CONVERGENCE OF LOCAL GOVERNMENT UNITS IN BOSNIA AND HERZEGOVINA

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Abstract

This paper studies the convergence in economic development between different local communities in Bosnia and Herzegovina in 1990–2010 time periods. We are testing the hypotheses that dispersion in level of real per capita income between municipalities decreases over time (Sigma-convergence). We also discuss on possible reasons for the observed trends. Results of this research can be useful for profiling and discussions about more balanced regional development policy, as well as for defining EU programmes and projects to support regional and local development of the county from 2014 to 2020.

Keywords: Convergence, Local government units, Bosnia and Herzegovina.

Introduction

Convergence has a wide application in various scientific and research areas. Special emphasis is on reduction, and ultimately eliminating the gaps in the level of economic development, in order to reduce tensions in the economic, political, environmental, social and other areas.

In this context, we are testing the convergence of local communities in Bosnia and Herzegovina. More precisely we examine following hypothesis:

H1: Dispersion in level of gross domestic product per head between local government units in Bosnia and Herzegovina has decreased in last two decades.

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Economic and Infrastructural Aspect of Local Development

The spatial framework of the research is therefore Bosnia and Herzegovina, specifically the gross domestic product per capita on the level of municipalities. Testing is based on the data collected by statistical offices in the country. Timeframe of the research is 1990 to 2010. To test the hypothesis we use a combination of summary measures, such as coefficient of variation and Gini coefficients, and analysis of distribution using histogram and cumulative frequency.

We are also discussing about possible reasons for the observed trends in GDP per capita.

Research results can be used to explain the economic sustainability of territorial organization, evaluation of development policies, redefining the territorial matrix, etc.

Theoretical framework and empirical findings

The problem of convergence is widely analyzed and verified in the economic literature. Analyzing the possibilities of dynamizing growth opportunities of poor regions and local communities and improving unfavourable trends in comparison with the rich regions and local government units reveals the complexity of the problem, but also points to efforts that would be necessary to at least partially resolve them.

Theoretical approaches and explanations of convergence are particularly intensified since mid-twentieth century. Researches were trying to find the explanation for the achieved growth rate of developed countries, but also to discover, and eliminate the factors of deviation between developed and developing countries. This has resulted in the construction of neo-classical growth model (Solow 1956). Theoretical explanations of convergence and its practical tests are usually performed under neo-classical growth models (Bogunovic 2001). The concept of convergence is complex and can be defined in different ways. The first approach is based on negative correlation between the rate of growth of income per capita and the initial level of income (Beta-convergence). Second approach assumes that there is dispersion in level of real per capita income between observed areas (community, region and state) but that it decreases over time (Sigma-convergence).

The concept of convergence can be tested at the global, national, regional and local level. At the regional level convergence has been tested on the example of the United States for the period 1880–1990, in the case of Japan for the period 1955–1990, Germany, Great Britain, France and Italy for the period since 1950. Convergence is tested for other countries also. In all the cases convergence is confirmed. It was found that the underdeveloped regions have above-average growth rates and that leads to equalization of inter-regional income distribution (Xavier and Sala-I-Martin, 1996). The European Union pays special attention to the analysis of convergence at
the level of integration, at national, regional and local level, through implementation of different policies, monitoring and evaluation of the results of these policies (Beckfield 2003).

This kind of testing is particularly important for poor countries, regions and local communities to find the paths of transition and restructuring for more dynamic economic development. This is especially important for creating economic policy in a particular economic space. Prospects of a community depend on improving the welfare of all its parts. Speed of movement towards the steady state is determined by the profile of economic policy, which then determines the speed of adjustment, and selection of mechanisms, measures and instruments of economic policy. Convergence is a process of positive change. Speed of convergence depends on the level of the gap and the relative pace of change, which is influenced by the structure of the economy. It is desirable that all the relevant economic variables converge towards a desired equilibrium state. In that case, integration linkages create positive economic motivation towards favourable results.

Economic development literature often recalls that “rich countries become richer and the poor become poorer”. Comparatively speaking, this phrase is based on the practical situation, such as the fact that there are no developed ideas and strategies that would allow development gap between rich and poor countries, regions and local communities to be minimized and/or eliminated.

Summary measures of disparities: Beta and Sigma-convergence

*Beta-convergence* refers to a process in which poor regions grow faster than rich ones and therefore catch up on them. The concept of Beta-convergence is directly related to neo-classical growth theory (Solow 1956) where one key assumption is that factors of production, in particular capital, are subject to diminishing return. Accordingly, the growth process should lead economies to a long-run steady state characterised by a rate of growth which depends only on the (exogenous) rates of technological progress and labour force growth. Diminishing return also implies that the growth rate of poor economies should be higher and their income and/or GDP per capita levels should catch up with those of rich economies.

When all economies are assumed to converge towards the same steady-state (in terms of GDP per head and growth rate), Beta convergence is said to be absolute. However, the steady-state may depend on features specific to each economy, in which case convergence will still take place, but not necessarily at the same long-run levels. This will be the case when GDP per capita is supposed to depend on a series of determinants such as factor endowment or institutions, which can vary from one economy to the other even in the long-run. Beta-convergence is then said to be conditional.
The methodology used to measure Beta-convergence generally involves estimating a growth equation in the following form:

\[ \ln(\Delta y_{i,t}) = \alpha + \beta \ln(y_{i,t-1}) + \gamma Z_{i,t} + u_{i,t}(1) \]

where

- \( y_{i,t} \) and \( \Delta y_{i,t} \) are respectively the level and the growth rate of GDP per capita in region \( i \) at time \( t \);
- \( Z_{i,t} \) includes all other factors supposedly affecting the growth rate;
- \( u_{i,t} \) is the standard error term; and
- \( \alpha,\beta \) and \( \Delta \) are the parameters to be estimated.

A negative relationship between the growth rate (\( \Delta y_{i,t} \)) and the initial level of GDP per capita (\( y_{i,t} \)), i.e. \( \beta \) is significant and negative, is the sign of a convergence process. The estimated value also indicates the rate at which regions approach their steady-state and hence the speed of convergence\(^1\).

While Beta-convergence focuses on detecting possible catching-up processes, Sigma-convergence simply refers to a reduction of disparities among regions in time. The two concepts are of course closely related. Formally, Beta-convergence is necessary but not sufficient for Sigma-convergence. Intuitively, this is either because economies can converge towards one another but random shocks push them apart or because, in the case of conditional Beta-convergence, economies can converge towards different steady-states.

A number of limitations of the Beta-convergence approach (see for instance Quah 1993) have led some economists to suggest that the concept of Sigma-convergence is more revealing of the reality as it directly describes the distribution of income across economies without relying on the estimation of a particular model. In addition, the lack of GDP data for many years in 1990–2010 time periods influenced us to concentrate the analysis on calculating just Sigma-convergence.

The most frequently used summary measures of Sigma-convergence are the standard deviation or the coefficient of variation of regional GDP per capita. However, other indices exist and present interesting properties (see for instance Cowell 1995 or World Bank 1999 for a detailed review of the mathematical properties of the most popular summary inequality measures). In this paper as one of the possible measures we also use Gini coefficient.\(^2\)

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\(^1\) Results obtained with the previously explained approach strongly depend on the specification adopted (absolute or conditional convergence, variables included in \( Z \), incorporation of spatial effects) and on the observations (period and regions considered, dataset used). It is therefore difficult to draw a single general conclusion from the vast panel of existing studies (see for instance the survey by Eckey and Türk, 2006).

\(^2\) Other possible measures are also Atkinson index, the Theil index and the Mean Logarithmic Deviation (MLD). The weighting schemes and implicit welfare functions vary across measures. For example, the
The coefficient of variation is a normalised measure of dispersion of a probability distribution. It is defined as the ratio of the standard deviation to the mean. It is often reported as a percentage by multiplying the above calculation by 100 which is sometimes referred to as the relative standard deviation (RSD or %RSD). The coefficient of variation is often preferred to the standard deviation which has no interpretable meaning on its own unless the mean value is also reported. For a given standard deviation value, the coefficient of variation indicates a high or low degree of variability only in relation to the mean value.

For the BIH municipalities coefficient of variation in 1990 and 2010 is as follows:

\[
\text{CoV}_{1990} = \frac{\sigma_{1990}}{X_{1990}} \cdot 100 = \frac{2796.15}{5916.65} \cdot 100 = 47.26\%
\]

\[
\text{CoV}_{2010} = \frac{\sigma_{2010}}{X_{2010}} \cdot 100 = \frac{2933.97}{4769.41} \cdot 100 = 61.52\%
\]

Comparing the disparities between BIH municipalities in 2010 with those in 1990 we can conclude that Sigma-convergence is not demonstrated. Coefficient of variation actually increased, from 47.26% in 1990 to 61.52% in 2010.

The Gini coefficient is mostly used as a measure of inequality in the distribution of personal income or wealth. By definition, it varies between 0 and 1. A low value indicates more equal distribution (0 corresponding to perfect equality), while a high Gini coefficient indicates more unequal distribution (1 corresponding to perfect inequality where income is concentrated in the hands of one individual). The Gini index is the Gini coefficient expressed as a percentage.

The Gini coefficient can be used to compare income distributions across different populations, in particular countries and regions. Under this measure, similarly with the previous one, disparities among BIH municipalities increased from 17.6% in 1990 to 20.3% in 2010.

MLD is more sensitive to changes at the lower end of the distribution, while the coefficient of variation is responsive to changes in tind of the distribution. The Gini coefficient is more sensitive to changes in inequality around the median. Consequently, these measures may not rank two distributions the same way, nor will time series patterns necessarily be the same for different measures. It is therefore generally required to compute a variety of measures to draw firm conclusions about changes in the extent of disparities.

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\footnote{It is important to mention that Gini coefficient is influenced by the granularity of the measurements. For example, a computation based on five 20% quantiles (low granularity) will usually yield a lower Gini coefficient than one based on twenty 5% quantiles (high granularity) taken from the same distribution.}
Analysis of the distribution

Summary measures of disparities are extremely useful as they provide a synthesis of the information and are relatively simple to compute. Their obvious drawback is that they do not allow for an in-depth look at the distribution of observations. In particular, they are not suitable for describing movements of observational units (in our case municipalities) within the distribution. However, such movements can add considerable insight to the analysis of local disparities by providing more details about the mechanisms at work in the convergence process. Several methods and instruments can be used to analyse the characteristics and the dynamics of the distribution. One class of instrument is based on visual inspection. Here we are using non-parametric estimation of density functions and cumulative density functions.

The most simple and frequently used non-parametric density estimator is the histogram (see for instance Boldrin and Canova 2001). However, this instrument suffers from two severe limitations. First, histograms are not smooth, and second, they depend on end points of the sub-intervals selected to cover the data values. One way to overcome these shortcomings is to use kernel density estimators. Under this method, each data point is the centre of normalised density function, referred to as the kernel. Densities are then added vertically to produce the estimation of the distribution. If a Normal is chosen as the density function, we obtain a Gaussian (stochastic) kernel density estimation of the distribution (see for instance Barrios and Strobl 2005).

It is of course important to select the most appropriate kernel and in particular the width of the sub-intervals surrounding the data point, referred to as the bandwidth. A common way to determine the optimal bandwidth is to choose one that minimises an optimality criterion which is often selected as the Asymptotic Mean Integrated Squared Error (AMISE). The Gaussian kernel estimation of the GDP per capita distributions for the BIH municipalities and for the years 1990 and 2010 is displayed in the Figure 1. The results are mixed. On one side, frequencies around the mean significantly increase indicating convergence. On the other side, however, frequencies also tend to increase for values below 70% and between 120 and 150% of the BIH average, indicating divergence. In addition, the estimation reveals an evolution from a unimodal to bimodal distribution. This is particularly interesting since it can lead to the conclusion that we are witnessing a polarisation process in BIH. Of course, this is something that requires deeper analysis in the future.
Figure 1: GDP/head (BIH=100): Distribution BIH municipalities, 1990–2010, Gaussian kernel estimation

![GDP/head (BIH=100): Distribution BIH municipalities, 1990–2010, Gaussian kernel estimation](image1)

Source: Author’s calculation

Figure 2: GDP/head (BIH=100): Cumulative frequency distribution, BIH municipalities, 1990–2010

![GDP/head (BIH=100): Cumulative frequency distribution, BIH municipalities, 1990–2010](image2)

Source: Author’s calculation
The *cumulative frequency* is the percentage of observational units for which the record value falls below a reference value. In general, the steeper the curve representing the cumulative frequency around the mean, the less the distribution features large disparities.

Figure 2 reports the cumulative frequency distributions of GDP per capita for BIH municipalities in 1990 and 2010. Again the results are mixed. Compared to the cumulative frequency in 1990, the frequency in 2010 is slightly steeper around 100. In a way this confirms that some convergence has taken place between these two dates. However, in 1990, the cumulative frequency of the GDP/head level corresponding to 60% of the BIH average was about 0.20, meaning that 20% of the observation (i.e. municipalities) had a GDP per capita below 60% of the BIH average. In 2010, this figure increased to 27%, indicating divergence process.

### Possible explanations

Possible explanation for the mixed results in previous analysis is the drastic change in GDP per capita between municipalities in the analysed period. In a number of municipalities there was a significant increase in GDP, while in the second group, GDP fell drastically. Municipalities with the highest drop in GDP per capita ranking are presented in Table 1.

#### Table 1: Municipalities with the highest drop in GDP pc ranking

<table>
<thead>
<tr>
<th>Municipality</th>
<th>GDP per capita 1990 rank</th>
<th>GDP per capita 2010 rank</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kalinovik</td>
<td>50</td>
<td>87</td>
<td>-37</td>
</tr>
<tr>
<td>Jajce</td>
<td>31</td>
<td>71</td>
<td>-40</td>
</tr>
<tr>
<td>Zvornik</td>
<td>12</td>
<td>53</td>
<td>-41</td>
</tr>
<tr>
<td>Han Pijesak</td>
<td>17</td>
<td>58</td>
<td>-41</td>
</tr>
<tr>
<td>Novi Travnik</td>
<td>21</td>
<td>65</td>
<td>-44</td>
</tr>
<tr>
<td>Ljubinje</td>
<td>29</td>
<td>74</td>
<td>-45</td>
</tr>
<tr>
<td>Trnovo</td>
<td>52</td>
<td>99</td>
<td>-47</td>
</tr>
<tr>
<td>Bileća</td>
<td>15</td>
<td>63</td>
<td>-48</td>
</tr>
<tr>
<td>Čajniče</td>
<td>38</td>
<td>93</td>
<td>-55</td>
</tr>
<tr>
<td>Maglaj</td>
<td>35</td>
<td>92</td>
<td>-57</td>
</tr>
<tr>
<td>Bugojno</td>
<td>13</td>
<td>86</td>
<td>-73</td>
</tr>
<tr>
<td>Drvar</td>
<td>3</td>
<td>107</td>
<td>-104</td>
</tr>
</tbody>
</table>

Source: Author’s calculation
Beside generally turbulent transition process and specific industrial structure, one possible reason for the significant changes in GDP between municipalities if for sure the new administrative division of the country into two entities and ten cantons created as a result of the Dayton Peace Agreement. This new administrative division is dominantly based on ethnic principles and resulted in two almost completely separate economic spaces. Pre-aggression division of the country on four economic regions and local communities was completely ignored (Osmankovic and Pejanovic 2006). Number of municipalities has increased from 109 to 143 and the Brcko District. Many municipalities are divided according to ethnic criteria, and are mainly concentrated on the border between the two entities. For decades formed territorial structure is divided. Link between the municipal centre and its environment is broken. Some of the newly created municipalities were left without key infrastructure, without the traffic and other connections necessary for development. Other areas were left without jobs and population. According to Aganovic (1997: 80), due to disruption of previously established connections around 40% of development potential is lost.

Confirmation of the above thesis we get if the divided municipalities on the territory of Federation of Bosnia and Herzegovina are extracted and analyzed individually and as a separate group according to different indicators of economic development. The level of development of this group of municipalities in 2010, measured by gross domestic product per capita, was significantly lower than the average of the Federation of BIH. We get a similar picture if we analyse other development indicators (such as unemployment rate, etc.) for this group of municipalities.

Conclusions

This paper has reviewed a number of methods and instruments developed for the analysis of economic and/or social inequalities and that can be used for examining disparities among local government units. One objective of the paper was to assess the convergence process among BIH municipalities using some of these instruments. Another was to show that used instruments can vary in terms of their specificities and qualities and that it is therefore important to be aware of their limits when measuring the extent and evolution of disparities.

More specifically, it has been stressed that while summary measures may be particularly convenient for synthesising complex information, they remain blind to a number of aspects that can be critical when it comes to assessing convergence. In our case, although the summary measures (such as the coefficient of variation and Gini coefficient) were not offered evidence of the convergence process, analyzing the distribution using histograms and cumulative frequency, we found that the results are actually mixed. The justification for these findings, we found in drastic changes in GDP per capita between municipalities. In the case of Bosnia and Herzegovina, one
of the causes of this situation, in addition to generally turbulent transition process and specific industrial structure of individual municipalities, certainly lies in new administrative division of the country as a result of the Dayton Peace Agreement. It is dominantly based on ethnic principles and resulted in two almost completely separate economic spaces. As a result, significant part of development potential is lost. Special problem we found in a group of divided municipalities. Existing territorial organization could be subject to further analysis in the context of competitiveness, sustainability, absorptive capacities and capabilities of local communities to deal with the crisis.

References