

THE ROLE OF SECTORAL STRUCTURE IN THE REGIONAL PERFORMANCE

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Abstract

The socio-economic development of the regions is not homogeneous. Disparities between regions are due to the sectoral orientation and economical possibilities of regions. The economic performance of the regions is significantly affected by the sectoral structure of the region. The reaction of individual regions to economic changes is different. The aim of this paper is to assess how the changes in the structure of the sectors affect the economic performance of regions. The analysis identifies the sources of economic growth of regions and their changes. This paper also provides insights concerning the convergence in performance across regions. The paper is focused on the regions of the Czech Republic (NUTS 3). The analysis found no convergence of sectoral structures in Czech regions. The regions use internal potential and does not significantly change the sectoral structure of the Czech regions.

Key words: economic growth, region, sector, convergence

JEL Code: R11, E01, O18

Introduction

Each region is to a certain extent specific, which is due to certain assumptions by the sector structure. The sector structure in the regions is an important factor influencing the regional economic performance which is limited by the region's potential. The importance of individual sectors for regional performance growth is not constant but varies over the time. The aim of this paper is to assess how the changes in the structure of the sectors affect the economic performance of regions with regard to convergence between regions.

The basis for measuring regional performance is Solow's neo-classical economic growth model. The model takes the form $Y(t) = F [K(t), L(t), T(t)]$ where $Y(t)$ is the flow of output produced at time t . Capital, $K(t)$ represents the durable physical inputs. The second input to the production function is labour, $L(t)$ and it represents the inputs associated with the human body. The third input is the level of knowledge or technology, $T(t)$ (Barro & Sala-i-Martin, 2004). This basic approach is now add by other theories of regional economic growth such as spillover

theory and related theory of specialization-diversity agglomeration economics (Oort, Geus, & Dogaru, 2015). Spillover theory, when occurring spillovers between sectors and regions. The present variety in an economy can be an additional source of economic growth. Since spillovers are geographically bounded, differences in regional growth should be related to qualitative differences in an economy's composition at the regional level. Only some sectors are complementary in that their joint presence within an economy causes additional growth. A region specializing in a particular composition of complementary sectors will experience higher growth rates than a region specializing in sectors that do not complement each other (Frenken, van Oort, & Verburg, 2007).

The economic performance of the region is usually characterized by the creation of gross domestic product or gross value added in absolute value or per capita. The causes of differences in economic performance of regions could be found in a number of ways. These include, in particular, natural conditions, cultural and social factors (Setek & Petrach, 2016), the age and educational composition of the population, entrepreneurial activities (Mura, Marchevska, & Dubravska, 2018), the level of transport infrastructure (Dusek, 2016), the level of transport services, as well as the unemployment rate (Pavelka, 2011) and, last but not least, the sectoral structure of the economy. The historical development also plays an important role. European regions display wide heterogeneity along certain dimensions such as economic structure and initial conditions. But they show a high degree of homogeneity along other dimensions, like economic and democratic institutions (Fiaschi & Lavezzi, 2007). Melecký (2016) add that socioeconomic development largely determined by the level of disparities between regions.

The economic potential regions are largely determined by its social and environmental components and reflects the level of the region's productive forces development, its ability to produce goods, perform work and provide services (Polednikova, 2017). Economies have always been prone to different kinds of exogenous shocks, which can destabilize the path and pattern of regional economic growth. Regional economy perturbed by a shock may move onto a new growth path by re-establishing economic linkages, both internally and with other regions. (Stanickova & Melecky, 2018). One possibility is to change the sectoral structure of the region.

1 Data and methodology

The article focuses on the impact of the change in the sectoral structure on regional performance in the Czech Republic for 2010 - 2017. The aim was to analyse the change in the performance of territorial statistical units at NUTS3 level, in terms of changes in the sectoral structure of

gross value added. Another aim was to find out whether there is a convergence of the sector structure within the Czech regions. The NACE classification was divided into 4 groups, namely agriculture (section A), industry (section B + C + D + E), construction (section F), services (section G - U).

The analysis of the real contribution of the sector to the change in GVA in individual regions was expected to adjust the GVA indicator to a price effect. It is clear that the evolution of the price level, which will vary by industry, needs to be taken into account. For the conversion of GVA in individual regions it was necessary to use price indices in the sector for the Czech economy. These price indices were used as a tool for statistical deflation.

$$IQ = {}_L I_p \cdot {}_P I_q = {}_P I_p \cdot {}_L I_q = \frac{\sum p_1 q_0}{\sum p_0 q_0} * \frac{\sum p_1 q_1}{\sum p_1 q_0} = \frac{\sum p_1 q_1}{\sum p_0 q_1} * \frac{\sum p_0 q_1}{\sum p_0 q_0} = \frac{\sum p_1 q_1}{\sum p_0 q_0}$$

IQ implies that by dividing the value index by the volume index, we get a price index that can be used as a deflator to eliminate prices. GVA indicators in the sectoral and regional breakdowns were obtained from the Annual National Accounts. GVA at sectoral breakdown in current prices in 2017, 2014 and 2010 was given the value index (IQ) and price indices were calculated using the published volume indices in the sector breakdown. The development of the price level in 2017 compared to 2010 for the groups of industries was then found to be the weighted arithmetic average of the price indices of individual sectors, where the gross value added in 2010 was the weights. Then the GVA was deflated in the regional and sectoral breakdown

$$\sum_{i=1}^4 p_{1i} q_{1i} : I_{p_i} \cong \sum_{i=1}^4 p_{0i} q_{1i} \quad (2)$$

In order to analyse the contribution of each sector to the development of GVA, it is possible to use additive links between sectors, namely GVA in years is given by the sum of gross added value of individual sectors. The contribution of each sector is equal to the product of the rate of growth (compared intervals t and t-1) and the share of this sector GVA interval t-1:

$$\left(\frac{GVA_{Si,t}}{GVA_{Si,t-1}} - 1 \right) * \frac{GVA_{Si,t-1}}{GVA_{t-1}} \quad (3)$$

$GVA_{Si,t}$ the gross value added of the sector at time t,

$GVA_{Si,t-1}$ the gross value added of the sector at time t-1,

GVA_{t-1} the total gross value added of the sector at time t-1.

The total aggregate growth rate of GVA is then equal to the sum of the contributions of each sector. That is the growth rate of GVA is the sum of the growth rates of each sector weighted by the GVA ratio of each sector to GVA.

To determine the convergence of GVA structure in regions, σ - convergence was used. σ - Convergence is based on the neoclassical theory of economic growth, on the basis of which all states converge to the same level. σ - convergence means reducing the rate of "dispersion" of the HPH share (the relative degree of variability) between regions over time. Convergence can be written:

$$\sigma_t > \sigma_{t+1} \quad (4)$$

or we can write

$$\sigma_{t-1} > \sigma_t \quad (5)$$

The coefficient of variation c_x , which is the share of the standard deviation (s_x) and the arithmetic mean, is used as a relative measure of variability.

$$c_x = \frac{s_x}{\bar{x}}, \quad \text{kde} \quad s_x = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}} \quad (6)$$

The thus σ convergence occurs when the coefficient of variation of the proportion of GVA in the individual regions decreases over time.

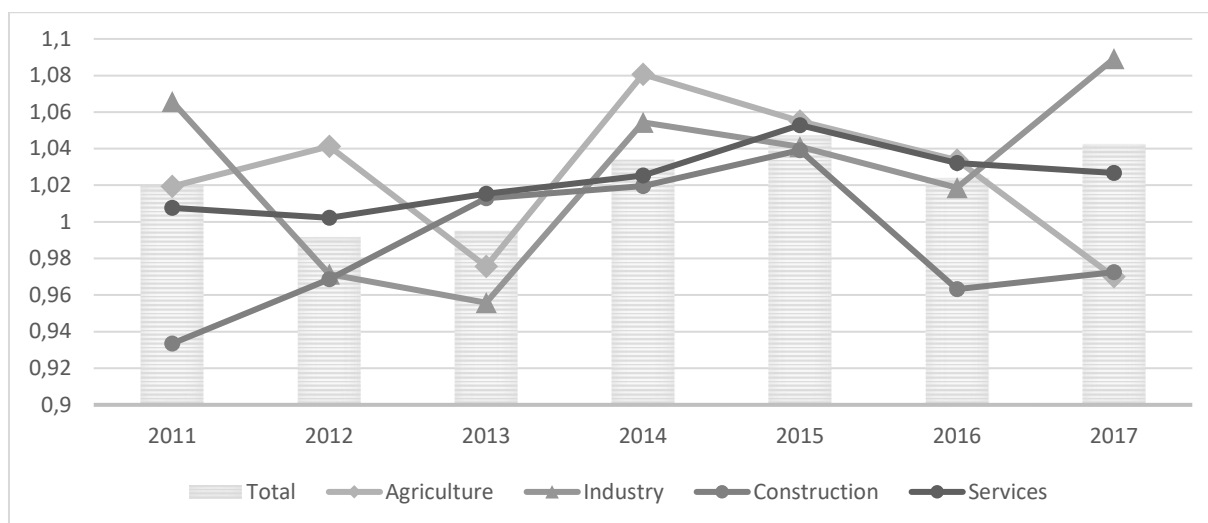
2 Results

2.1 Regional performance and business cycle

The real economic cycle, which is an important factor that affects the growth of regions. The real business cycle was determined by the GVA growth rate both for all Czech economy and on the basis of groups of sectors (Figure 1).

The economy of the Czech Republic is slightly increasing in 2010 after a recession, in 2012 and 2013 there is still a slight decline in economic performance (the GVA index is lower than 1), but since 2014 the economy is still growing. It can be seen from Figure 1 that growth between 2014 and 2017 can be considered stable. The industry is developing slightly differently in some years. In the period of small decline in GVA in the whole economy (2012-2013), caused mainly by industry and agriculture, the growth of services and the growth of construction (2013). Since 2014, economic growth has been driven mainly by industry.

Fig. 1: Development of GVA in the Czech Republic at 2010 prices (index).

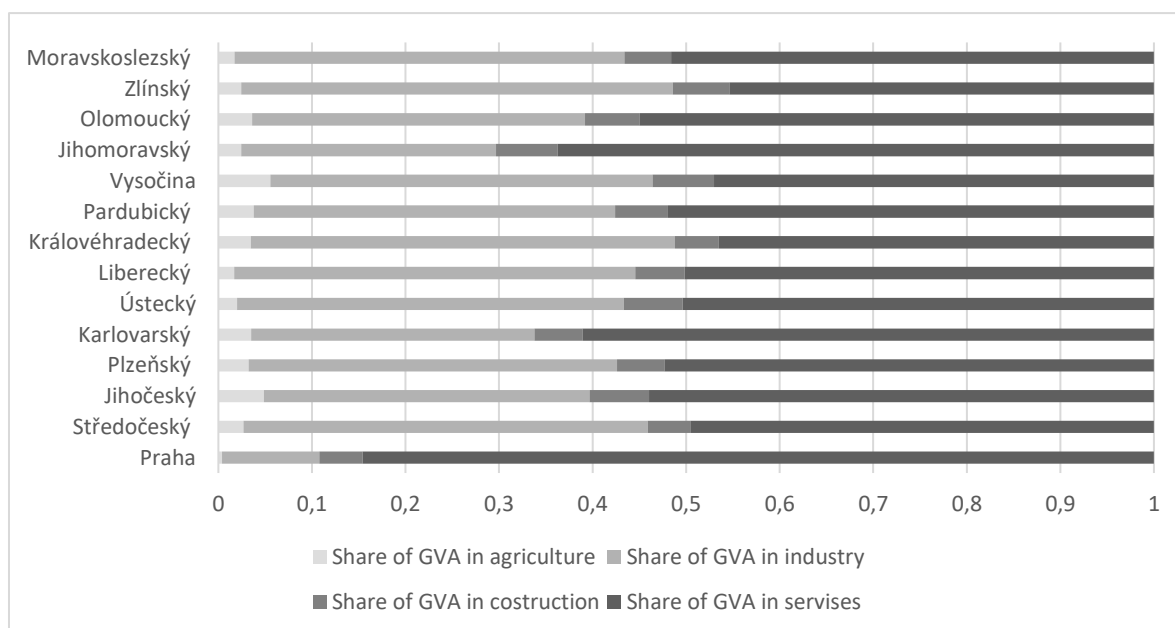


Source: Own calculations based on the data National account

2.2. Sectoral structure and regional performance

The share of individual industries in GVA formation in individual regions in 2017 is shown in Figure 2. The share of GVA in agriculture is traditionally the highest in the Region Vysočina (5.6% in 2017) and in the Region Jihočeský (4.9% in 2017). Since 2010 this share has become more important. In other regions, the share of GVA in agriculture is lower - below 4%. But even in other regions this share is slightly increasing in the monitored period.

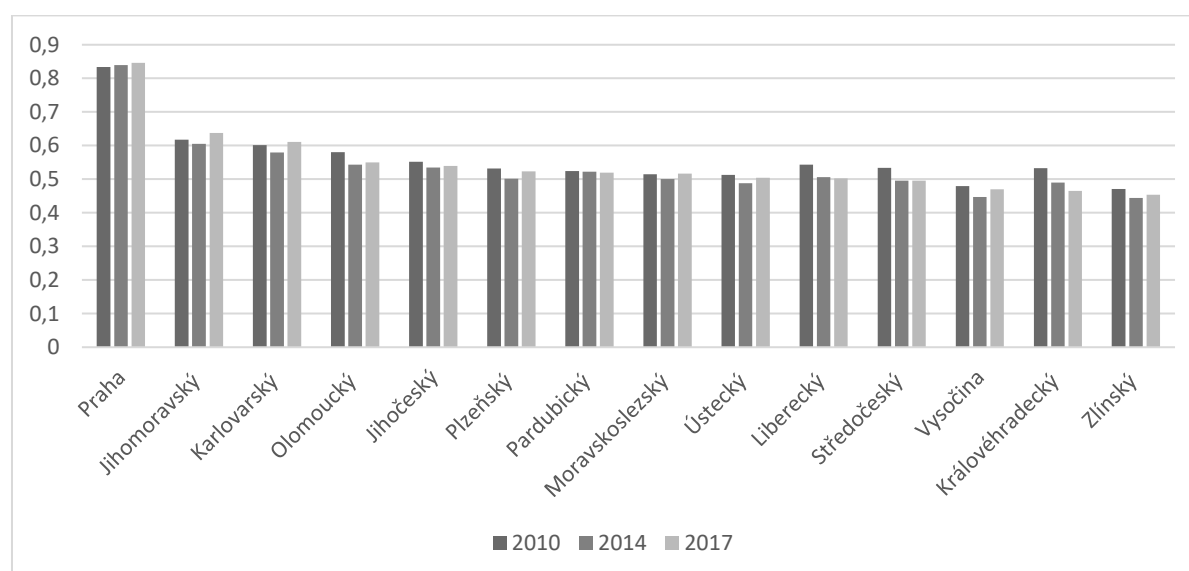
Fig. 2: Share of sectors in GVA in Czech regions in 2017



Source: Own calculations based on the data National account

The share of GVA in the construction industry ranges from 4.5% (Region Středočeský - a decline of 1.4 percentage points compared to 2010) to 6.6% in the Region Jihomoravský and in the Region Vysočina. In both of these regions, a decline in the share of this sector can also be observed. The most significant part of GVA is represented by industry and services, while these groups have also undergone significant changes, so their GVA shares in the regions were expressed in more detail in Figure 3 and 4. The highest share of services in GVA (Figure 3) is typical for the capital city Prague (almost 85%), the Region Jihomoravský (almost 64%) and the Region Karlovarský (61%). In these regions, there is an increase of 2 percentage points in 2017 compared to 2010. On the other hand, less than 50% of GVA in services are in the Region Vysočina, Region Královehradecký and Region Zlínský.

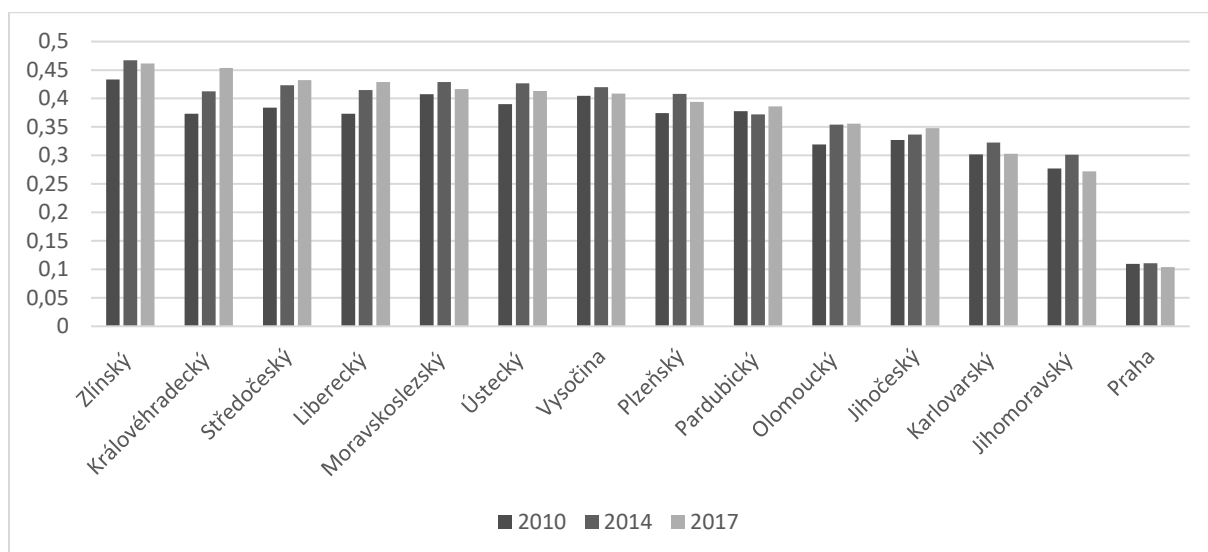
Fig. 3: Development share of services on GVA in the Czech regions (NUTS3)



Source: Own calculations based on the data National account

The development of the GVA share in the industry is decreasingly illustrated in Figure 4. In regions where the share of industry is significant (more than 35%), this share is still growing especially in the Region Královehradecký (approx. 45.4% - it consists mainly of manufacturing industry - an increase of 8 percentage points), the Region Zlínský (share of GVA 46.1% - an increase of about 3 percentage points), the Region Středočeský (a share of 43.2% - an increase of about 5 percentage points).

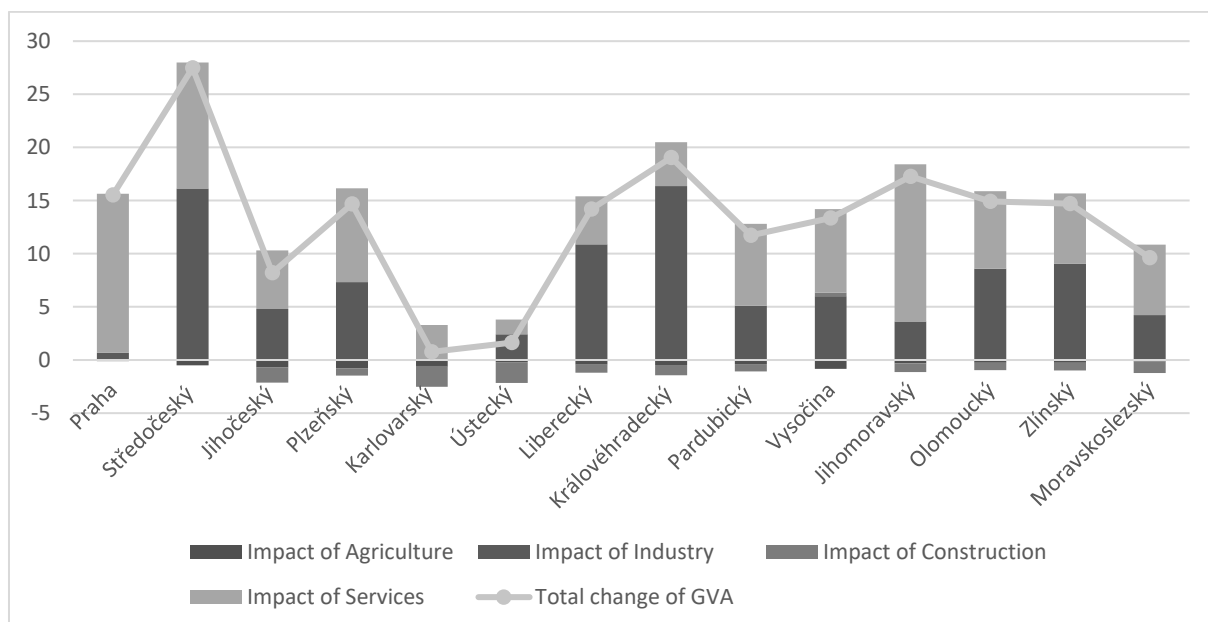
Fig. 4: Development share of industry on GVA in the Czech regions (NUTS3)



Source: Own calculations based on the data National account

Figure 5 illustrates the overall GVA change in individual regions in 2017 in comparison with 2010, when price developments were first eliminated. GVA increased in all regions. The highest increase can be seen in the Region Středočeský (27.5%) and the Region Královéhradecký (19%).

Fig. 5: Contribution of sectors to change GVA in Czech region (NUTS3) in 2017 (basic year 2010, relative change in %)



Source: Own calculations based on the data National account

In both of these regions, the increase in performance was mainly influenced by the growth of industry (in the Region Středočeský, it accounted for more than half of the total change, in the Region Královéhradecký about 80% of the total change in GVA). Another significant influence of the industry on the change in the region's performance is in the Region Liberec (the total change in GVA is 14.2% of which the industry represents an increase of 10.9%, ie more than 75%). GVA also grew above 15% in the Region Jihomoravský, Prague, where growth was driven by the services sector. In both regions, services have a predominant influence on GVA growth (more than 85%). The lowest GVA change in 2017 compared to 2010 occurred in the Region Karlovarský (0.76%) and in the Region Ústecký (1.65%). In these regions, although the services (Region Karlovy Vary) and industry (Region Ústí nad Labem) have had a positive impact, the construction industry is negatively affected.

The last step of the analysis was to assess whether there is a convergence between the sectoral structures in the regions and the GVA per employee. The convergence of the monitored indicators (Table 1) was assessed using the coefficient of variation (σ -convergence) as Bal-Domanska (2016). If we focus on the convergence of the regional shares of regions, it is possible to state on the basis of the coefficient of variation that the convergence of sectoral structures within regions does not occur.

Tab. 1: Result of regions sector convergence (variation coefficients)

	Share of GVA in sector			GVA/employees	
	2010	2014	2017	2010	2017
Agriculture	44.62	44.54	43.67	18.73	13.52
Industry	22.50	23.00	24.45	25.80	28.84
Manufacturing	28.72	28.30	29.43	23.38	24.30
Construction	12.75	12.94	12.80	12.17	15.31
Services	15.34	17.63	17.79	18.31	21.72

Source: Own calculations based on the data National account

The highest variability of regions is (as expected) in the share of agriculture in GVA, the lowest is in the share of construction. The share of GVA in the construction sector is not very different in individual regions. Concerning GVA per employee (practically labour productivity), the variability in the regions is relatively low, the highest about 25% is in the industry, which also includes manufacturing. However, this variability does not decrease. There is no convergence of GVA levels per employee in industry or in other sectors, except for agriculture (coefficient of variation decreases over the period under review). Convergence of regions cannot be discussed even from the point of view of GVA per capita. The variability of this indicator within regions is only slightly decreasing.

Conclusion

The paper deals with the impact of the change in the sector structure on regional performance in the Czech Republic. Regions in the Czech Republic can be divided into those that are more focused on services or industry. The capital of the Czech Republic, Prague, has a specific position with a high share of services. It was found that there is no significant change in the structure of the sector of the individual regions in the context of the business cycle. The convergence of regions performance (GDP per capita per capita) was slow. Zdrzil and Applova (2016) consider that convergence trend in Czech regions is caused by disparities in productivity. It was not found convergence of sectoral structures in regions. On the contrary, increasing variability was found in the period of high economic growth. This is not negative. The region uses internal potential and does not significantly change the sectoral structure of regional economies. Bal-Domańska (2016) in the future attaches big role in convergence of R&D and knowledge-based sectors (manufacturing and service).

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