ECONOMIC CONVERGENCE OF CZECH REGIONS IN TERMS OF GDP AND UNEMPLOYMENT RATE IN RESPONSE TO FDI FLOWS: DO BUSINESSES AND REGIONS FLOURISH?

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Abstract: The convergence analysis of regions of the Czech Republic is performed in the period 2000–2017. Two convergence concepts are methodologically described and applied: 1) the regional variability of real gross domestic product per capita is examined by the σ-convergence method; 2) the tendency of poorer regions to grow faster than the richer is assessed by the concept of β-convergence. The analysis results do not manifest any palpable tendency of the Czech regions to converge. Furthermore, a role of foreign direct investment flows (FDI) as a catalyst that should contribute to the convergence of the Czech regions in terms of unemployment is assessed based on the relationship between the cumulative regional FDI flows per capita and regional unemployment development in period 2005-2017. The assumption that the FDI flows create new jobs and thereby contributing to the reduction of unemployment is studied by means of the statistical apparatus, regression and correlation analysis. No positive impact of regional FDI flows on regional unemployment was proven.

Keywords: Convergence, unemployment rate, gross domestic product, foreign direct investment, subsidy and enterprise.

1 Introduction: the concept of economic convergence and the role of foreign direct investments in economy

The notion of convergence, in the economical context, means that the difference of the monitored criterion among the examined economies over time decreases and becomes negligible, i.e., converges to zero. The convergence of economic performance is measured, as a rule, by comparing of the development of the gross domestic product (GDP) per capita (Barro & Sala-i-Martin, 1992).

Foreign investments are considered to be one of the most important aspects of globalization. Within the classical theories they are assumed to play an important role in the economic development of backward economies due to the property of high capital mobility. Therefore, foreign investments are considered to be a catalyst contributing to the convergence of the poorer economies to the economically advanced countries (Gorynia & Blanke-Lawniczak, 2009).

Modern theories such as „New economic geography" and "Endogenous growth theory" are more *cautious* when considering the impact of foreign capital on the convergence; their assessments are based on conditions in which the convergence process should occur (Barry et al., 2003).

The significance of foreign investments has been magnified in economies that lack investment capital, which was the case of the transition economies of post-communist countries of Central and Eastern Europe (Bevan & Estrin, 2004). The demand for foreign investments was here associated with a lack of domestic savings needed to start the process of market economy, with a need for new production technologies and sophisticated procedures in order to facilitate easier access to more mature markets.

In the Czech Republic the important milestone for the inflow of foreign direct investments (FDI) was the year 1990, in which the transformation process of transition from a centrally planned economy to a market system began, and in which liberalization of capital flows was carried out (Mandel & Tomšík, 2006).

Despite the fact that FDI benefits can be verified with difficulty, it is considered that they stand largely behind the growth of Czech industry, export growth and the improving state of the Czech economy. As pointed out in Zamrazilová (2007), a massive influx of FDI can also have negative consequences. Concerns relating to the risk of FDI are based on the fact that foreign-owned enterprises thrive better than domestic companies. This may ultimately lead to the destruction of domestic competition. Another negative impact of FDI was empirically confirmed in the study of Zemplinerová (2006). It revealed that foreign-owned enterprises in the manufacturing industry were generally very demanding regarding the need for physical capital and labor saving. At the same time it showed that the labor and capital productivity of companies with foreign participation was significantly above average; this gave the companies a head start in market competition.

In contrast to this analysis, the defenders of FDI commonly argue for an increasing pressure on improvement of the competitive environment, growth of new employment opportunities, the involvement of domestic enterprises in international trade, rising labor and capital productivity and the influx of new knowledge and technologies (Mitic & Ivić, 2016).

A foreign investors´ decision on entering the market of a host country is influenced by many factors, analyzed e.g., in Bruno & Cipollina, 2018), one of the most significant of which is the amount and type of support offered by the host country. Nevertheless, there is no consensus on the effectiveness of investment incentives. In this regard, many studies have proved that from a long-term point of view the FDI showed a negligible or no even impact on the decrease of unemployment. The reason is attributed to dislodging the existing firms from the market and/or the introduction of capital-intensive production to the detriment of production employing human factors (Dinga & Münich, 2010). From this perspective FDI have not fulfilled their purpose and incentive costs can be regarded as a waste of public funds.

The positives of FDI incentives are associated with the production of positive externalities in the host countries in terms of growth-beneficence; in terms of this, positive impact can be considered if unemployed workforce is involved in the work process and/or if technological possibilities of the economy get advanced (Strat et al., 2015).

The below processed macroeconomic analysis contributes to the topic from two perspectives. The first perspective focuses on convergence assessment of the Czech regions during the period 2000-2017. We examine whether the disparity among heterogeneous regions in terms of real gross domestic product per economically active capita was reduced. Namely, σ-convergence method enables us to evaluate whether variability of product per economically active capita among the Czech regions has decreased. Furthermore, within the concept of β-convergence it is assessed whether the poorer regions grow faster than the richer.

The second perspective examines the relationship between the cumulative regional FDI inflows per capita and unemployment development in the Czech regions. The assumption that the FDI create new jobs, and thereby, according to FDI proponents, contribute to the reduction of unemployment will be assessed by means of the regression and correlation analysis.

The following text will be structured as follows: in section 2, the methodologic approaches are given. Section 3 presents the data from which analysis draws. Section 4 concentrates on the convergence analysis of the Czech regions in the period 2000-2017. Section 5 enables to look into the relationship between the cumulative regional FDI inflows and unemployment rate (UR) development in the Czech regions. Results of both the sections 4

and 5 are discussed within their parts. Finally, the section 6 summarizes the main points of the topic and presents the original results of the analyses.

2 Methodology applied

The methodological approach utilizes two concepts of convergence that lean on neoclassical model of growth, *β*-convergence and *σ*-convergence (Barro & Sala-i-Martin, 1992; Sala-i-Martin, 1996). The convergence criterion is the real gross domestic product expressed per capita (*Y*). *β*-convergence concept is defined as a situation in which poorer regions (i.e., regions with lower income per capita) grow faster than richer regions. In a simplified way the actual course of *β*-convergence for the period *T* can be quantified by means of (1) using the regression function:

$$Y_{i,T} - Y_{i,0} = \alpha_1 - \beta_1 \cdot Y_{i,0} + \varepsilon_i, \quad (1)$$

where *i* refers to the region, *0* and *T* refers to two time instants. *β*-convergence assumes a positive value of regression parameter β_1; the regression function enables to analyze how the convergence has been achieved over the monitored years *t* = 0,1,2, ... *T*. If all regions are at the same steady state, α_1 and the period is long enough to enable the regions to converge to this steady state, the parameter β_1 will be equal to 1, which is an ideal case. The parameter β_1 reflects what difference was eliminated *on average* to the steady state. This formula also assumes a steady state with zero growth per capita. In the context of empirical *β*-convergence examination, the modified regression (2) can be utilized:

$$\gamma_i(T) = \frac{1}{T} \cdot \log\left(\frac{Y_{i,T}}{Y_{i,0}}\right) = \alpha + \beta \cdot logY_{i,0} + \varepsilon_i, \quad (2)$$

in which the left side represents the average growth of log-product per capita over the period *t* = 0…*T* dependent on the initial economic level $Y_{i,0}$. *T* is the total number of years of the monitored period, *α* is a constant, *β* is the regression coefficient, ε_i is a random component. This formula implicitly assumes identical steady states in the surveyed regions (Slavík, 2007).

If the regression coefficient is significant and negative, and the coefficient of determination R^2 is high (i.e., straight lines well capture the variability of the variable), it can be assumed that the poorer regions grow on average faster than richer regions. However, it does not mean, that the dispersion of *Y* among regions reduces.

The decreasing variability of *Y* can be captured by the *σ*-convergence. It consists in reducing the variance, or respectively the standard deviation of *Y* among regions, which occurs if inequality (3) is true:

$$\sigma_t^2 \geq \sigma_T^2 \quad (3)$$

where $t < T$, σ_t^2, σ_T^2 are variances of *Y* at times (years) *t*, *T*, respectively.

σ-convergence is identical with an intuitive understanding of convergence in the sense of reduction disparities among regions; *β*-convergence is in the case of large differences in the initial levels among regions necessary but not sufficient condition for the existence of *σ*-convergence (Rapacki & Próchniak, 2009).

The question of the contribution of FDI in terms of their impact on the unemployment development in the Czech regions, further on referred as UR or unemployment rate, will be evaluated based on regression and correlation analysis. This procedure is commonly used in the analyses of FDI impacts on economy as shown e.g., in Novák et al. (2016) or Schmerer (2014).

3 Data description

The analysis is based on regional data available from public databases of the Czech National Bank (CNB, 2019) and the Czech Statistical Office (CSU, 2019). The convergence analysis uses the data from the period 2000-2017. The analysis covering the FDI data is based on cumulated regional FDI flows in the period 1999-2015, with the UR and GDP per capita delayed by one year, i.e., in period 2000-2016. The monitored regions correspond to territorial division described by NUTS 2.

Figure 1 shows the development of the three studied indicators, GDP per capita, cumulated FDI per capita and UR, in the Czech Republic.

The development of unemployment in the monitored period was significantly affected by its cyclical component due to the outbreak of the global financial crisis in 2008, which negatively affected all Czech regions (the greatest impact of the crisis on regional unemployment growth can be observed between 2009-2013). Simultaneously, the crisis led to decrease in GDP. This period is accompanied by slowdown in the FDI flows. The considered period contains several short-time economic cycles; therefore, it provides an opportunity to compare relations of analysed indicators under non-homogeneous conditions.

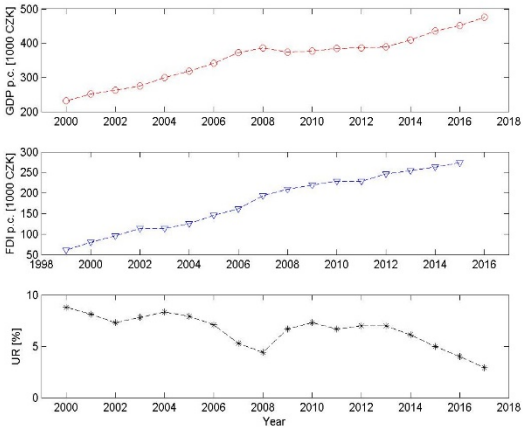

Figure 1: Development of the GDP (the upper graph), the development of cumulated FDI (the middle graph), both expressed in 1000 CZK per capita, and the development of UR (the lower graph) in the Czech Republic. Source: own processing, based on the data of CSU (2019) and CNB (2019)

In terms of the FDI distribution among the Czech regions, the capital Prague markedly differs from the other regions, hence it is not included in further analysis. In the subsequent parts, 13 regions are considered for analyses, namely: Central Bohemia (SC), South Bohemia (JC), Plzen region (PL), Karlovy Vary (KV), Usti (US, Liberec (LI), Hradec Kralove (HK), Pardubice (PA), Vysocina (VY), Olomouc (OL), South Moravia (JM), Zlin (ZL), Moravian-Silesian region (MS).

4 Results of analysis of *β*-convergence and *σ*-convergence of regions in the Czech Republic

Results of *β*-convergence of the Czech regions based on relation (2) are shown in Figure 2. The horizontal axis represents the natural logarithm *Y* (= GDP per capita) in the initial year t_0 = 2000, the vertical axis represents the average annual growth of product in accordance with the left side of relation (2) for a given period *T* = 17, namely

$$\gamma(17) = \frac{1}{17} Ln\left(\frac{Y(2017)}{Y(2000)}\right) \quad (4)$$

The data in Figure 2 are interleaved with a regression line by means of the least squares. Both the estimated regression (*β*) and correlation coefficient (*ρ*) are negative, but non-significant with *β* = - 0,0194, *ρ* = -0,2711, with *p*-value 0,3704 of the corresponding *t*-test. The regression model captured in Figure 2 is based on data summarized in Tab. 1.

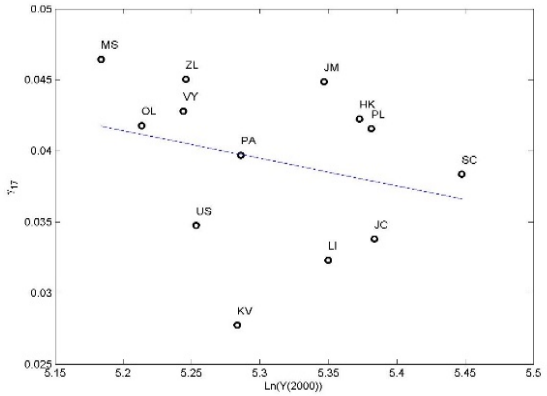

Figure 2: Cross-regional analysis of β-convergence of the Czech regions in 2000-2017. Source: own processing

Table 1: GDP per capita Y in 2000 (in thousands CZK) and average productivity growth rate γ for the period T = 17 in the regions of the Czech Republic

Region	SC	JC	PL	KV	US	LI	HK
Y(2000)	232,182	217,824	217,352	197,046	191,193	210,562	215,488
γ (17)	0,0384	0,0338	0,0416	0,0227	0,0348	0,0323	0,0423
Region	PA	VY	JM	OL	ZL	MS	
Y(2000)	197,531	189,362	209,902	183,677	189,743	178,346	
γ (17)	0,0397	0,0428	0,0449	0,0418	0,0450	0,0464	

Source: own processing

The development of the Y = GDP per capita variability in years 2000-2017 among regions used for the analysis of σ-convergence according to (3) is summarized in Tab. 2 with estimated standard deviations σ shown in the 2nd row.

Table 2: Variability of product per capita Y expressed by means of population standard deviation σ (in thousands CZK, period 2000-2017)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Sdev Y	69,6	79,7	85,8	93,7	102,7	111,4	120,5	135,4	141,7
Mean Y	220,4	238,4	249,0	259,8	281,5	298,6	319,5	345,4	355,4
Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
Sdev Y	134,5	135,9	133,1	132,0	133,0	134,8	152,0	156,3	165,6
Mean Y	346,7	348,2	356,0	357,2	361,1	380,0	401,8	415,7	438,8

Source: own processing

Discussion of results

The results of the analysis indicate that GDP development in the Czech regions does not fulfill any of considered criteria of convergence, i.e., neither in terms of (2) nor (3) convergence trend was showed; on the contrary, as we can see from Tab. 2 the dispersion among the regions increased, particularly in the periods of economic growth.

Tab. 1 enables us to identify two groups of regions according to their initial Y in the year 2000, namely, with Y < 200 thousands of CZK (KV, PA, US, ZL, VY, MS, OL), and the rest with Y > 200 thousands of CZK.

Analogically, the regions can be separated into two groups according to γ as follows: the group of regions with γ < 0,035 (KV, US, LI, JC) and the group with γ > 0,035.

As we can see from Fig. 2, five out of seven regions with lower initial Y reached the group of the larger γ; in contrast, some regions included in the richer group according to Y achieved worse results of γ. This indicates that there is at least certain tendency for initially poorer regions to grow *on average* faster than the richer ones. However, the variability among regions is so large that it does not enable us to formulate a definite conclusion.

As regards to the analysis of the variance across regions, it can be seen from Tab. 2 that the variability of Y across regions has not increased systematically; at the crisis outbreak in 2008-2009 it decreased and then stabilized until 2014. Nevertheless, the present period of economic growth leads to further growth of regional disparity.

5 Results of analysis of trend in UR development and its correlation with FDI

The trend in development of UR in the Czech regions is examined by means of the regression model based on equation (1) that captures the relation between UR in the initial year 2000 with the change in UR from 2000 to 2017 (see Fig. 3) and enables to compare regional UR development in the considered period.

The correlation between the analyzed variables is negative and significant (ρ = -0,977, slope parameter of regression line β= -0,8502 with p-value ~10-8 computed from corresponding t-distribution). As we can see from Fig.3, the strongest contribution to the resulting relationship was due to the regions US, MS and OL characterized by the highest UR in 2000 and, simultaneously, by its highest decrease between 2000-2017.

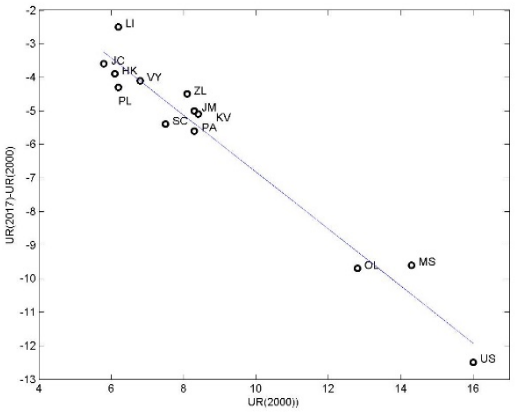

Figure 3: Relation between the UR in 2000 and the UR change between the period 2000-2017. Source: own processing

The question arises whether any positive influence of regional FDI flows to the regional UR development can be proven. Graphically the dependence between these variables is captured in Fig. 4, where cumulated regional FDI flows per capita in 2000-2015 are plotted on the horizontal axis and the UR change between 2000 and 2016 is shown on the vertical axis. In the case of an explicit impact of FDI on UR, we expect a negative dependence in the sense that larger regional FDI flows lead to a more significant decrease in UR. The data, however, do not support such a conjecture. The dependence is positive, though not significant statistically (ρ = 0,2678, slope β = 0,0168, p-value in the corresponding t-test is 0,3764).

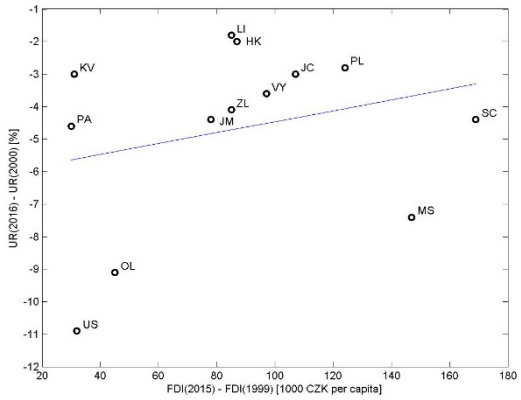

Figure 4: Cumulated FDI flows (in thousands of CZK per capita) over the period 1999-2015 versus differences in UR between 2016 and 2000. Source: own processing

Discussion of results

Regarding the FDI flows the regions can be separated to three groups: rather low FDI recipient (KV, PA, US, OL), high FDI recipient (MS and SC) and middle recipient (HK, LI, JM, ZL, VY, JC, PL), (see Fig. 4). However, the response values of the UR change are rather scattered, which means that the development of UR in regions in the same group was quite different. Hence, the results do not support the assumption of the positive impact of regional FDI flows on the regional UR development.

To obtain more details about individual regions (for instance on MS region experiencing a positive contribution of FDI to UR change due a massive investment to the Hyunday factory, among others) the micro-economic analysis of the particular FDI impacts on UR should be performed.

These results can be attributed to the fact that the basic characteristics of the regions (economic, population, geographical, historical, cultural, etc.) are given so strongly that the FDI flows could not systematically affect the UR development over considered time. Another reason may follow from the FDI state support policy, which in practise manifests itself by the decrease of overall costs of the supported firms giving them competitive advantage. Simultaneously, the inflow of FDI is often connected with the technology modernization and more efficient production processes, which can lead to the substitution of labour factor for capital resulting in the UR increase.

6 Conclusion

The issue of the convergence of the Czech regions in 2000-2017 and its relation with the foreign direct investments was discussed and analysed by means of empirical data. Any significant trend in convergence was not proven. Nevertheless, in the examined period, the internal and external temporary factors seem to influence the regional GDP potential in terms of temporary convergence; this applies to the GDP variability reduction as well as unemployment reduction in the poorer regions. As an external temporary factor, the financial crisis 2008 can be regarded, internal temporary factors cover diverse forms of regional growth supports, including the FDI inflows.

Moreover, a question was arisen whether any positive influence of regional FDI flows to the UR development could be revealed. The performed analysis excluded this hypothesis. This may have resulted from the existence of basic and strong characteristics of the regions (economic, population, geographical, historical, cultural, etc.), which did not allow the FDI flows to affect systematically the UR development over the considered time. Another reason could arise from the FDI state support policy. This allows us to conclude that the insensitivity of unemployment rate to the FDI inflows indicates ineffectiveness of active employment policy, in particular regarding the FDI as one of the instruments of the unemployment reduction.

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Primary Paper Section: A

Secondary Paper Section: AH, BB