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Bulgaria in the EU Cohesion Process

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Summary:

Cohesion is a precondition for implementing a number of important EU internal and external policies, such as functioning of the single market, the Eurozone, Common commercial policy, Environmental policy, etc. Therefore, achieving stronger cohesion is one of the main tasks of the European institutions. But in order to assess the development of the EU cohesion process and thereof the effectiveness of the ongoing cohesion policy, it is necessary to introduce and assess the results of certain cohesion indicators. The article includes nine such indicators: GDP per capita; Research and development expenditure as percentage of GDP; High-tech exports as percentage of total exports; People at risk of poverty or social exclusion; the Gini Coefficient; Life expectancy at birth; Density of motorway network; Share of trains in total inland passenger transport; Population connected to wastewater collection and treatment system. By using the Mean Absolute Deviation (MAD), the study establishes that in the decade of 2004-2014 there was enhanced cohesion in the EU in 8 out of the 9 indicators used. Based on comparison between Bulgaria's individual results and those of the EU as a whole, it concludes that Bulgaria has not yet been able to get fully included in the cohesion process: 7 out of the total 9 cohesion indicators are lower than the average for the EU indicators.

Key words: cohesion policy, cohesion indicators, European Union, Bulgaria

JEL Classification: F15, F36, F42, H77

1. Introduction

The EU cohesion is realized in three different dimensions. They are mentioned in Article 3 of the Treaty on European Union where we can read that the union "…shall promote economic, social and territorial cohesion, and solidarity among Member States."[1] The indicators used in this article address all three of the above-mentioned cohesion dimensions.

The importance of cohesion in order to pursue the EU policies can be seen in table 1.

Bearing in mind the great significance of cohesion for the implementation of the EU policies, the author attempts in this article to measure cohesion in the EU on national level and also to measure

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[1] European Commission (2012). Consolidated Version of the Treaty on European Union, Official Journal of the European Union, 26.10.2012, C326/17, 26.10.2012.

Table 1. Cohesion impact on different EU policies

Cohesion type	Impacts	Affected EU policies
Economic	Lower costs to comply with uniform standards and minimum safety requirements	Single market, Environment policy, Competition policy, Common agricultural policy, Common transport policy
	Greater convergence of the economic cycle	Eurozone[2]
	Greater similarity in export specialization	Customs union, Common commercial policy, Development policy
	Better energy efficiency	Common energy policy, Climate change policy, Environment policy, Common foreign policy, Development policy
Social	Convergence of national social models and gradual establishment of a single EU social model	Social policy, Education policy, Health care policy, Fiscal policy, Eurozone
	Bridging the gap between Western and Eastern Europe	Common foreign policy, Common security and defense policy, Neighborhood policy, Development policy, Single area of freedom, security and justice
Territorial	Lower logistic and transport costs	Single market, Tourism, Customs union, Common commercial policy
	Lower costs for transmission of electricity and natural gas	Common energy policy, Climate change policy, Common foreign policy, Neighborhood policy
	Better internet and communications	Single market, Single information area, Education policy, Innovation policy
	Lower investment costs	Industrial policy, Single market, Fiscal policy, Eurozone, Innovation policy

Bulgaria's progress in the EU cohesion process.[3]

2. Review of Literature

Concerning the progress toward the achievement of the Europa 2020 Strategic Goals Rappai (2015) states that although Eurostat annually publishes the values of a number of indicators on both national and cross-national levels, not many studies have been conducted on the methodology of how the progress can be quantified[4]. Therefore, he decides to construct a quite sophisticated complex index to measure the progress both on national and on regional level. Although the complex Rappai index contributes

[2] See Baldwin, R., Wyplosz, Ch. (2009) The Economics of European Integration, 3rd Edition, London: McGraw-Hill, pp. 326-331 about the relationship between homogeneity (strong cohesion) of the Eurozone and the capabilities to pursue single monetary policy.

[3] It is important to stress that cohesion is recognized as a significant factor for growth and sustainability not only on regional, national and supranational level (the EU), but also on global level – see: OECD. (2011). Perspectives on Global Development 2012: Social Cohesion in a Shifting World. OECD, Paris, p. 17.

[4] Rappai, G. (2015). Europe En Route to 2020: A New Way of Evaluating the Overall Fulfillment of the Europe 2020 Strategic Goals, Social Indicators Research, 129(1), pp. 77-93.

towards assessing the implementation results of the EU 2020 Strategic Goals, the cohesion (approximation) among the Member States is in fact not measured.

Pasimeni (2013)[5] makes a successful attempt to decrease the negative impact of heterogeneity which exists with regard to the indicators under examination and creates three complex indexes for each of the examined spheres of activity in the Europa 2020 strategy. These indexes he indicates as: Smart Growth Index, the Sustainable Growth Index and the Inclusive Growth Index. By calculating the geometric average of these three indices he constructs the so-called Europe 2020 Index. The Pasimeni index has the same purpose as the index of Rappai, showing the progress towards the objectives of the Europa 2020 strategy, but not the rate of approximation of regions or Member States. Nevertheless, we can state that the Smart Growth Index shows to a certain extent the progress in the field of economic cohesion, the Sustainable Growth Index in territorial cohesion and Inclusive Growth Index in social cohesion. But this does not take place at national level, only at regional level.

Çolak and Ege (2013) put emphasis on measuring the differences in achieving the objectives of "Europa 2020 strategy". That is why this model also gives some information with regard to the development of the cohesion process in the EU, although it does not affect some of its significant dimensions. Moreover, the analysis of these authors is also only at regional level.[6] Bal-Domańska, Sobczak (2016), analyse the relationship between the implementation of the smart growth indicators in the Europa 2020 strategy and the growth in the GDP per capita of the population in the regions receiving assistance.[7] Mohl (2016) makes extensive research on the macroeconomic effects of the EU Cohesion policy. His attention is focused on measuring the effectiveness of the policy[8]. His findings indicate that EU Cohesion Policy has some positive impact on economic growth in the poorest regions but not evidence can be given that EU funds significantly increase public investment, which is a very important precondition for sustainable growth.

On behalf of the European commission Jerzy Pieńkowski and Peter Berkowitz (2015) analyse most of the existing models on measuring the impact of the cohesion policy (a total of 22 models). All these models, however, are on regional level. After identifying the progress made in analytical methods, they rightly noted some shortcomings that should be addressed in future. These include the limited scope of the studied regions which are found mainly in the old Member States; lack of analyses that show the effects of individual Member States, and in particular for newly Member States, which receive the bulk of the resources of cohesion funds. In addition, the models analyzed by them are concentrated on the impact of cohesion measures on increasing the GDP per capita, which is not the only indication for the availability or lack of cohesion. As a substantial disadvantage, the two authors point out the use of "very technical language" which hinders interpretation and use of models in taking political decisions.[9]

[5] Pasimeni, P. (2013). The Europe 2020 index. Social Indicators Research, 110(3), pp. 613–635.

[6] Çolak, M. S., & Ege, A. (2013). An assessment of EU 2020 strategy: Too far to reach? Social Indicators Research, 110(3), pp. 659–680.

[7] Bal-Domańska, B., Sobczak, E., (2016), On the Relationships between Smart Growth and Cohesion Indicators in the EU Countries. Statistics in Transition, Vol. 17, No. 2, Wrozlaw, pp. 249-264.

[8] Mohl, Ph. (2016) Empirical Evidence on the Macroeconomic Effects of EU Cohesion Policy, Springer Gabler, pp. 12-16.

[9] Pieńkowski, J., Berkowitz, P. Econometric assessments of Cohesion Policy growth effects: How to make them more relevant for policy makers?, Regional Working Paper 2015, European Commission, WP 02/2015, Brussels, 2015, p. 12

The only econometric model which uses the EU Cohesion policy on national level is the model Tomova, M., et al. (2013). But it has a limited task "to test empirically the link between the soundness of national fiscal and economic policies and the achievement of the European Union objectives regarding socio-economic development"[10]. To this intent an index was constructed based on several indicators on infrastructure, health, education, employment opportunities, environmental sustainability and welfare. Then the authors compared the volume of the cohesion expenditure and progress with regard to their constructed index. This approach indicates the effectiveness of the used funds, but does not analyze the cohesion state in itself (convergence or divergence).

3. Methodology

The first step is to select the most suitable indicators for measuring the EU cohesion. It is important to bear in mind that for this study the cohesion indicators have to be measured at national and not at regional level and have to include the three dimensions of EU cohesion - economic, social and territorial. Then based on these selected cohesion indicators, we have to establish how far the EU has gone into the cohesion process and what the dynamics in this process has been over the last decade. The third step is to compare the development of the cohesion process as a median value for the EU and of Bulgaria, as an individual achievement.

The most synthesized cohesion indicator at national level is without doubt the *GDP per capita* indicator. The more similar the results of different Member States are, the stronger the cohesion is, and vice versa, the greater the deviations are from the average, the weaker the cohesion is. That is why we can use the mean average deviation formula.

$$MAD = \frac{1}{n}\sum_{i=1}^{n}[x_i - \mu]$$

*where: **n** = 28 (the number of EU Member States), x_i is the GDP per capita in the member state **i**, while is the mean size of GDP per capita in the EU.*

The *GDP per capita indicator* is very important, however, it is not sufficient to measure the cohesion and we have to go in details in order to find out different factors that determine the state of the cohesion. Eurostat uses 26 so-called cohesion indicators, grouped in 4 groups: Smart growth, Sustainable growth, Inclusive growth and Context.[11] These indicators, however, cannot be directly applied in the current research, because on the one hand, they are too many in number and there is no sufficient updated statistical data on all of them. On the other hand, these indicators are at regional and not at national level. Moreover, these Eurostat indicators are selected in such a way as to be in compliance with the objectives of the Europe 2020 strategy[12]. Thus they serve primarily to assess the achievements in implementing this strategy which do not fully coincide with the achievements of the three dimensions of the EU cohesion – economic, social and territorial. That is why for the purpose of this study are used only 4 of the indicated indicators of Eurostat,[13] and the remainder is selected by the author.

[10] Tomova, M. et al., (2013) EU Governance and EU Funds – Testing the Effectiveness of EU Funds in a Sound Macroeconomic Framework, European Commission, DG ECFIN, European Economy, Economic Papers No 510, 2013, Brussels, p. 7.

[11] See: Eurostat (2016) Cohesion Indicators, http://ec.europa.eu/eurostat/web/cohesion-policy-indicators/cohesion-indicators.

[12] European Commission, (2010) Europa 2020: A Strategy for Smart, Sustainable and Inclusive Growth, COM(2010) 2020 final, Brussels.

[13] These are: “Research and development expenditure as % of GDP”; People at risk of poverty or social exclusion (Percentage of total population); “Life expectancy at birth” and “Population connected to wastewater collection and treatment system”.

In the field of economic cohesion, we can, for example, successfully use as indicators: *High-tech exports as % of total exports* and *Research and development expenditure as % of GDP*. Both indicators reflect well the structure of the respective economy and the more a given member state is closer to the average EU indicators, the closer it is to the average structure of the EU economy. Correspondingly, the sum of the differences is an indicator of the state of the economic cohesion. The smaller this sum is (MAD), the greater the economic cohesion is.

With regard to social cohesion, both the distribution of the gross domestic product and the provision of the population with basic services are of importance. A key aspect in social cohesion is the social homogeneity within a community i.e. how fair the distribution of income is and what the conditions are in order to include all segments of society in social life.[14] To this end, three social indicators can be used: Gini coefficient[15], *People at risk of poverty or social exclusion (Percentage of total population*)[16] and *Life expectancy at birth*[17] As is the case in measuring economic cohesion, social cohesion as well is reversely proportional to MAD, i.e. the greater the total deviation is, the less the cohesion is and vice versa, the more the deviation decreases, the greater the cohesion is.

With regard to territorial cohesion, applying the same method, we can use the following indicators: *Density of motorway network (km per 1000 sq. km per area*); *Modal split of passenger transport - percentage share of trains in % in total inland passenger-km* and *Population connected to wastewater collection and treatment system*. The latter indicator characterizes well the rate of similarity (or the extent of differences) in the environmental infrastructure and respectively has strong relevance towards both the territorial and social cohesion.

After we have examined the changes in EU cohesion as a whole, we shall compare the average results of all Member States and those of Bulgaria. Thus we will be able to make some conclusions and recommendations affecting not only some common phenomena in the EU, but also Bulgaria's specific place in the cohesion process.

4. Findings

Firstly, we will examine the synthesized cohesion indicator of the GDP per capita and establish MAD (in percentage points) in 2004 and in 2015, i.e. at the moment of the Eastern enlargement of the EU and eleven years later.

As we can see in table 2, in 2004, MAD was 33.1 – indicating a rather weak cohesion. Ten years later in 2015, we have a result of 26.4, indicating an increase in cohesion.

[14] The concept "social cohesion" emerged in the 20th century. It is a force that unites (keeps together) the social groups in society, regardless of ethnic, racial or gender differences. See: Stanley, D., (2003), What Do We Know about Social Cohesion: The Research Perspective of the Federal Government's Social Cohesion Research Network. The Canadian Journal of Sociology, Vol. 28, No. 1, Special Issue on Social Cohesion in Canada (Winter, 2003), Montréal, pp. 5-17 and Chan. J., Chan. E., To, H.-P. (2006). Reconsidering Social Cohesion, Developing a Definition and Analytical Framework for Empirical Research. Social Indicators Research, Vol. 75, No.2 273-302.

[15] The Gini coefficient is defined as the relationship of cumulative shares of the population arranged according to the level of equalized disposable income, to the cumulative share of the equalized total disposable income received by them. For more information see: http://ec.europa.eu/eurostat/.

[16] This indicator corresponds to the sum of persons who are: at risk of poverty or severely materially deprived or living in households with very low work intensity. For more information see: http://ec.europa.eu/eurostat/.

[17] See also http://ec.europa.eu/eurostat/.

Table 2. Deviation in GDP per capita (as % of EU average)

	2004			2015		
	Xi	Xi - μ	[Xi - μ]	Xi	Xi - μ	[Xi - μ]
EU	100.0			100		
Belgium	121.0	21.0	21.0	119.0	19.0	19.0
Bulgaria	34.0	-66.0	66.0	47.0	-53.0	53.0
Czech Republic	78.0	-22.0	22.0	87.0	-13.0	13.0
Denmark	124.0	24.0	24.0	127.0	27.0	27.0
Germany	120.0	20.0	20.0	124.0	24.0	24.0
Estonia	54.0	-46.0	46.0	75.0	-25.0	25.0
Ireland	145.0	45.0	45.0	137.0	37.0	-37.0
Greece	96.0	-4.0	4.0	68.0	-32.0	32.0
Spain	98.0	-2.0	-2.0	90.0	-10.0	10.0
France	110.0	10.0	10.0	106.0	6.0	6.0
Croatia	55.0	-45.0	45.0	58.0	-42.0	42.0
Italy	110.0	10.0	10.0	96.0	-4.0	4.0
Cyprus	97.0	-3.0	3.0	82.0	-18.0	18.0
Latvia	46.0	-54.0	54.0	64.0	-36.0	36.0
Lithuania	49.0	-51.0	51.0	75.0	-25.0	25.0
Luxembourg	238.0	138.0	138.0	264.0	164.0	164.0
Hungary	61.0	-39.0	39.0	68.0	-32.0	32.0
Malta	80.0	-20.0	20.0	88.0	-12.0	12.0
Netherlands	133.0	33.0	33.0	128.0	28.0	28.0
Austria	126.0	26.0	26.0	128.0	28.0	28.0
Poland	50.0	-50.0	50.0	69.0	-31.0	31.0
Portugal	81.0	-19.0	19.0	77.0	-23.0	23.0
Romania	34.0	-66.0	66.0	57.0	-43,0	43,0
Slovenia	88,0	-12,0	12,0	83,0	-17,0	17,0
Slovakia	57,0	-43,0	43,0	77,0	-23,0	23,0
Finland	117,0	17,0	17,0	109.0	9.0	9.0
Sweden	126.0	26.0	26.0	124.0	24.0	24.0
UK	119.0	19.0	19.0	108.0	8.0	8.0
		MAD 2004	**33.1**		**MAD 2015**	**26.4**

*Note: * xi is the GDP per capita in the member state i in percent of the average GDP*
*** xi – μ is the deviation of the individual result to the mean size of the GDP per capita in the EU (μ)*
**** [xi - μ] is the absolute size of the deviation.*
Source: Estimated by the author on figures from Eurostat

Additional information about the pace of convergence of GDP per capita in Bulgaria and the EU average is given in the figure below:

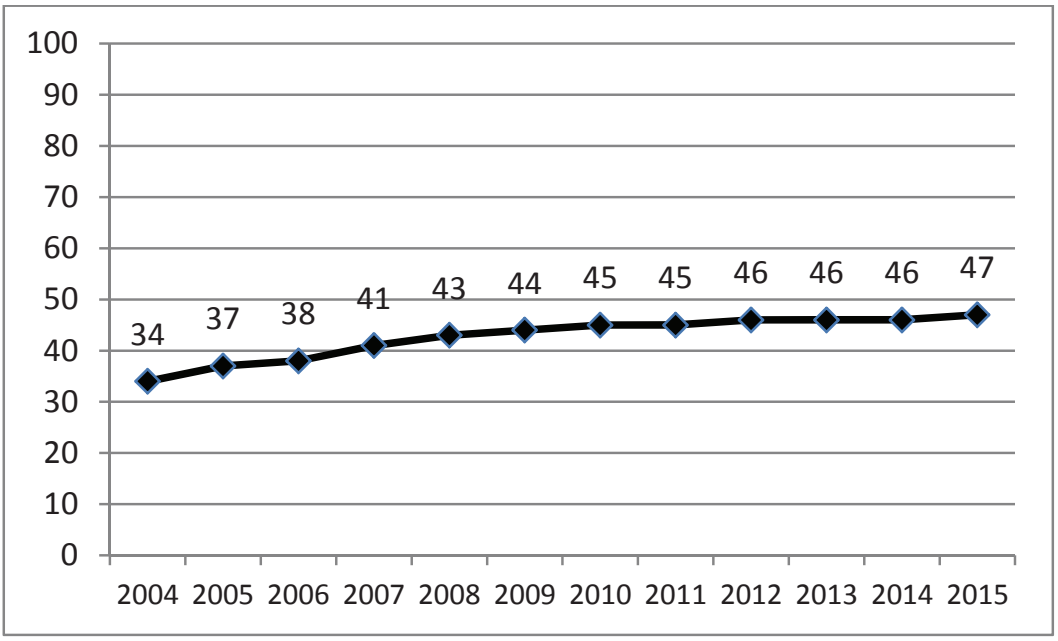

Fig. 1 Dynamics of GDP per capita in Bulgaria as percentage of EU average (EU = 100)
Source: Estimated by the author on figures from Eurostat

An indicator which reflects well the structure of the economy in the different Member States and is useful in determining the economic cohesion is *R&D expenditure as % of GDP*. In this indicator, the dynamics of MAD is shown in table 3.

With regard to the *High-tech exports as % of total exports* indicator the results obtained in the same way as those indicated in the above table are as follows. In 2007, MAD was equal to 51.0 percentage points, and in 2014 it was 38.8 points.

In social cohesion, the following results were established: With regard to the *People at risk of poverty or social exclusion as % of GDP* indicator: Mean Absolute Deviation (MAD) in 2007 = 28.4 percentage points and in 2014 was equal to 23.7 percentage points. This shows that in this important indicator for measuring EU social cohesion, deviations have gone down, i.e. we have increase in cohesion. At the same time, it can be pointed out that during that period in 17 of a total of 27 Member States we have a growth in the share of people at risk of poverty or social exclusion as % of GDP and only in 10 a decrease of this share, which shows that the problem of poverty has not been resolved. Progress is mainly due to the decrease in the index of most of the New Member States: Bulgaria, Romania, Poland, Slovakia, etc.

As regards the Gini Coefficient, the situation is improving. While in 2007 MAD was equal to 12.7 percentage points, in 2014, it went down to 11.1 percentage points. This speaks about a certain improvement of social cohesion in the EU and also in terms of disparities in income distribution within the different Member States.

With the third indicator of the level of social cohesion – *Life expectancy at birth (total for the whole population*), the situation again is similar to the results obtained for the other two

Table 3. Deviation by Member States in research and development expenditure as % of GDP (compared to EU average)

	2004				2014			
		x_i*	$x_i - \mu$**	$[x_i - \mu]$		x_i*	$x_i - \mu$**	$[x_i - \mu]$
EU (28)	1.76				2.03			
Belgium	1.81	102.8	2.8	2.8	2.46	121.2	21.2	21.2
Bulgaria	0.47	26.7	-73.3	73.3	0.80	39.4	-60.6	60.6
Czech Republic	1.15	65.3	-34.7	34.7	2.00	98.5	-1.5	1.5
Denmark	2.42	137.5	37.5	37.5	3.05	150.2	50.2	50.2
Germany	2.42	137.5	37.5	37.5	3.05	150.2	50.2	50.2
Estonia	0.85	48.3	-51.7	51.7	2.87	141.4	41.4	41.4
Ireland	1.18	67.0	-33.0	33.0	1.52	74.9	-25.1	25.1
Greece	0.53	30.1	-69.9	69.9	0.84	41.4	-58.6	58.6
Spain	1.04	59.1	-40.9	40.9	1.23	60.6	-39.4	39.4
France	2.09	118.8	18.8	18.8	2.26	111.3	11.3	11.3
Croatia	1.03	58.5	-41.5	41.5	0.79	38.9	-61.1	61.1
Italy	1.05	59.7	-40.3	40.3	1.29	63.5	-36.5	36.5
Cyprus	0.34	19.3	-80.7	80.7	0.48	23.6	-76.4	76.4
Latvia	0.40	22.7	-77.3	77.3	0.69	34.0	-66.0	66.0
Lithuania	0.75	42.6	-57.4	57.4	1.01	49.8	-50.2	50.2
Luxembourg	1.62	92.0	-8.0	8.0	1.26	62.1	-37.9	37.9
Hungary	0.86	48.9	-51.1	51.1	1.37	67.5	-32.5	32.5
Malta	0.49	27.8	-72.2	72.2	0.83	40.9	-59.1	59.1
Netherlands	1.81	102.8	2.8	2.8	1.97	97.0	-3.0	3.0
Austria	2.17	123.3	23.3	23.3	2.99	147.3	47.3	47.3
Poland	0.56	31.8	-68.2	68.2	0.94	46.3	-53.7	53.7
Portugal	0.73	41.5	-58.5	58.5	1.29	63.5	-36.5	36.5
Romania	0.38	21.6	-78.4	78.4	0.38	18.7	-81.3	81.3
Slovenia	1.37	77.8	-22.2	22.2	2.39	117.7	17.7	17.7
Slovakia	0.50	28.4	-71.6	71.6	0.89	43.8	-56.2	56.2
Finland	3.31	188.1	88.1	88.1	3.17	156.2	56.2	56.2
Sweden	3.39	192.6	92.6	92.6	3.16	155.7	55.7	55.7
UK	1.61	91.5	-8.5	8.5	1.70	83.7	-16.3	16.3
MAD_{2004}				47.3	MAD_{2014}			42.4

*Note: * xi is the GDP per capita in the member state i in percent of the average GDP*
*** xi – μ is the deviation of the individual result to the mean size of the GDP per capita in the EU (μ)*
**** [xi - μ] is the absolute size of the deviation.*
Source: Estimated by the author on figures from Eurostat

indicators of this group: MAD decreases from 3.3 percentage points in 2007 to 2.8 in 2014. As a whole, it can be said that with regard to this indicator there has been the greatest approximation of Member States' results which shows that medical and related to them social services are at a high level, typical of the developed economies. Nevertheless, some substantial differences have remained been the economically developed countries and the less developed ones. Differences in life expectancy between Bulgaria and Romania, on the one hand, and counties such as Spain, Italy, and Finland remain as much as 8-9 years.[18]

In territorial cohesion, the situation is as follows: Based on Eurostat data and other sources[19] it can be seen that with regard to the indicator *Density of motorway network (km per 1000 sq. km per area)*, there has been a decrease in disparities, with MAD for this indicator being 94.6 points in 2014, and falling to 75.1 points in 2014.

As for the *Share (%) of railway transport (trains) in total inland passenger transport (passenger-km*) indicator, the situation however is different: in 2004 MAD was 37.1 percentage points, and ten years later, in 2014 it was 38.0 points. This slight increase in MAD shows a certain decrease in territorial cohesion for this indicator. If we look deeper at the results (see table 4) we will find that disparities could have been greater if there had not been a substantial decrease of the share of railway transport for passengers in some of the Member States that lag behind economically, such as Poland, Romania, Hungary and the Baltic republics. This negative trend in the mentioned Member States neutralizes the rise in the share of the more advanced ones such as the Scandinavian Member States, Austria, and the UK. The opposing trends in these groups of countries to a certain extent neutralize themselves and are due to the increasing technological gap between the railway transport in the developed part of the EU and the part that lags behind economically. That is why, it can be expected that when this compensatory moment disappears and if the technological disparities remain, MAD in the field of the railway transport will start to increase even more.

Table 4. Deviation by Member States in share (%) of railway transport (trains) in total inland passenger transport (passenger-km) (compared to EU average)

	2004				2014			
		x_i*	$x_i - \mu$**	$[x_i - \mu]$		x_i*	$x_i - \mu$**	$[x_i - \mu]$
EU (26)	6.8				7.6			
Belgium	7.1	104.4	4.4	4.4	7.7	101.3	1.3	1.3
Bulgaria	5.1	75.0	-25.0	25.0	2.5	32.9	-67.1	67.1
Czech Republic	7.5	110.3	10.3	10.3	8.4	110.5	10.5	10.5
Denmark	9.3	136.8	36.8	36.8	10.1	132.9	32.9	32.9
Germany	7.5	110.3	10.3	10.3	8.5	111.8	11.8	11.8
Estonia	1.8	26.5	-73.5	73.5	1.9	25.0	-75.0	75.0
Ireland	3.0	44.1	-55.9	55.9	2.9	38.2	-61.8	61.8
Greece	1.6	23.5	-76.5	76.5	0.9	11.8	-88.2	88.2
Spain	5.0	73.5	-26.5	26.5	6.5	85.5	-14.5	14.5
France	8.7	127.9	27.9	27.9	9.3	122.4	22.4	22.4

[18] http://ec.europa.eu/eurostat

[19] http://www.nationmaster.com/country-info/stats/Transport/Road/Motorway-length

Croatia	4.2	61.8	-38.2	38.2	3.0	39.5	-60.5	60.5
Italy	5.5	80.9	-19.1	19.1	6.3	82.9	-17.1	17.1
Latvia	5.4	79.4	-20.6	20.6	4.1	53.9	-46.1	46.1
Lithuania	1.5	22.1	-77.9	77.9	1.0	13.2	-86.8	86.8
Luxembourg	3.6	52.9	-47.1	47.1	4.3	56.6	-43.4	43.4
Hungary	13.4	197.1	97.1	97.1	9.9	130.3	30.3	30.3
Netherlands	8.4	123.5	23.5	23.5	9.7	127.6	27.6	27.6
Austria	9.4	138.2	38.2	38.2	12.1	159.2	59.2	59.2
Poland	8.5	125.0	25.0	25.0	5.8	76.3	-23.7	23.7
Portugal	3.8	55.9	-44.1	44.1	4.2	55.3	-44.7	44.7
Romania	11.4	167.6	67.6	67.6	4.8	63.2	-36.8	36.8
Slovenia	2.7	39.7	-60.3	60.3	2.1	27.6	-72.4	72.4
Slovakia	6.0	88.2	-11.8	11.8	7.3	96.1	-3.9	3.9
Finland	4.7	69.1	-30.9	30.9	5.0	65.8	-34.2	34.2
Sweden	7.5	110.3	10.3	10.3	8.9	117.1	17.1	17.1
UK	5.7	83.8	-16.2	16.2	8.5	111.8	11.8	11.8
			MAD $_{2004}$	37.1			MAD $_{2014}$	38.0

*Note: * xi is the GDP per capita in the member state i in percent of the average GDP*
*** xi – μ is the deviation of the individual result to the mean size of the GDP per capita in the EU (μ)*
**** [xi - μ] is the absolute size of the deviation.*
Source: Estimated by the author on figures from Eurostat

As a third indicator, characterizing similarities (disparities) in the infrastructure we can use the *Population connected to wastewater collection and treatment system* indicator. This indicator characterizes well the degree of similarity (or disparities) in the ecological infrastructure and it also affects social cohesion. The table below shows that in 2007, MAD was 49.7 percentage points and went down to 33.3 points in 2014.

Generalized dynamics of MAD by individual cohesion indicators is shown in table 5.

Comparison between the average indicators for the EU (MAD) and the individual cohesion indicators for Bulgaria by the above-mentioned indicators is shown in table 6.

5. Conclusions and recommendations

Overall EU cohesion is increasing. This can be seen from data on deviation in GDP per capita presented in table 2. This result is confirmed by the results in table 5, where cohesion is examined in its three dimensions – economic, social and territorial. The EU Cohesion process has developed despite the crisis in 2008-2009. As we can see in table 5, in all selected cohesion indicators, except *Share of trains in total inland passenger transport*, there is decrease in MAD, which comes to suggest that there is increase in cohesion.[20] Nevertheless, the differences between the Member States

[20] TThese data do not correspond to the rather pessimistic picture, presented in the analysis of Stratfor (Stratfor (2015). The Controversial EU Cohesion Policy Falls Short, https://www.stratfor.com/analysis/controversial-eu-cohesion-policy-falls-short

Table 5. EU MAD dynamics in selected cohesion indicatorstors

Indicator	Initial result		Final result	
	Year	MAD	Year	MAD
GDP per capita	2004	33.1	2015	26.4
Research and development expenditure as % of GDP	2004	47.3	2014	42.4
High-tech exports as % of total exports	2007	51.0	2014	38.8
People at risk of poverty or social exclusion (EU 27)	2007	28.4	2014	23.7
Gini Coefficient (EU 27)	2007	12.7	2014	11.1
Life expectancy at birth	2007	3.3	2014	2.8
Density of motorway network	2002	94.6	2014	75.1
Share of trains in total inland passenger transport	2004	37.1	2014	38.0
Population connected to wastewater collection and treatment system	2007	49.7	2014	33.3

Source: Estimated by the author

Table 6. Comparison of EU MAD dynamics and Bulgaria approximation dynamics in chosen cohesion indicators

Indicator	**Period**		**Change in deviation (%)**	
	Initial result	Final result	EU MAD	BG to EU average
GDP per capita	2004	2015	-20	-19
Research and development expenditure as % of GDP	2004	2014	-10	-17
High-tech exports as % of total exports	2004	2014	-24	-8
People at risk of poverty or social exclusion (EU 27)	2007	2014	-16	-56
Gini Coefficient (EU 27)	2007	2014	-12	+5
Life expectancy at birth	2007	2014	-14	+2
Density of motorway network	2002	2014	-21	-14
Share of trains in total inland passenger transport	2004	2014	+3	+268
Population connected to wastewater collection and treatment system	2007	2014	-33	-17

Source: Estimated by the author

remain substantial. For example, if we look at the differences in GDP per capita, although MAD has decreased from 33.1 to 26.4, in the case of Bulgaria, extrapolating the 2004-2015 trend of approximation of about 3% per year, we can estimate that the country will need 53 years more to catch with the EU average. The recommendation could be – to preserve, and if possible to increase the priority assistance of the EU Member States that are economically lagging behind the EU average, by using cohesion financial instruments as differences continue to be substantial.

From the viewpoint of economic cohesion the EU has shown progress with regard to the *Research and development expenditure as % of GDP* index, as well as in the *High-tech exports as % of total exports* index. Bulgaria has made up for the differences in the average indicators for the EU along these cohesion indicators. The rate of convergence, however, is different. As we can see in table 6, it is more successful in R&D expenditure, while as regards high-tech exports, Bulgaria lags behind the average rate of convergence in the EU. What causes it? We can assume that the better result in R&D expenditures is due to the subsidies from the EU budget in the period 2007-2013 through the EU Competitiveness operational program. The growth in expenditures, however, has not yet shown the expected impact on the structure of revenues from research and development. Revenues from professional, scientific and technical activities in Bulgaria are 20% less than the average indicator for the EU. The recommendation should be to improve the effectiveness in the research and development expenditure. For this purpose, reporting could be done not by the rate of funds utilization but through the incoming revenues from implemented projects.

With respect to social cohesion, the EU has also made progress in the three indicators under examination. Comparing its progress with Bulgaria's progress (Table 6), it is evident that considerably better results than the EU average have been achieved in the *People at risk of poverty or social exclusion* indicator. However, this can hardly be the reason for complacency, bearing in mind that in 2014 the share of people at risk of poverty or social exclusion in Bulgaria remained extremely high - 40% of the total population. It is true that according to Eurostat in 2007, it was even as high as 60% and there is a trend towards the EU average value. However, this is not due to a sharp rise in income as it can be seen in the GDP per capita data. It is also not due to fairer income distribution as we can see from the Gini coefficient. It seems this is due to overcoming the initial absolute poverty, owing to having reached a basic level of provision, typical of the development of countries with emerging economies. This conclusion is also confirmed by the results of the indicator Life expectancy at birth, where Bulgaria is not in the general process of convergence. One of the recommendations would be to work more actively towards a single social model in the EU, which could decrease the large differences in the Gini coefficient. Another recommendation is during the following program period to pay greater attention to the social dimension of the EU cohesion process, particularly with respect to countries which are economically least developed, such as Bulgaria and particularly in the field of medicine.

With respect to territorial cohesion, the greatest disparities are by the *Density of motorway network* indicators. Hence a recommendation can be made for a more active use of cohesion funds to build a single EU motorway network. With regard to Bulgaria's results, it can be noted that as seen in Table 7 for the two *Density of motorway network* and Population connected to wastewater collection and treatment system indicators, convergence to the average EU indicators has been going on at a slower rate than the EU average, but on the whole satisfactory. However, the third indicator, *Share of trains in total*

inland passenger transport marks a serious situation. Not only is there no convergence, but conversely, Bulgaria's results indicate a divergence from the EU average. Bulgaria's railway network does not facilitate the development of speedy communications and this makes railway transport for passengers uncompetitive. This exposes the need to pay special attention to railway transport when developing EU's cohesion policy as regards Bulgaria.

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