one country specializes in.

Table 2. Industrial sector specialization index and GDPpc level

	2000.	2005.	2010.	2015.	+/-	GDPpc u EUR, 2015.
Czech R.	1,41	1,53	1,50	1,69	+0,28	16.000
Hungary	1,23	1,34	1,43	1,55	+0,31	11.100
Slovenia	1,32	1,37	1,25	1,46	+0,14	18.700
Slovakia	1,29	1,40	1,35	1,42	+0,12	14.500
Romania	1,19	1,41	1,59	1,38	+0,19	8.100
Poland	0,94	1,07	1,10	1,24	+0,30	11.200
Lithuania	0,93	1,04	1,12	1,21	+0,28	12.900
Bulgaria	0,76	0,98	0,95	0,99	+0,24	6.300
Estonia	0,91	0,99	1,04	0,99	+0,08	15.400
Serbia	1,28	0,86	0,89	0,98	-0,29	4.700

Source: Authors' calculations based on Eurostat and SORS data

The observed EU member states showed high level of specialization of the manufacturing sector in the considered period, especially since the onset of the global economic crisis. One would have expected a decrease in specialization due to the effect of external shocks, however, this did not occur. The direction and the dynamics of changes in the level of specialization indicates a growth of specialization in this sector in the observed EU member states which is consistent with their respective comparative advantages. Furthermore, member states seek to implement strategic documents, such as the "Europe 2020" and the strategies for "Smart Specialization Platform" in order to continuously implement structural changes, encourage reindustrialization, develop new and modernize the existing industries and improve competitiveness.

It is evident that the specialization of manufacturing sector in Serbia does not match the corresponding phase of industrial development, i.e., the level of specialization should have been greater, if one considers the U-shaped relationship between the GDPpc and production specialization. As Serbia's GDPpc is at a significantly lower level, particularly with regard to Slovenia (4 times), Czech Republic (3.4 times) and Hungary (2.3 times) - whose manufacturing industries show a growing trend in terms of specialization, the country's manufacturing industry should concentrate on significantly improving the level of specialization of its manufacturing activities.

Table 3. Change in specialization and average growth rates

	2000-2005.		2006-2010.		2011-2015.	
	Change S	average growth rate	Change S	average growth rate	Change S	average growth rate
Czech R.	0,12	6,8	-0,03	7,0	0,19	3,1
Hungary	0,11	6,2	0,09	0,8	0,12	2,5
Slovenia	0,05	4,8	-0,12	1,4	0,21	1,3
Slovakia	0,11	12,6	-0,05	1,4	0,07	6,8
Romania	0,22	6,1	0,18	3,9	-0,21	0,6
Poland	0,13	8,0	0,03	9,9	0,14	5,4
Lithuania	0,11	10,8	0,08	1,9	0,09	5,4
Bulgaria	0,22	6,6	-0,03	3,3	0,04	4,2
Estonia	0,08	8,2	0,05	1,6	-0,05	5,4
Serbia	-0,42	-2,2	0,03	2,0	0,09	3,0

Source: Authors' calculations based on Eurostat and SORS data

The analysis of changes in specialization of manufacturing industries, i.e., their growth or decrease over a five-year period, confirms the findings that the more specialized the activity, the slower the growth rate (Foster-McGregor et al., 2015). This rule applies to all analyzed EU member states (Table 3). These countries recorded a decrease in the average growth rate of manufacturing industry over the three separate five-year periods, while their production specialization kept on increasing. The exception was the period 2005-2010, when the countries, except for Poland and the Czech Republic, recorded a decline in production due to the global economic crisis.

Serbia's manufacturing industry, in addition to a decrease in the production specialization (in particular in the period 2000-2005), had a negative average growth rate due to the lagging and inefficient privatization. The Period 2006-2015 is characterized by the production specialization volatility and barely positive average growth rate of the manufacturing industry.

Table 4 gives the values of the *S* index by activity sector of the manufacturing industry in Serbia. It shows that the level of specialization in six activity sectors in 2015 was higher compared to the EU-28 average, as well as that the number of activity sectors was reduced for 3 manufacturing sectors in relation to 2000. In terms of activity sectors, the following have the higher level of production specialization: Manufacture of coke and refined petroleum products (C19), Manufacture of food products, beverages and tobacco products (C10-C12), Manufacture of textiles, wearing apparel and leather (C13-C15), Manufacture of rubber and plastic products(C22), Manufacture of wood and of products of wood and cork (C16) and Manufacture of other non-metallic mineral products (C23). Except for the Printing (C18), Manufacture of coke and refined petroleum products (C19), Manufacture of rubber and plastic products (C22) and Manufacture of motor vehicles (C29), where a growth in specialization is recorded, all other activity sectors show a decrease in

specialization. Despite the growth of investments in the production of motor vehicles, the level of specialization in this area is below the EU-28 average. It is higher only in relation to Bulgaria, Estonia and Lithuania. This is due to insufficient investments in relation to the level and development needs of other manufacturing industry's activity sectors.

Table 4. S index- activity sectors of the manufacturing industry in Serbia

	2000-2005.		2006-2010.		2011-2015.	
	Promena S	Prosečna stopa rasta	Promena S	Prosečna stopa rasta	Promena S	Prosečna stopa rasta
Czech R.	0,12	6,8	-0,03	7,0	0,19	3,1
Hungary	0,11	6,2	0,09	0,8	0,12	2,5
Slovenia	0,05	4,8	-0,12	1,4	0,21	1,3
Slovakia	0,11	12,6	-0,05	1,4	0,07	6,8
Romania	0,22	6,1	0,18	3,9	-0,21	0,6
Poland	0,13	8,0	0,03	9,9	0,14	5,4
Lithuania	0,11	10,8	0,08	1,9	0,09	5,4
Bulgaria	0,22	6,6	-0,03	3,3	0,04	4,2
Estonia	0,08	8,2	0,05	1,6	-0,05	5,4
Serbia	-0,42	-2,2	0,03	2,0	0,09	3,0

Note: the activity sectors where the value of the S index exceeds 1, as well as the EU-28 average, are marked in color

Source: Authors' calculations based on Eurostat and SORS data

A particular problem here is that all six activity sectors belong to either low or medium-low technology group, hence the lower levels of productivity and value added. While the manufacture of motor vehicles, machinery, equipment, chemicals and chemical products have a predominant share in production structure (and factors of production) of the new EU member states, in Serbia we have quite a different situation. The mentioned major manufacturing sectors are labor- and resource-intensive; therefore, these two factors are very important for Serbian production specialization, which can be considered a disadvantage.

Table 5 gives an overview of Industrial sector specialization index by activity sectors in the new EU member states and Serbia.

The *S* index of the observed countries shows the level of production specialization in relation to the EU-28, the number and diversity of activities in which some countries specialize, as well as the technological intensity level of production systems. The new EU member states have increased their manufacturing industry specialization. Furthermore, the general rule that large countries are characterized by a low degree of manufacturing industry specialization (as is the case with Poland and Romania), while the small countries have a higher degree of specialization (which is not the case with Bulgaria, Estonia and Lithuania) has not been confirmed in terms of the new

EU member states. Small countries with higher GDPpc levels have generally higher levels of manufacturing industry specialization, as well as the number of sectors with higher levels of specialization of production.

Table 5 S index – activity sectors of the manufacturing industry, 2000-2015.

Sektor oblast		Bulgaria	Czech R.	Estonia	Lithuania	Hungary	Poland	Romania	Slovenia	Slovakia	Serbia
C	2015	0,99	1,69	0,99	1,21	1,55	1,24	1,38	1,46	1,42	0,98
	+/-	0,23	0,28	0,08	0,28	0,32	0,30	0,19	0,14	0,13	-0,29
C10-12	2015	1,43	1,05	1,00	2,19	1,10	1,57	2,48	0,71	0,67	2,00
	+/-	0,17	-0,56	-0,35	0,10	-0,33	0,14	-0,43	-0,46	-0,63	-0,91
C13-15	2015	3,37	1,12	1,82	2,77	0,87	1,16	3,91	1,28	1,66	1,85
	+/-	1,27	-0,38	-0,68	-1,03	-0,73	-0,04	1,21	-1,12	-0,44	-0,25
C16	2015	1,00	2,00	9,00	4,67	1,00	2,33	2,33	2,67	3,67	1,33
	+/-	0,50	0,00	3,25	1,42	-0,25	0,58	0,08	0,17	1,92	-0,17
C17	2015	1,00	1,00	0,75	1,25	1,00	1,50	0,50	1,25	1,25	1,00
	+/-	0,67	0,00	0,25	0,75	0,33	0,67	-0,17	-0,08	-0,58	-0,17
C18	2015	1,00	1,33	1,00	1,33	1,00	1,00	1,00	1,33	1,00	1,00
	+/-	0,67	0,67	0,17	0,67	0,17	0,17	0,67	0,17	0,33	0,33
C19	2015	1,50	0,50	2,50	0,00	4,50	3,00	9,00	0,00	3,50	6,50
	+/-	-5,17	-0,83	2,17	0,00	0,17	1,00	5,67	0,00	-1,17	2,50
C20	2015	0,91	0,91	0,36	1,36	1,27	0,82	0,73	1,09	0,73	0,91
	+/-	0,08	-0,26	-0,22	0,45	0,44	-0,02	0,14	0,09	-0,36	-0,59
C21	2015	0,44	0,44	0,11	0,44	1,78	0,33	0,22	3,00	0,11	0,33
	+/-	-0,39	-0,22	-0,06	0,28	-0,06	0,00	-0,28	0,33	-0,56	-0,67
C22	2015	1,14	3,00	0,43	1,71	2,14	2,00	1,29	2,29	2,57	1,71
	+/-	0,81	1,44	-0,13	1,05	1,14	0,89	0,73	0,84	1,46	0,38
C23	2015	2,00	2,40	1,40	1,40	1,60	2,20	1,80	1,80	1,60	1,20
	+/-	1,33	-0,04	0,29	0,62	0,38	0,64	0,47	0,58	-0,07	-0,91
C24	2015	1,60	2,00	0,00	0,20	1,20	1,20	1,80	2,40	2,40	0,80
	+/-	0,23	0,00	0,00	0,08	0,33	0,33	0,43	1,03	-0,48	-0,58
C25	2015	0,93	2,00	1,27	0,60	1,07	1,40	0,73	2,13	2,13	0,80
	+/-	0,58	0,71	0,50	0,31	0,13	0,64	0,20	0,37	1,13	-0,08
C26	2015	0,63	1,88	1,00	0,63	2,38	0,63	0,75	1,00	1,13	0,38
	+/-	0,35	1,15	0,45	-0,19	0,74	0,26	-0,07	-0,09	0,49	-0,08
C27	2015	0,78	2,00	1,00	0,44	1,00	0,89	1,00	2,33	1,11	0,44
	+/-	0,48	0,60	0,50	0,04	-0,80	0,19	0,40	0,33	0,11	-0,36
C28	2015	0,65	1,47	0,41	0,35	1,94	0,53	0,53	0,88	0,94	0,41
	+/-	0,20	0,36	0,19	0,19	1,33	0,03	-0,08	0,27	0,05	-0,09
C29	2015	0,31	3,25	0,50	0,13	3,13	1,00	1,19	1,25	2,63	0,63
	+/-	0,24	1,25	0,21	-0,09	0,98	0,50	0,69	0,54	1,27	0,13
C30	2015	0,40	1,20	0,20	0,40	0,40	1,00	1,00	0,20	0,40	0,20
	+/-	0,15	0,45	0,20	-0,35	0,15	-0,25	-0,25	-0,05	0,15	-0,05
C31-32	2015	1,00	1,29	1,57	3,86	1,14	1,57	1,14	1,29	1,14	0,71
	+/-	0,67	0,06	-0,10	2,75	0,48	0,57	-0,41	-0,05	0,37	-0,29
C33	2015	0,83	1,67	1,33	1,17	0,83	1,50	1,50	1,67	1,33	0,33
	+/-	0,17	0,00	-0,50	0,67	0,17	0,00	1,00	0,17	-0,33	0,17
Broj oblasti		6	15	7	10	12	11	10	14	13	6

Note: the activity sectors where the value of the S index exceeds 1, as well as the EU-28 average; +/- change 2015-2000 are marked in color

Source: Authors' calculations based on Eurostat and SORS data

Countries with lower GDPpc levels, such as Bulgaria, have less specialized production systems compared to the EU-28 average and a smaller number of sectors with a higher level of specialization of production. Bulgaria and Estonia are at a similar level of specialization as Serbia, and these countries specialize in almost the same number of manufacturing industry sectors. If we compare the number of manufacturing industry sectors that these three countries specialize in and the industrial structure and specialization of other countries, especially the Czech Republic, Hungary, Slovakia and Slovenia, it can be concluded that these new EU member countries, considering the number of manufacturing industry sectors they specialize in are diversification-oriented.

In terms of the analyzed EU countries, except for the Czech Republic, Hungary, Slovakia and Slovenia, which have a slightly lower share of traditional manufacturing industry sectors and even show tendency of further reducing their share (C10-C12, C13-C15 and C31-C32), specialization exceeds the EU-28 average. Generally, all countries involved in the production of coke and refined petroleum products (C19) have a very high level of specialization which is well above the EU-28 average. The Czech Republic, Hungary, Slovakia and Slovenia belong to the group of countries with a high BDPpc level, and tend to increase degree of specialization in medium-high technology manufacturing (C-20 and C27-30), as well as in those areas characterized by a more sophisticated production and high-technology industries (C-21 and C-26). Estonia, Lithuania and Poland are making efforts to increase specialization in areas characterized by medium-high technology manufacturing and reduce the share of medium-low technology industries. Bulgaria and Romania, as countries with lower GDPpc levels have a higher level of specialization of production in traditional manufacturing industries which are characterized by low- and medium-low technology intensity. The tendency in these countries is to decrease specialization in low-technology industries and increase specialization in medium-low technology intensity industries.

5. Conclusion

Industrial sector specialization index of Serbia compared to the analyzed new EU member states (except for Estonia and Bulgaria) is at a low level due to the low and/or declining share of the sector in total GVA of the country's economy. Based on the U-shaped relationship between the GDPpc level and specialization of production, the value of this index should have been greater, as is the case with the EU member states.

The level of specialization of manufacturing sector in Serbia is low in comparison with the phase of the country's industrial development. Changes in specialization over a five-year period confirm the rule that increase in specialization brings about decrease in the manufacturing industry growth rate. In terms of the analyzed EU countries, this is exactly the case. However, in Serbia we have a different situation, i.e., the decrease in specialization is accompanied by negative or low growth rates.

Structural changes in the industry of Serbia and the new EU member states, as well as changes in their specialization/diversification in the period 2000-2015, indicate that the U-shaped relationship holds for specialization development. Also, Serbia and the new EU member states that have lower GDPpc specialize in smaller number of manufacturing sectors/activities compared to the EU member states with higher GDPpc which specialize in many industries and endorse more diverse specialization. This is due to the different production specialization factors on which some industrial sector specialization rests, as well as the differences in comparative advantage of the mentioned sector. Industrial specialization in Serbia is mainly implemented in low and medium-low technology production sectors, which confirms the rule that at lower GDPpc levels and at early-stage specialization development, industrial specialization is located in low or medium- low technology sectors. However, in the new EU member states specialization of production induces increase in technology intensity of production in those industries that generate greater GVA. This confirms the hypothesis that the level of specialization influences the creation of new and productive activities both in the manufacturing industry of Serbia and the new EU member states.

Results of the analysis point to the fact that Serbia needs to implement (smart) specialization concept as a new innovative industrial policy agenda in order to effectively channel the investments to technology innovation projects and their implementation in those sectors/industries that have comparative advantage. Smart specialization would encourage structural changes in the manufacturing industry and the development of new manufacturing and productive activities, while the major generators of GVA and employment would shift towards knowledge- and technology- intensive activities. A more determined orientation towards smart specialization would lead to technological development and higher value-added activities, which would secure an effective and long-term sustainable economic growth in the future.

6. References

Aiginger, K., & Davies, S. W. (2004). Industrial specialisation and geographic concentration: two sides of the same coin? Not for the European Union. *Journal of Applied Economics*, *7*(2), 231.

Aiginger, K., & Rossi-Hansberg, E. (2006). Specialization and concentration: a note on theory and evidence. *Empirica*, *33*(4), 255-266.

Aiginger, K., Boeheim, M., Gugler, K., Pfaffermayr, M., & Wolfmayr-Schnitzer, Y. (1999). Specialisation and (geographic) concentration of European manufacturing. *Study commissioned by the European Commission*. 11.

Clar, G. (2015). Perspectives for Research and Innovation Strategies for Smart Specialisation (RIS3) in the wider context of the Europe 2020 Growth Strategy/Günter Clar, Patries Boekholt, Claire Nauwelaers, Christian Saublens, Marek Tiits. *Luxembourg: Publications Office of the European Union*, *88*. 17-22.

Directorate-General for Enterprise and Industry – DGEI. (2011). EU industrial structure 2011 — Trends and Performance. (2011). European Commission, Luxembourg, 39-42.

De-Miguel-Molina, B., Hervas-Oliver, J. L., Boix, R., & De-Miguel-Molina, M. (2012). The importance of creative industry agglomerations in explaining the wealth of European regions. *European planning studies*, *20*(8), 1263-1280.

European Commission. (2015). Perspectives for Research and Innovation Strategies for Smart Specialisation (RIS3) in the wider context of the Europe 2020 Growth Strategy. DG Research and Innovation.

Hausmann, R., & Rodrik, D. (2003). Economic development as self-discovery. *Journal of development Economics*, *72*(2), 603-633.

Foray, D. (2011). Smart specialisation and the New Industrial Policy agenda. *Policy Brief*, (8), 1-15.

Foray, D., & Goenaga, X. (2013). The goals of smart specialisation. *S3 policy brief series*, *1*, 2013, 1-18.

Foster-McGregor, N., Kaba, I., & Szirmai, A. (2015). *Structural change and the ability to sustain growth* (No. 048). United Nations University-Maastricht Economic and Social Research Institute on Innovation and Technology (MERIT).

Imbs, J., & Wacziarg, R. (2003). Stages of diversification. *The American Economic Review*, *93*(1), 63-86.

Jakopin, E. (2017). Smart specialisation of manufacturing industry: Relying on one's own strengths and targeted attraction of FDI. *Ekonomika preduzeća*, *65*(1-2), 155-173.

Kaulich, F. (2012). *Diversification vs. specialization as alternative strategies for economic development: Can we settle a debate by looking at the empirical evidence?*. United Nations Industrial Development Organization. 2-20.

Klinger, B., & Lederman, D. (2006). Diversification, innovation, and imitation inside the global technological frontier. *World Bank policy research working paper*, (3872). 22-28.

Krugman, P., & Venables, A. J. (1996). Integration, specialization, and adjustment. *European Economic Review*, *40*(3), 959-967.

McCann, P., & Ortega-Argilés, R. (2015). Smart specialization, regional growth and applications to European Union cohesion policy. Regional Studies, 49(8), 1291-1302.

Osakwe, P. N. (2007). Foreign aid, resources and export diversification in Africa: A new test of existing theories. 1-19.

Palan, N. (2010). *Measurement of Specialization The Choice of Indices* (No. 62). FIW working paper. 1-38.

Russu, C. (2015). Industrial Specialization of the European Union Member Countries. *Economic Insights-Trends & Challenges*, *67*(2). 63-73.

Subramanian, A. (2007). Capital Account Convertibility: A Neglected Consideration. *Economic and Political Weekly*, *42*(25), 2413-2418.

UNIDO. (2015). *Industrial Development Report 2016. The Role of Technology and Innovation in Inclusive and Sustainable Industrial Development.* Vienna, 28.

Van Ark, B., O'Mahony, M., & Timmer, M. P. (2008). The productivity gap between europe and the united States: trends and causes. *The Journal of Economic Perspectives*, *22*(1), 25-44.