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SOCIO-ECONOMIC TRANSFORMATION OF ŠUMADIJA DISTRICT (SERBIA)

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Abstract: The paper starts from the hypothesis that the examined area is characterized by a process of intensive functional transformation accompanied by certain population changes. The transformation of the settlement structure is shown in the area of Šumadija district. The trend of demographic and economic development was observed with a historical overview. It was upgraded with quantitative analyzes (chain index, population change index, functional classification, index of specialization and localization) for the period 1971–2011. The aim was to determine the degree of socio-economic transformation of Šumadija district and the regularities according to which these changes took place. Industrialization generally brings changes in the functional orientation and redistribution of the population. The deagrarianization was one of the main features, with parallel emigration of the rural population. These changes were intensive in 1961–1981, when the peak of employment in secondary activities was registered. Since then, significant spatial transformation in Šumadija district was visible. Special analyzes were used to confirm the assumption that Kragujevac is a dominant labor center, an administrative and service nucleus, which has a propulsive influence on the development of its immediate surroundings (suburban belt) and the wider area (Šumadija district). The contribution of this paper is in the understanding of the scope, spatial distribution, and intensity of changes that have occurred in Šumadija district. It introduces the historical circumstances and quantitative research into a broader concept as a basis for understanding the trajectories of spatial and socio-economic development, and responds to many social challenges specific for this territory.

Keywords: functional transformation; demographic trend; settlement; Šumadija district

Introduction

Throughout history, numerous events in Serbia have caused significant changes in the performance of activities, which have influenced the genesis, transformation of the structure, and the physiognomy of its settlements. Some events were related to external influences on the organization and spatial development (Ottoman system of settlement formation and way of life) (Cvijić, 1902). Some of them reflected on the construction type (Balkan profane architecture (Kojić, 1933), Austro–Hungarian building system (Kojić, 1958), compaction and "descent" of settlements (Cvijić, 1902; Kojić & Simonović, 1975),

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etc.), while others show tendencies toward improving living conditions in villages, political decisions (housing and settlement consolidation (“ušoravanje” in Serbian) (Djordjević, 1914), agrarian reform, etc.) and economic issues (industrialization, tertiarization and recent economic trends—transition, deindustrialization). Each of these processes has determined the way of life, distribution in space, emphasis on certain functions, morphological shaping, and the evolution of the settlement structures.

The aim of this paper is to examine what changes have taken place in the settlements network of Šumadija district, to identify developmental poles and flows, and to determine the trajectory of functional and demographic changes. Šumadija district (Nomenclature des Unités territoriales statistiques 3—NUTS 3) was chosen to be the observed area due to the different criteria for its delimitation in the past (Jovanović, 1988). This area is a representative for the observation of the socio-economic transformation due to its continuous oscillations in the pace of the population and economic development through history. The focus of the paper is on the functional features of Šumadija district and its transformations in the functional structure, while population development was observed as one of the consequences of the economic processes that have occurred in this area. Through the changes in functional contents, the type of settlements and municipalities has been changing. The analysis of the functional structure at the municipality level identified their functional orientation. Changes in the activity structure have also been analyzed, which indicated the spatial expression of certain activities in Šumadija district and the formation of labor centers and developmental poles. The City of Kragujevac, as the largest administrative unit in terms of population and economically the most important one, was separately observed at the settlement level in order to determine the patterns of functional development in the settlements network. The period from 1971 to 2011 was taken as relevant for the analysis of the functional structure and identification of significant transformations. Industrialization conditioned the most intense changes in terms of economic development and population growth, which were visible as early as in the 1970s. The year 2002 was taken as relevant for the second phase of functional transformation. It was the point when the changes in economic structure were realized as a product of the economic collapse during the 1990s and the beginning of transitional changes. The latest available data were from 2011.

Research methodology

Socio-economic transformation is a wide and complex issue, which requires the engagement of different approaches based on qualitative and quantitative research. In practice, it has been confirmed that one-sided observation of the processes that take place in space cannot be used to determine spatial changes, to recognize their causes, or to consider their effects. For that purpose, it is necessary to approach the problem systematically. This paper starts from the hypothesis that the area is characterized by a process of intensive functional transformation that was accompanied by certain population changes, which were generated by the influence of the formed developmental nucleus in the area—Kragujevac (here and after, the administrative center of the City of Kragujevac and Šumadija district is referred to as Kragujevac). In order to understand the circumstances under which the settlement network of Šumadija district has developed, the historical method was applied to collect facts in the archival material. Since it is not possible to use a qualitative approach to fully observe the direction of the spatial transformation, and in order to avoid the tendency toward descriptive analysis, a quantitative approach was applied. Mathematical-statistical tools in the form of indices were consulted in order to examine the interdependence of demographic fluctuations and the changes in the economic structure.

The data on population dynamics were analyzed for the period 1948–2011 by applying the population change rate, which showed the proportional variations of the phenomenon over time, or growth rate (Statistical Office of the Republic of Serbia [SORS], 2008). The chain indices calculated for the time series showed the direction of the phenomenon, with values greater than 100, indicating that the phenomenon increased in the observed period, and the ones less than 100 showed its decrease (Kero, Dobša, & Bojanić-Glavica, 2008). Changes in the settlement size and population were expressed by cumulative series of shares in the total number of settlements of the appropriate size and the number of inhabitants. A comparison of the obtained results was performed. The data on a comparative overview of the population from 1948–2011 were used to calculate these indicators (SORS, 2014).

The process of functional transformation of the municipalities of Šumadija district, as well as of the City of Kragujevac at the settlement level, was carried out for the period 1971–2011. The classification was made according to Fehre's model of tenar diagram, based on the participation of the active population by activity sectors, which has found wide application in geographical and spatial planning practice (Grčić, 1999; Tošić, 1999; Veljković, Jovanović, & Tošić, 1995). The classification of municipalities, based on the population economic structure was used in the paper as one of the bases for determining the directions of socio-economic transformation (Miletić & Drobnjaković, 2015). For the same purpose, an index for the determination of the relationship between the activity sectors in each municipality and the entire Šumadija district was used. The index has a wide application in research of functional specialization (Obrębalski & Walesiak, 2015) and served as a basis for isolating dominant activities and determining the peak of development, which was associated with the population changes. As municipal centers were the developmental poles of local territories, the relation of the relative importance of activity sectors (Z_i) in them for the observed period, i.e., surplus employment in activity sectors, was determined. In this regard, their functional specialization was performed. For this purpose, a modified Hoyt's relative employment index (Hoyt, 1954; Jovanović, 1988) was consulted, according to the Equation (1):

$$Z_i = 100 Dmci/Amci - 100 Ddi/Adi \quad (1)$$

where is Z_i —relative importance of activity sector; $Dmci$ —employees in activity sector in the municipal center; $Amci$ —active population in the municipal center; Ddi —employees in activity sector of the district; Adi —active population of the district.

Given that the accelerated economic and social development was encouraged by the strong development of industry, the importance of this function in municipal centers was taken into account. The categorization of municipal centers according to the coefficient of localization and participation of industry (Lind) in them was performed. This coefficient measured the ratio of the employment rate in a certain economic sector of a territorial unit (settlement, region) and the employment rate in the same economic sector at the level of the wider territory to which it belongs (region, state). Values higher than 1 showed a higher employment rate in the settlement compared to the region as a whole, indicating the specialization of settlements in the economic sector (Obrębalski & Walesiak, 2015). It is the most widely used model for the assessment of the activities agglomeration at a particular location (Angulo, Mur, & Trivez, 2014; Christofakis & Gkouzos, 2013), due to its calculation simplicity, data availability, as well as its applicability in

different contexts (Figueiredo, Guimaraes, & Woodward, 2007). In this research, a modified Florence model was applied (Sargant Florence, 1944; Jovanović, 1988) using the Equation (2):

$$Lind = Imc/Id - Zmc/Zd \quad (2)$$

where is *Lind*—coefficient of localization; *Imc*—active population of the municipal center in the industry; *Id*—active population of the district in the industry; *Zmc*—employees in the municipal center; *Zd*—employees of the district.

By the graphic representation of the obtained values in the coordinate system (the relative importance of industry on the abscissa, and the coefficient of localization on the ordinate), the ratio of the centers in the hierarchical system was determined. A greater distance from the coordinate center indicated a higher level in the settlement hierarchy (Jovanović, 1988).

The data from the Federal Statistical Office (FSO, 1974) and the SORS (1981, 1991, 2004, 2011) on the population by activity sectors were used to examine the functional features of Šumadija district. One of the disadvantages of the applied models is that they were based on the data on the population economic structure according to the place of residence, and not the place of work. The relative employment and the coefficient of industry localization could not be precisely determined due to the influx of working-age population from the surrounding area. A certain modification of the models, such as excluding workers who commute daily to municipal centers, would lead to greater reliability of the models. However, the data on the number of daily migrants by activity sectors at the settlement level were not available.

Basic settlement features of Šumadija district

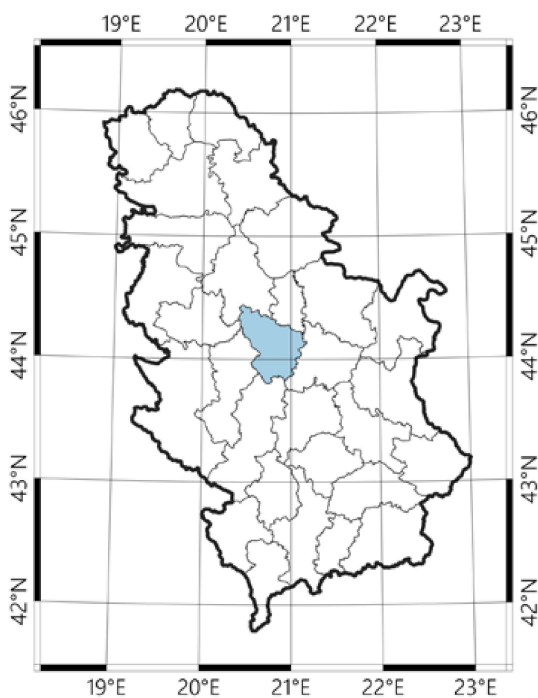


Figure 1. Šumadija district within the national territory.

Šumadija district has the central position in Serbia, in the place where important Balkan and European communications meet (Jovanović, 1988). Depending on the goals of the research, this region is differently bordered in the literature: “a piece of land between the rivers Morava and Kolubara” (Stefanović Karadžić, 1969, p. 57); the land between the rivers Morava, Danube, Sava, Kolubara, and the settlement of Ljig (Miličević, 1876); from Kopaonik and Jastrebac to the north (Cvijić, 1922); unclearly demarcated hilly and wooded area “behind Braničevo toward Niš” (Djordjević, 1932, p. 2); a space that is all surrounded by natural borders, water channels of different depths (Radivojević, 1932); “The land of hills, terraces and plains . . . from the Drina to the Timok” (Kojić, 1941, p. 4). This earlier delimitation of Šumadija relied mainly on its physical-geographical characteristics. Due to the influence of social factors in regional studies, Šumadija is observed as a statistical district.

Šumadija is mentioned as: a “transit” area; an area of forced and political migration (population movement, colonization); a free forested country; an

immigration area with a conglomerate of the population of different origins; a key area of unification and liberation of the Serbs; the core of free spirit; the heart and soul of the Serbian nation (Cvijić, 1922; Ćorović, 1932; Kojić, 1941; Radivojević, 1932; Stepanović & Milanović, 1965).

The settlement network in Šumadija district was created and shaped under the influence of the spontaneous population movement and the historical circumstances that marked the phases of its development. First, settlements were formed in hilly areas as settlements of the predominantly scattered type (Cvijić, 1902). Due to the constant population movements, the settlement structure was gradually mitigated by continuous and mass settling, morphological expansion of settlements and gradual compaction, creating a new variety of Šumadija type of settlement. The patterns of semi-compacted settlements (Kojić & Simonović, 1975) were dominant. The exceptional geographical and traffic position of this area, stimulated by economic development, played a key role in the last morphological transformation of the settlement. Housing was intensified along roads, the settlement morphologically elongated, taking a linear form (Kojić, 1958).

Today, Šumadija district covers an area of 2,387 km² (the Government of the Republic of Serbia [GRS], 2014), although the original Šumadija enhanced a much wider area. According to the data for 2011 (SORS, 2012), this area was inhabited by 293,308 inhabitants, living in 175 settlements in six municipalities (Arandjelovac, Batočina, Lapovo, Topola, Rača, and Knić) and the City of Kragujevac. With regard to the configuration of the terrain and the dominant settlement type, this area is characterized by a dense settlement network, at a smaller distance from the average for the Republic of Serbia, which indicates a tendency to compacting of the settlements and their divisions in the past (Drobnjaković & Spalević, 2017). The largest urban settlement of Šumadija district is Kragujevac, which represents the economic, administrative, cultural, educational, and health center of Central Serbia.

Population fluctuations of Šumadija district

The population in Šumadija district immigrated in several migration stages. The significant settling in the past is associated with population movement at the end of the 17th and during the 18th century, while more intensive settling began in the second half of the 18th century (Ćorović, 1932; Vasović, 1953). In that period, villages were predominantly small by population size, but the towns did not differ significantly either, except for Kragujevac. A significant population and housing increase was recorded in the second half of the 19th century (Savić, 1988). This was basically the result of the positive natural increase in the villages and the immigration of the working-age population outside this area. In the socialist period, there was a stage of the fastest growth of settlements, i.e., the growth of population and built-up areas. That was the result of territorial and population development of Kragujevac, strong urbanization, and the construction of economic facilities and modern roads, which shaped the character of Šumadija (Savić, 1988).

The population change of Šumadija district by municipalities is characterized by different trends. It was analyzed by the dynamics index for the period 1948–2011 (Figure 2). Observed at the municipal level, it could be seen that the intensity of post-war population growth was weak since the 1980s, when the peak was reached. Continuous population growth was noticed in the City of Kragujevac, while municipalities that were territorially and functionally smaller were characterized by a population decline since the 1960s. Intensive migrations within this area, especially the most productive part of the population, caused the redistribution of the population in favor of urban areas and larger labor centers.

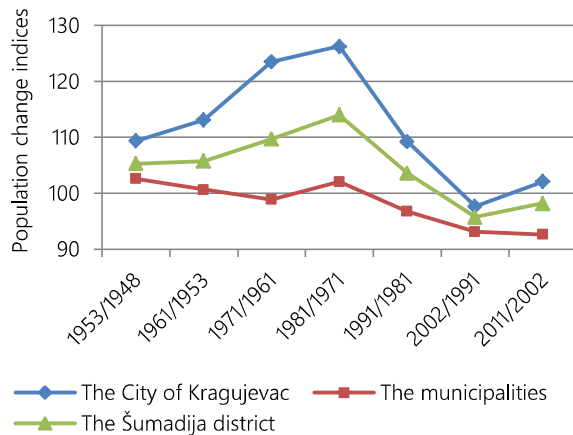


Figure 2. Population change indices of the Šumadija district. Data used for the presentation of results are calculated based on 2011 Census of Population, Households and Dwellings in the Republic of Serbia: Book 20. Comparative overview of the population in 1948, 1953, 1961, 1971, 1981, 1991, 2002 and 2011: Data by settlements, by SORS, 2014 (<https://pod2.stat.gov.rs/ObjavljenePublikacije/Popis2011/Knjiga20.pdf>). In the public domain.

The increase in urban and decline in rural population was related to the period of rapid industrial development that encouraged migration toward urban settlements and led to a strong concentration of population in a small area. Thus, the most intensive emigration from the countryside was registered in the period 1961–1971, and a bit weaker one during the period 1971–1981 (Radovanović, 1995). According to population change rate in inter-census periods, the most intensive increase of Šumadija district was registered in the period 1961–1971 (42.7%), and continued in the next ten-year period 1971–1981 (35.5%). The population decline, both in rural and urban settlements, was recorded in the period 1981–1991. From 1991 to 2002 that decline was –4.3% for Šumadija district, which was a product of complex social circumstances, such as sanctions, economic crisis, transition, and other changes that took place in the former SFR Yugoslavia

and the Republic of Serbia. After political stabilization and the introduction of elements of transitional changes in the economy, the negative demographic tendencies in district slowed down. In the period 2002–2011 the population reduced by –1.8% (Figure 2).

Population changes of Šumadija district, based on the population change rate in 1948–2011 and on the type of settlements, took place in favor of urban settlements. The largest inflow occurred during the period of intensive migrations from 1961 to 1981, when the urban population of certain municipal centers increased by up to 50% (Arandjelovac, Kragujevac, and Topola). Based on the population change rate in the rural areas of Šumadija district, it was noticed that rural settlements were losing population continuously, mostly in the period 1991–2002 (–10.5%). That was the result of the earlier population redistribution during the period 1961–1981, which disrupted the age, economic and educational structure of the rural population. Uncontrolled movement of the labor force in the period of industrialization had a degenerative impact on the development of rural areas.

Functional structure and transformation of Šumadija district

Economic flows in Šumadija district, functional orientation, and structure of settlements have always been dictated by exogenous influences. The economic life of Šumadija before the liberation from the Ottoman Empire was marked by primitiveness and backwardness. Favorable natural conditions, as well as social circumstances that placed Šumadija at the center of political and war events for centuries, made agriculture the dominant economic branch.

After the Second World War, the largest part of the active population of Šumadija district was engaged in agriculture, as well. The intensive economic development of Šumadija district began in the 1960s, in the direction of strengthening the secondary sector, especially industry, parallel with service and

administrative functions. It established a “strong agglomeration of workers and population” (Stepanović & Milanović, 1965, p. 71). This resulted in population redistribution toward the central settlements. At the same time, the transformation of the structure of activities in the settlements took place. In the vicinity of industrial centers, development zones were formed that encouraged function’s concentration and urbanization, and caused changes in the settlement size and its functional character. Contemporary economic patterns of Šumadija district are based on the development of several basic branches, which have proved to be a factor in agglomerating other activities: industry (metal, automotive and complementary industries, stone and non-metal mining, food, wood), agriculture, trade, traffic, and tourism. The transformation of the economy was marked by negative tendencies, especially in the industrial sector, caused by the unfinished restructuring process, global recession, negative effects of transition, and lack of investment (Miletić, 2008; Vukotić, Zakić, Aničić, & Vuković, 2014; Vuković, 2009). However, positive changes in the past decade are evident, expressed through an increase in the number of economic entities, development of entrepreneurship, reduction of large economic systems, and the strengthening of the service sector.

As an indicator of the economic activities transformation of Šumadija district, the active population size and index changes by sectors of activity in 1971–2011 were observed (Figure 3). In general, a trend of deagrarization was noticed, expressed through low index values, i.e., a continuous decrease of the active population engaged in agriculture. The most intensive decline was recorded in the municipalities of Lapovo, Arandjelovac and Batočina and the City of Kragujevac. Economic development of these territorial units shifted in favor of other activity sectors. An increase in the primary sector was not recorded in any municipality during the observed period. The lowest values of the index of active population change in this sector are related to the period 1981–1991, when an industrial peak was registered, i.e., mass employment in most of the municipalities of Šumadija district.

Industry and other secondary activities, in general, have been of great importance for the development of this area since the middle of the 19th century, which significantly influenced the change and direction of the economic structure. Since then, there has been a continuous increase in the number of employees in the secondary sector, except in the period of the early development that was based on agriculture and trade, and during economic crises. The highest increase in the

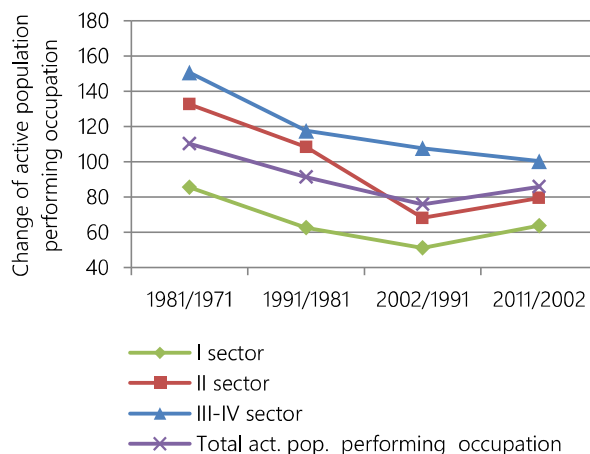


Figure 3. Changes in the economy’s activity structure of Šumadija district, 1971–2011. Data used for the presentation of results are calculated based on *Census of population and dwellings, 1971: Book 10. Population: Activity: Results by settlements and municipalities*, by the FSO, 1974 (<https://publikacije.stat.gov.rs/G1974/Pdf/G19744003.pdf>). In the public domain; *Active population performing occupation by place of work and activity (data by settlements)* [Unpublished raw data; Documentation tables], by the SORS, 1981; *Active population performing occupation in country by place of work and activity (data by settlements)* [Unpublished raw data; Documentation tables], by the SORS, 1991; *Economically active population performing occupation by activity (data by settlements)* [Unpublished raw data; Documentation tables], by the SORS, 2011; *Census of population, households and dwellings in 2002: Book 6. Activity and gender of the active population performing occupation: Data by settlements*, by the SORS, 2004 (<https://publikacije.stat.gov.rs/G2002/Pdf/G20024006.pdf>). In the public domain.

number of employees in this group of activities was registered in the first ten years of the observed period in the entire area (Figure 3), led by the City of Kragujevac with its strong industrial development and the formation of a significant labor center. However, in other municipalities of Šumadija district, this peak occurred late in the next ten years, as a consequence of the gradual dispersion of the industry. That peak of employment in secondary activities in the period 1981–1991 was noticed especially in the municipalities of Knić, Rača, and Topola. The largest decline in the value of the index was registered in the period 1991–2002, as a consequence of numerous social changes (NATO bombing, sanctions, economic crisis, and recession) that stopped the development of this area. The largest industrial center—Kragujevac also had a drastic decline. After entering the transition period, the first measures gave some positive shifts visible during the period 2002–2011. The industry was gradually recovering, and a slight increase in the number of employees in this activity sector was registered. Significant inflow of foreign investments gave positive impulses to the development of local and district economy (“FIAT”, “Rapp Zastava”, “Unior components” in Kragujevac, “Yura Corporation” in Rača, “Kronospan” in Lapovo, “Grah automotive” in Batočina) They were directed toward strengthening the branches of medium and high-tech development and toward creating new developmental poles through different spatial forms (GRS, 2014; Miletić, 2008).

As Šumadija district had a long-standing role as an administrative, educational, and cultural center, the tertiary and quaternary sectors were important in the functional shaping of the area. During the observed period, this group of activities recorded an increase, but the trend gradually decreased (Figure 3). The development of some municipalities shifted in this direction. The service sector was especially important for the economic life and survival of smaller towns in Šumadija district (Arandjelovac, Batočina, Rača, Knić, and Topola), as well as for the City of Kragujevac itself.

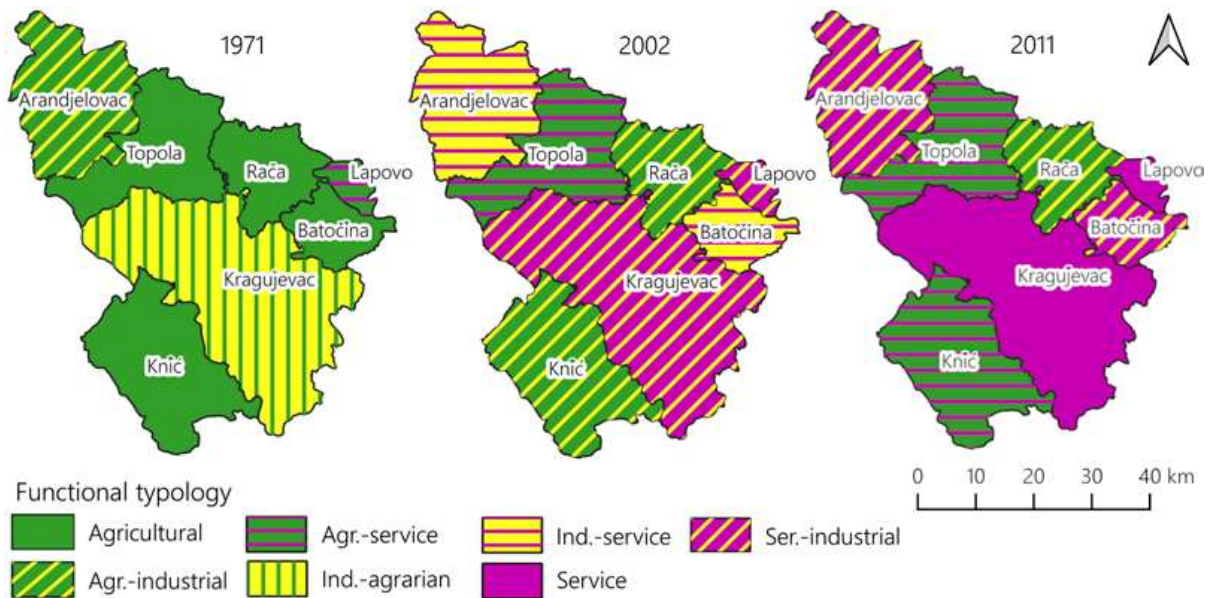


Figure 4. Functional typology of the municipalities of Šumadija district: 1971, 2002, 2011. Data used for the presentation of results are calculated based on *Census of population and dwellings, 1971: Book 10. Population: Activity: Results by settlements and municipalities*, by the FSO, 1974 (<https://publikacije.stat.gov.rs/G1974/Pdf/G19744003.pdf>). In the public domain; *Census of population, households and dwellings in 2002: Book 6. Activity and sex of the active population performing occupation: Data by settlements*, by the SORS, 2004 (<https://publikacije.stat.gov.rs/G2002/Pdf/G20024006.pdf>). In the public domain; *Economically active population performing occupation by activity (data by settlements)* [Unpublished raw data; Documentation tables], by the SORS, 2011.

In order to overview the functional changes of the municipalities in Šumadija district and to determine the orientation and their functional transformation in the period 1971–2011, Fehre's method of tenar diagram was used. By analyzing the functional orientation, based on dominant economy branches, it was noticed that local units underwent significant transformations (Figure 4). In general, Šumadija district in 1971 was predominantly agrarian. Only the City of Kragujevac had a primary industrial orientation, with a significant share of agriculture in the activities structure. In addition to agriculture, the shaping the economic structure was also influenced by secondary activities in the municipality of Arandjelovac (mining) and services in the municipality of Lapovo.

The structure of the active population of Šumadija district changed significantly in 2002. At that time, the influences of industrial development and urbanization could already be noticed in terms of the transformation of the socio-economic structure of the municipalities (Figure 4). The municipalities of Rača (57.3%), Knić (53.4%), and Topola (53.1%) maintained a dominant agrarian orientation, but in some municipalities, the influence of the service (Topola) and secondary sector (Knić and Rača) could be felt. Intensive development of industry conditioned the active transformation from the agrarian to the non-agrarian sector in the municipalities of Arandjelovac and Batočina, whose orientation shifted toward the industrial-service type. On the other hand, the most significant transformation was carried out in the economic structure of the municipality of Lapovo, which completely reoriented the economy from the agrarian to the service-industrial type. The City of Kragujevac, affirmed as the administrative, political, and cultural-educational center of the area, directed its functional development predominantly toward service-industrial activities. In general, there was a growing importance of tertiary and quaternary activities, both due to the development of the central functions and due to the decline in industrial production and other secondary activities. That was caused by major structural changes in the economy in this period characterized by the process of deindustrialization (Miletić, 2008). Peri-urban zones were formed, especially in the vicinity of Kragujevac, which were represented by settlements that were exposed to a socio-economic transformation.

The trend of tertiarization of the economy continued in 2011. Almost all the municipalities in Šumadija district were oriented toward the service functional type or one of the transitional subtypes. The economy of the City of Kragujevac was transformed into a purely service type, which was a consequence of the change in the economic structure and the result of industrial stagnation and its being marked as a "loser" (Gorzelač, 1998) in the previous period due to the lack of capability to transform. The service activity was also pronounced in the municipality of Lapovo, as a result of the transit position and the development of traffic activities. In 2011, the economies of the municipalities of Arandjelovac and Batočina were transformed into a service-industrial type, while the agrarian-service orientation characterized the municipalities of Knić and Topola. Only the municipality of Rača maintained its agrarian-industrial orientation.

In order to determine the direction of the functional specialization, it was meaningful to use other methods that would indicate the functional transformation. For that purpose, Hoyt's index of relative specialization of activities, i.e., relative employment in the sector, was consulted. Based on the degree of relative functional specialization in the period 1971–2011, an interrelation was established between the activities in the municipal centers that influenced the majority of the surrounding settlements (Table 1). Greater variability was noticed at the beginning of the observed period (1971), which was the result of prioritizing certain centers in the economic development, accompanied by a specific position in the settlement network in Šumadija district and the proximity of the strongest developmental and labor pole (Kragujevac). The settlements of Rača and Topola were shaped as urban nuclei with concentrated tertiary-quaternary activities. In the settlements of

Arandjelovac and Batočina, specialization toward the secondary sector was performed, while a particularly intensive specialization in those sectors was registered in the City of Kragujevac. The economy of Knić was still predominantly oriented toward agriculture, while in Lapovo the agrarian sector remained, with a slight service and administrative specialization due to the concentration of traffic activities. From the partially polyfunctional character of the observed municipal centers of Šumadija district in 1971, the specialization in the sector of service and administrative functions followed in the next period (Table 1). Only the settlement of Arandjelovac recorded a slight diversification in secondary activities (mining) in 2002, while recent functional specialization of the entire Šumadija district moved to the tertiary and quaternary sectors.

Table 1
Relative functional specialization of municipal centers, 1971–2011

Municipal center	1971			2002			2011		
	I	II	III-IV	I	II	III-IV	I	II	III-IV
Arandjelovac	-52.41	5.28	47.13	-18.62	3.08	15.53	-13.81	-5.32	19.13
Baočina	-43.30	15.22	28.08	-12.79	-4.41	17.20	-12.13	-8.57	20.70
Knić	17.04	-13.51	-3.53	-9.61	-1.14	10.75	-9.54	-5.43	14.97
Kragujevac	-53.21	24.83	28.38	-18.39	-2.30	20.69	-13.60	-9.40	23.00
Lapovo	1.16	-18.40	17.24	-10.63	-11.07	21.70	-12.42	-8.55	20.97
Rača	-29.65	-16.41	46.06	-14.13	-1.81	15.94	-12.07	-2.15	14.22
Topola	-45.77	-4.42	50.18	-16.06	-10.35	26.41	-10.60	-11.25	21.85

Note. Data used for the presentation of results are calculated based on *Census of population and dwellings, 1971: Book 10. Population: Activity: Results by settlements and municipalities*, by the FSO, 1974 (<https://publikacije.stat.gov.rs/G1974/Pdf/G19744003.pdf>). In the public domain; *Census of population, households and dwellings in 2002: Book 6. Activity and gender of the active population performing occupation: Data by settlements*, by the SORS, 2004 (<https://publikacije.stat.gov.rs/G2002/Pdf/G20024006.pdf>). In the public domain; *Economically active population performing occupation by activity (data by settlements)* [Unpublished raw data; Documentation tables], by the SORS, 2011.

In the observed period, the beginning of industrialization was taken as a turning point for the development of settlements and municipalities. This activity branch was a developmental generator and a pull factor for the settling of many areas, which led to an accelerated pace and degree of urbanization. The development poles were formed in the observed area, expressed by a dynamic agglomeration whose development drivers were a key factor for empowering and directing the development and qualitative changes in the activity structure of the region (Jovanović, 1988). For that reason, the relative importance of industry was considered in the municipal centers of Šumadija district, as the bearers of the socio-economic transformation (Miletić, 2008).

Based on the relative size of the industry localization according to Florence's method, a hierarchy of municipal centers was established. The rank of a settlement, i.e., the importance of its industry, was established based on the relation of the relative importance of industry in the municipality center and the localization coefficient. According to the performed analyzes, a distinct polarization was observed in the settlement network of Šumadija district. On one side was Kragujevac which presented the most important industrial center and the settlement of the highest hierarchical rank. Kragujevac was turned into a developmental pole, determined by the strong industry development accompanied by other service and administrative functions. This was especially pronounced in 1971, when progressive industrial development was recorded. In the later period, a significant decline was noticeable, but the importance of industry was still at a higher level compared to other centers that were influenced by Kragujevac. Within the group of other municipal

centers, only Arandjelovac was distinguished, thanks to the developed secondary sector. Significant fluctuations in the period 1971–2011 were not noticed in terms of industry localization, which indicated that these were the centers of lower hierarchical rank.

Socio-economic settlement transformation of the City of Kragujevac

The development of Kragujevac and its surroundings was subject to the influence of natural and socio-historical factors. The central position in Šumadija enabled Kragujevac to become “the bearer of the knightly and national spirit . . . the soul of a movement, the stage of great action” (Maksimović, 1932, p. 322) and a carrier of the transformation of Šumadija. “Those mutual moral suggestions between Šumadija and Kragujevac, are a part of the cultural history of this country” (Maksimović, 1932, p. 324).

Kragujevac was mentioned relatively late in the written sources. In the earlier Turkish era (the beginning of the 18th century), Kragujevac was not a significant center. As one of the caravan stations, without any special economic life and significance, it was a small agricultural center, a peaceful craft and trade place (Stepanović & Milanović, 1965). This long period of Ottoman reign was characterized by the antagonistic attitude toward rural surroundings (Popović, 1956). After the Second Serbian Uprising (1815), Kragujevac and its surroundings began their faster economic development, gaining a noticeable role in the economy and history of liberated Serbia. Since the time when it became the capital (1818), the functional features of the town and its rural surroundings changed significantly. In the economic structure, crafts and trade took precedence, which was encouraged by the good traffic position, especially since the 1890s with the railway traffic being launched. In the middle of the 19th century, Kragujevac entered the early industrial stage, with the founding of Topolivnica (1851). The focus in the economic structure was shifted to industry, with further strengthening of quarterly activities concentrated in Kragujevac. At that time, the town had a wide sphere of economic influence. In this period, the town was characterized by a significant population increase. The role of Kragujevac as the capital reflected on its physiognomy, and its morphological expansion. The town’s prosperities were achieved mainly at the expense of the rural area.

In the period between the two world wars, the town’s power gradually weakened due to a great economic crisis, but also due to the economic specialization and strengthening of smaller municipal centers of Šumadija district. The post-war, socialist period was marked by the rapid prosperity of the town and its rural surroundings, dictated by the strong development of industry and its material and technical basis. This was reflected in population changes and the uneven population distribution. Several branches of industry were launched in it at different developmental stages: metal, food, canning, leather, paper, and textile. During this period, the gravitational sphere of Kragujevac was expanding. The town had a great influence on its rural surroundings, on the changes in the rural economy, and it contributed to the rapid transformations of social relations (Popović, 1956). The collapse of industry in the 1990s left a mark on the economic development of Kragujevac and its surroundings. The recent restructuring process has been slow, but some positive movements are visible through foreign direct investment and the activation of entrepreneurship.

The population of rural settlements in the City of Kragujevac was rapidly decreasing due to intensive migration, transfer of the population from agrarian to other activity sectors, and the disruption of population structures (age, education) (Figure 5). From the post-war period to nowadays, the rural population has decreased by 38%.

Population trends were reflected in the fluctuations of the settlements’ population size. Based on the obtained results, settlements had an average size of 824 inhabitants in the post-war period (1948).

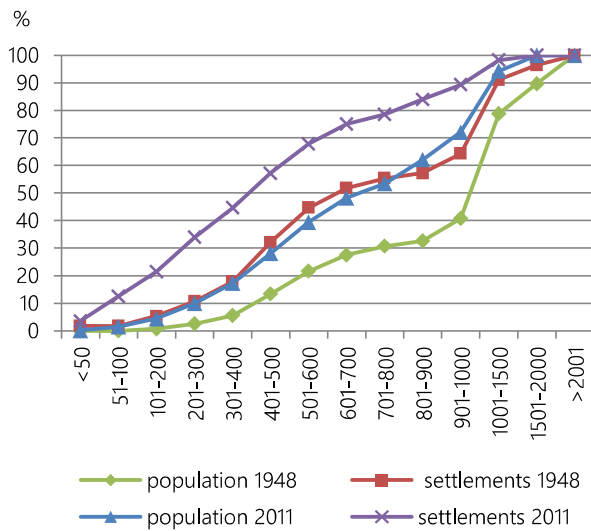


Figure 5. Population fluctuations in rural areas of the City of Kragujevac. Data used for the presentation of results are calculated based on 2011 Census of Population, Households and Dwellings in the Republic of Serbia: Book 20. Comparative overview of the number of population in 1948, 1953, 1961, 1971, 1981, 1991, 2002 and 2011: Data by settlements, by SORS, 2014. (<https://pod2.stat.gov.rs/ObjavljenePublikacije/Popis2011/Knjiga20.pdf>). In the public domain.

The distribution of settlements according to the population size was fairly even. Each of the categories (small, medium, and large) occupied a third of the total number of settlements. According to the 1948 Census, the number of settlements which were big by population size (over 1000 inhabitants) was slightly higher, with 35.7%, in which 60% of the rural population was concentrated (Figure 5). After the intensive fall in the number of the rural population from the 1960s and 1970s, the demographic situation of rural areas was significantly disturbed. Due to the continuous population decline in the rural settlements of the City of Kragujevac, the settlement network was significantly fragmented compared to the beginning of the observed period. The average size of rural settlements decreased by about 40%, and in 2011 amounted 510 inhabitants. The distribution of the settlements by size categories was rather uneven, shifted in favor of demographically small settlements (up to 500 inhabitants). They accounted for 57.1% of the total number of settlements, but were inhabited by 28.1% of the

population. The number of demographically big settlements was reduced to 10%.

In order to understand the economic structure of the City of Kragujevac, a functional classification of settlements on its territory (56 rural settlements and the City of Kragujevac) was performed. The settlements of the City of Kragujevac were with a dominant agrarian function (50 rural settlements) in 1971. This means that more than 60% of the active population was engaged in agriculture. Only the settlements in the immediate vicinity of the center and some of traditionally central and industrialized settlements had a diversified structure—agrarian-industrial (Baljkovac, Maršić, and Stragari), industrial-agrarian (Grošnica, Erdeč, and Trmbas), which was partly conditioned by the population coverage according to the place of residence, and not the place of work. This is the period when the category of worker-farmer was built, and settlements in the town’s peri-urban ring were gradually activated.

The socio-economic transformation of settlements of the City of Kragujevac was conditioned by the industry development. Low prices of agricultural products and agricultural land in rural settlements accelerated rural-urban migration and the transfer of labor force to non-agricultural activities. The influence of Kragujevac determined the changes in the demographic structure in the surrounding settlements. According to the data for 2002, the settlement transformation on the City territory toward service and industrial activities was noticed (Figure 6). The number of settlements with a pure agrarian orientation was reduced to 32 settlements. Significantly faster functional transformation was performed in the suburban zone, whose settlements had a diversified economic structure due to the engagement of residents in the service and administration sector, and especially in industry. Suburban settlements in this period were predominantly of the service-industrial type (Figure 6).

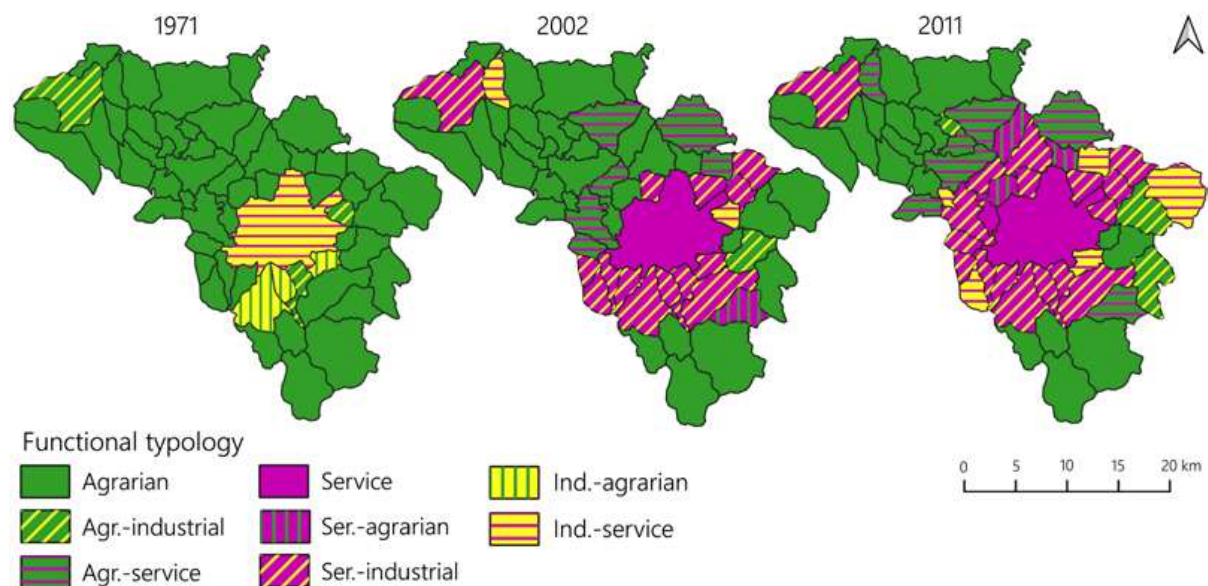


Figure 6. Functional typology of the settlements of City of Kragujevac: 1971, 2002, 2011. Data used for the presentation of results are calculated based on *Census of population and dwellings, 1971: Book 10. Population: Activity: Results by settlements and municipalities*, by the FSO, 1974 (<https://publikacije.stat.gov.rs/G1974/Pdf/G19744003.pdf>). In the public domain; *Census of population, households and dwellings in 2002: Book 6. Activity and gender of the active population performing occupation: Data by settlements*, by the SORS, 2004 (<https://publikacije.stat.gov.rs/G2002/Pdf/G20024006.pdf>). In the public domain; *Economically active population performing occupation by activity (data by settlements)* [Unpublished raw data; Documentation tables], by the SORS, 2011.

The expected continuation of the transformation process toward industrial and service types was recorded in 2011. The number of agrarian-type settlements was reduced to 20, while the number of service-type settlements (with subtypes) rose to 22. Spatially, the expansion of the town's zone of influence (service function) was noticed, as a carrier of spatial-functional transformations, where a settlement ring with predominantly service-industrial type was formed around the town (Figure 6). This was accompanied by the development of services, i.e., the spatial expansion of the effects of urbanization, due to the population redistribution in favor of the mentioned areas. Following the tendencies of socio-economic transformations on the City territory in this period, a more intensive transformation could be noticed along the frequent roads through which the town's influence, as an administrative and economic center, spread on the surrounding municipalities. This confirmed the importance of Kragujevac as a labor center and the economy's core that represented a pull factor for population and the capital of the surrounding areas, characterized by lower economic development and less significant central functions.

Discussion and concluding remarks

Considering the topic of spatial changes initiated by economic and population movements, the paper starts from the assumption that Šumadija faced intensive functional transformation that was accompanied by appropriate population changes generated by the strong development center—Kragujevac. Similar transformation pattern has been observed in other parts of country. Under the influence of regional centers as the main development poles, their surroundings have been transformed, e.g. Novi Sad (Bubalo-Živković, 2005), Novi Pazar (Tošić & Nevenić, 2006), Čačak

(Nikolić, 2013), Valjevo, Bor, and Knjaževac (Spasić, Petrić, & Krunić, 2005), Jadar area (Gajić, Vujadinović, & Šabić, 2011) and the like. Šumadija district is characterized by dynamic development which has been reflected through frequent population movements and oscillations in economic structure. Such changes have caused a strong spatial transformation.

The population and economic development of the Šumadija district throughout history have been mutually conditioned. Population changes were the result of economic movements, but, on the other hand, the accumulation of the population has contributed to further prosperity in the economy, morphological, and physiognomic transformation of settlements. The settling of Šumadija intensified in the 18th and 19th century, which was related to the liberation from the Ottoman Empire, when the conditions for peaceful progress were provided. Intense demographic changes on the territory of Šumadija district began to occur after the Second World War, due to the rapid development of industry in urban areas. The trend of functional orientation ran from agrarian to secondary, and then to service activities.

Physical-geographical conditions determined the genesis and type of settlements in this area. As economic development progressed, socio-economic factors significantly conditioned the transformation of the functional and spatial settlement structure. The changes of the development phases marked the physiognomy and functional character of the municipalities of Šumadija district. In the early post-war period, agrarian orientation was dominant, except in Kragujevac, which had the role of a political, cultural, educational, and economic center. Industrialization brought changes in the functional orientation and redistribution of the population. The process of deagrarianization was one of the main features in the entire observed period, with parallel emigration of the rural population. These changes were particularly intensive in the period 1961–1981, when the peak of employment in secondary activities was registered. It offered new job opportunities and attracted mass population movements toward municipal centers and population redistribution in favor of urban areas. A multifunctional development of municipal centers of Šumadija district was noted a priori in the direction of industrial development and related activities in the 1970s. The bearer of these changes was certainly Kragujevac. Rural settlements in the town's vicinity were already gradually being socio-economical transformed under its influence.

The period of economic stagnation, and even the negative tendencies in production caused by a series of unfavorable circumstances (bombing, economic sanctions, the collapse of industrial systems, recession, and entering the transitional phase) reflected on the changes in economic structure and population development. The transfer of the population took place gradually in favor of service and administrative functions. Their development led to the transformation of settlements in terms of urbanity in the gravitational sphere of municipal centers. The economic structure of the entire Šumadija district was transformed. The trend of migration to municipal centers in this period already weakened, leaving the rural area with a disturbed demographic structure. Rural areas were characterized by general stagnation and devaluation of economic and demographic potentials. However, the overall population decline became a feature of this area since 1991 due to major structural changes in the economy, when migration was directed outside the studied area, as well as outside the country. The most intensive changes were registered in the immediate vicinity of the City of Kragujevac. The strong influence of the urban settlement was reflected in the administrative changes. Certain suburban settlements were merged with the town (Drobnjaković & Spalević, 2017). This resulted in the population growth in the city center and in the changes in the economic structure of the population.

Recent spatial changes on the territory of Šumadija district are the result of socio-economic transformations in the previous period, directed partly by economic globalization as a new order in

the world economy. By investing in the recovery of the economy of this area, the population decline was partially slowed down. In accordance with global trends, the economy was restructured, illustrated by the “transformation of the economic system, transition from industrial production to development and diversification of tertiary activities” (Miletić, 2008, p. 55), which was visible in this area through the changes in the employees’ structure. In this regard, tertiarization is a dominant feature of the entire area, with the City of Kragujevac leading in this sector. Its place at the top of the hierarchy in the settlement network confirmed its role as an economic (industrial), administrative, and cultural-educational center throughout history. Despite the collapse of the economy of this town, it is still the leading labor and functional center with the strongest territorial scope of influence. This is in line with its categorization as a center of macro-regional importance and its dominant influence on the surroundings as a center of functional-urban area of international importance (GRS, 2014). The most intensive changes under its influence were reflected in the peri-urban zone, so that the highest degree of socio-economic and functional transformation was expressed in the settlements near the town and along the frequent roads. Remote settlements and those without a concentration of business functions expressed the lowest degree of transformation.

Observed in the context of further spatial development, the analyzed dynamics of changes will continue. Given the share of agricultural land and of agriculture in the economic development (GRS, 2014), some municipalities of Šumadija district (Batočina, Topola, and Knić) will retain an agrarian or mixed functional character. On the other hand, investments in the production sector, mostly directed toward Kragujevac, with the development of activities in the corridor zone, confirm the results and expectations for further spatial development of the observed area.

In the long run, the most negative consequences due to economic and demographic development are expected in the rural area. Services, activities, and facilities in the rural area have been significantly devalued and devastated due to strong industrialization that encouraged spontaneous deagrarianization and undirected urbanization. The spatial development of Šumadija district performed with a manner of suppression of primary activities, which reflected in the agricultural population decline, dispersal of the working-age contingent, and the disruption of rural population structures. In order to prevent emigration and further devastation of rural areas, it is necessary to re-build rural capacities: renew rural infrastructure, increase the availability of public services, create conditions for diversification of activities, support the establishment of small and medium enterprises in rural areas, encourage the rural tourism services and local initiatives in the field of knowledge improvement (agriculture, food safety, and organic agriculture) in order to alleviate disproportions in favor of urban areas (Bogdanov, 2007; Vukotić et al., 2014; Vuković, 2009). Their weakly expressed functions are not able to employ the local population that is forced to migrate to Kragujevac as the strongest labor and functional center in the area and beyond.

According to the analyses, the basis for socio-economic changes and empowering the role of settlements lies precisely in creating conditions for the development and in activating their capacities, strengthening the human capital, and creating opportunities for new products and services. That would give priority to endogenous factors in achieving local development, and diminish the influence of exogenous ones, which have directed the transformation of Šumadija district. However, some of the proposed methods can serve as a tool for mitigating spatial transformations and development. It could be useful in creating policies for urban and rural development, housing, organizing public services, and the like. The presented methods are based on insufficiently accurate statistics collected by place of residence. In order to better understand the spatial transformations caused by the changes in the structure of the economy, it is necessary to intertwine them with other data, such as the number of daily-migrant workers, their economic orientation, spatial accessibility of settlements to labor

centers, analyzes that more accurately show economic specialization, and some alternative data sources that indicate the directions and changes in the intensity of economic activity in space. Complementary analyzes on the economic orientation of the labor force and tendencies in education, especially of young people who are entering employment, with the performed analyzes could serve as an adequate basis for monitoring and directing spatial changes.

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