Impact of Industrial Development on the Spatial Structures in the Danube Region in Serbia

Slavka Zeković

Abstract This chapter summarizes the key problems of development changes as well as industrial development and its degradation, and provides an analysis of industrial development in the Danube and Belgrade regions (level of NUTS 2). The analysis includes two components: (1) economic growth and developmental changes; and (2) territorial concentration. In the chapter are identified the results of development changes and economic growth by applying shift-share analysis. The chapter shows that the consideration of national share, industrial mix, and regional share in total shift-share employment growth of the regions indicate a strong process of deindustrialization. An allocative component of regional economic growth has a positive value reflecting above-average industrial productivity. Comparative analysis of the regional industrial territorial concentration is based on location quotient. The results indicate a decrease of the territorial industrial concentration in the two Serbian regions.

Keywords Belgrade and danube region · Industrial growth · Development changes

1 Introduction

In the Republic of Serbia, like in other ex centrally-planned economies, long-term development strategies have been performed based on industrialization. Industry played the most important role in contribution in GDP growth, employment, and export. This chapter presents the analysis of key problems related to developmental changes involved in industrial restructuring, decrease of industrial growth, decrease in industrial employment and competitiveness, deep deindustrialization, industrial

S. Zeković (✉)
Institute of Architecture and Urban & Spatial Planning of Serbia, 11000 Belgrade, Serbia
e-mail: slavka@iaus.ac.rs

degradation, and weakening of the territorial industrial concentration in the two developed regions during the post-socialist period.

In 2008, GDP growth in Serbia was 3 % with a negative GDP rate in some years, a decrease in competitiveness, a delay in economic reforms, high unemployment, and an increase in regional-development discrepancies. The collapse of industrial development in the Serbian economy, as a key consequence of the transitional development policy, was induced by different factors and contexts. The main contextual factors can be identified in both the transition process as well as the global economic and financial crisis and its repercussions on territorial development. During the post-socialist transition recession in Serbia, 700,000 jobs were lost in industry with almost 1 million unemployed, 1.3 million (or 20 %) poor inhabitants, and bankruptcy of enterprises [1]. In the Belgrade and Danube regions 27.1 % of the total population and 41.6 % of the total employees [1] are concentrated, and they realizing 60 % of the GDP with the allocation of approximately 65 % SMEs of the Serbia.

2   Applied Approach and Methods

Quantitative approaches have been applied using the tools of comprehensive and comparative analysis. Identification of the main effects of territorial development in the two regions is based on the comprehensive development framework approach. The methodological approach involves correlation between the national and regional levels. The suggested approach implies mobilization of strengths and resources in development under conditions of prolonged global economic and financial crisis with emphasizing regional responsibility for structural change and spatial components. The applied comprehensive analysis of the regional industrial development includes (1) the dynamics and components of regional growth and development changes; and (2) the spatial concentration. Comprehensive evaluation of industrial development has an "imperialistic" and "hybrid" character [2]. Evaluation depends on contextual factors and indicators that play an important role at the national and regional levels. Many *quantitative methods* exist for the analysis of regional industrial development including the techniques of economic base, production functions, shift-share analysis, input-output analysis, location quotient, optimization techniques, cost-benefit methods, and qualitative research [3]. The quantitative approaches applied in the comprehensive analysis of industrial development in the two regions included shift-share analysis, Spider method, and location quotient.

Shift-share analysis is a widely applied analytical technique used for retrospective decomposing of changes in employment in different regions. The aim of this analysis is to identify changes in industry with consideration of comparative advantages in particular areas regardless of whether or not they show growth or decline of employment and inhabitants. According to the general form of analysis, total employment in the regional area is e, while employment is the activity ith of

the region e_i (e_i^t at the beginning of the period and e_i^{t+n} at the end). Calculation includes the framework of the reference area (country) along with the total number of employees E (E^t at the beginning of the period and E^{t+n} at the end) with employment in the ith activity E_i (E_i^t at the beginning of the period and E_i^{t+n} at the end). The shift-share model is based on employment dynamics in the ith activity of the regional area, which is a function of three components [4]: (1) regional share in national growth; (2) mix of changes in the activities themselves; and (3) shift and change of activities in the region. Changes in employment in the ith activity of the region from the time t to time $t + n$ can be measured by the share, mix, and shift changes due to the following formula [4]:

$$e_i^{t+n} - e_i^t = e_i^t \left[\frac{E^{t+n}}{E^t} - 1 \right] + e_i^t \left[\frac{E_i^{t+n}}{E_i^t} - \frac{E^{t+n}}{E^t} \right] + e_i^t \left[\frac{e_i^{t+n}}{e_i^t} - \frac{E_i^{t+n}}{E_i^t} \right]$$

Shift-share analysis is used to determine the contribution of each component to regional growth using the formula:

$$SS = NS + IM + RS$$

where SS = shift-share, i.e., the share of changes; NS = the proportion of changes at the national level; IM = the share of industrial mix/structure; and RS = regional allocation changes. The component "*national share*" (NS) is measured as the increase of total employment in the regional area due to growth of national economy in the analyzed period. The component "*industry (structural) mix*" (IM) identifies the growth rate of the industry in the region based on the national growth rate for this sector. The allocative component "regional change" (RS), or the competitive effect, is perhaps the most important among the components. It points to the potential and role of leading and lagging industries in the regional/metropolitan area. The competitive effect compares the growth of the regional/metropolitan area in the industrial sector with a growth rate of the same sector at the state level (or e.g., labor productivity). A leading industry is the one in which a local area has a higher growth rate compared with that of industry in the state.

The advantage of the shift-share method is that it uses a simple way to decompose the territorial differences in economic or sectoral growth by analysis of the three growth components: structural, competitive/differential, and allocative growth [5].

Location quotient (LQ) is widely used analysis of the economic base as well as measure for determination of the spatial distribution of industry, i.e., the level of spatial concentration of activity in an area compared with that in a larger area. Industry development is measured regarding to the number of inhabitants or total number of employed in an area. The numerical value of this indicator is used as a basis for typology and classification of region compared with the national level, whereas the average value LQ = 1 indicates average industry development. Values greater than LQ > 1 imply a more developed region with production specialization.

LQ 1 implies week industrial development. The formula for calculating LQ (the so-called "Balassa index") is **as follows** [6]:

$$\text{(LQ)} = \frac{e_i/e}{E_i/E}, \text{ or LQ} = \frac{e_i/e}{s/S}$$

where e_i is the number of people employed in regional industry; e is the total number of people employed in the region; E_i is the number of people employed in industry; E is total employment on a national level, s is the number of inhabitants in the region; and S is number of population in the country [7, 8].

3   Results and Discussion

By the application of shift-share analysis in decomposition of the regional economic growth, we offered in this chapter a way of general assessment to determine which part of the regional differences in average employment can be attributed to specific regional employment and which part to the effects of certain sectoral structures.

Comparative evaluation of the dynamic of development of the two regions was implemented during the period 1990 to 2012. The analysis shows that the greatest contribution to the decline of industrial employment was weak and inappropriate competitive industry structure, then the impact of factors, and then components of national economic growth trends. Due to intensive deindustrialization, both regions are characterized by a considerable volume of adverse impacts of industrial structure with fewer adverse impacts due to national components. The empirical results show that although it shows some negative values, the structural component of the shift-share analysis of the regions shows a slightly better effect of regional economic decline than the national average. Industrial structure and the factors that determine it led to the decline of industrial and overall employment in both areas. This is a consequence of favorable regional conditions (Table 1).

Results of the empirical analysis indicate that the process of deindustrialization, as measured by a drastic drop in employment has been very intense in the Belgrade and Danube regions. Increased employee productivity and favorable regional conditions, as well as better management arrangements, have contributed to

Table 1 Relative values of shift-share analysis of industrial growth in two regions during the period 1990 to 2012

	Belgrade	Danube region
Shift-share (SS)	−0.1010732	−0.200592
National share (NS)	−0.0521483	−0.104350
Industrial mix (IM)	−0.0602689	−0.120599
Regional share (RS)	+0.0113440	+0.024357

Table 2 Dynamics of spatial industrial concentration by LQ in the Belgrade and Danube regions during the period 1990 to 2012

Indicator	Belgrade region	Danube region
LQ 1990	1.31	0.85
LQ 2012	0.47	0.34
Change LQ	−0.84	−0.51
Difference (%)	−278.7	−250.0

alleviation of the overall decline of industrial employment in this area compared with the Serbian average. An allocative component of decomposed growth of the regions has a positive value (+0.0113440 in the Belgrade region and +0.024357 in the Danube region). This shows that the both regions are specialized in the industrial sector, the productivity of which is above the national average.

A strong process of deindustrialization, the concentration of economic activities and productive forces in the both regions, along with increasing geographical differences in the overall level of industrial development, are the consequence of transitional recession and reflect the lack of adequate regional policy, policy of industrial innovation, strong impact of global economic and financial crisis, the use of available territorial capital, and spatial directing of activities.

For analysis of *the spatial industrial concentration* in the Belgrade and Danube regions regarding industry distribution, we used quantitative LQ values expressed by relation of industrial and total employment in these regions and on a national level according to the number of population in these territories. Based on LQ values in both regions during the period 1990–2012, we estimate that there is a significant drop of LQ role in industry development and spatial concentration of industry (Table 2). Spatial concentration of industry in the Belgrade is 2.8 times less than it was in 1990.

Territorial disposition of the location-development potential and resources and trend of growth of the Belgrade and Danube regions (as the most developed) could intensify the increase of regional differences in Serbia [9]. This is a consequence of attractive and competitive conditions for development along the Danube corridor.

4 Conclusions

The empirical results of the comprehensive analysis and evaluation of the three components of industrial development in the Belgrade and Danube regions in Serbia show that economic growth and competitiveness are almost entirely explained by differences in its specificities in terms of employment. The results show that although having negative values, the structural component of the shift-share analysis of the regions indicates a slightly better effect of regional economic decline than the national average. The allocative component of decomposed economic and industrial growth of the regions has a positive value as a reflection of specialization in the sectors of the regions, the productivity of which is

above the national average. Shift-share analysis indicates that deindustrialization was very intensive in both regions. Comprehensive analysis of the economic development shows substantive development changes, decreased competitiveness, strong deindustrialization, and higher labor productivity in both regions. Zeković [9] There is a need to support better competition and territorial cohesion of industry in accord with European commitments [10] and the Spatial Plan of the Republic of Serbia [11].

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