REGIONAL DEVELOPMENT IN CENTRAL-EASTERN EUROPEAN COUNTRIES AT THE BEGINNING OF THE 21ST CENTURY: PATH DEPENDENCE AND EFFECTS OF EU COHESION POLICY

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Abstract: Cohesion Policy has provided new impulses for development in Central and Eastern European Countries (CEECs) that continue to be challenged by regional disparities. This paper investigates the effects of the European Union Cohesion Policy on regional development. After presenting historical development patterns of the investigated area and opportunities afforded by this policy, its effects on a variety of indicators are analysed for the period 2007–2014. The analysis allowed confirming positive effects of EU Cohesion Policy on the development of CEE regions. However, these effects differ across the investigated area. Moving forward, it will be crucial to develop institutions and policies characteristic to each region that are stable and efficient without external funds.

Key words: CEECs, convergence, EU Cohesion Policy, path dependence, regional development

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Introduction

Central and Eastern European Countries (CEECs) – according to the OECD glossary of statistical terms (2000) – is the group of countries comprising Albania, Bulgaria, Croatia, Czechia, Hungary, Poland, Romania, Slovakia, Slovenia and the three Baltic states: Estonia, Latvia and Lithuania. The macro-region went the hard economic way in the 20th century, suffering vast destructions from the First and Second World Wars and afterwards – located east of the Iron Curtain and dependent on the Soviet Union – operating ineffectively under centrally-planned economies. The turn of the previous and current centuries was a time of socio-economic transformation and integration with the European and global economy – in particular, with the European Union (EU). At that time, a new role was given to regional authorities that gained administrative and financial tools to pursue autonomous development policies. It brought many

opportunities, but also new challenges to the regions of CEECs.

The main aim of the paper is to explain the development patterns of CEE regions and to examine the effects of EU Cohesion Policy – the primary policy tool for regional development – on CEE regions. To do so, we use the path dependence concept to present the historical legacy of development in the region. We then look deeper at Cohesion Policy to analyse its impacts on CEE regions, investigating two hypotheses: (1) that Cohesion Policy provides an opportunity for CEE regions to break from their historical development paths and (2) that the impacts of Cohesion Policy on development potentials differ between CEE regions. The analysis is conducted on two levels, country and regional (NUTS II), utilising data from the 2007–2013 programming period of the European Union Cohesion Policy (the first full period in which CEECs took part). Therefore, we include the CEE countries covered by the abovementioned OECD definition excluding Albania and Croatia. Moreover, we frame the analysis with additional background historical data as well as information for the ongoing period of EU Cohesion Policy over the years 2014–2020.

Path dependence and the historical context of regional development in CEECs

The concept of path dependence is used to describe regional economic development trajectories, taking into account historical economic and political legacies. Rooted in the acknowledgement of historical contingency, path dependence is characterised as the existence of increasing returns, technological 'lock-in' and multiple equilibria resulting from historical decisions in economic production (Arthur 1994; David 1985, 2001). Moreover, path dependent processes are believed to shape regional innovation systems (Isaksen 2001; Tödtling, Trippl 2005), now considered to be the drivers of economic growth within endogenous growth or place-based development models.

In order to understand the historical basis of regional development in CEECs, it is useful to distinguish between the different types of regions in this heterogeneous group of countries.

Isaksen (2001) proposed three types describing the challenges to regional innovation systems: old industrial, fragmented and peripheral areas. Old industrial areas are those primarily affected by lock-in as the main barrier to innovation, thus becoming overspecialised in mature industries experiencing decline (Tödtling, Trippl 2005). The loss in competitive advantage, nevertheless, can also be felt in the peripheral (i.e. rural and remote) areas in terms of their relationships with the European and national cores, which are characterised by organisational thinness affecting institutional aspects such as knowledge infrastructure and absorption capacity (ibid.). In comparison, fragmented regions are associated with metropolitan areas, possibly with clusters, but lacking networks for innovation activities, cooperation and trust (ibid.; Isaksen 2001). Thus, hard and soft factors affect the regional development potentials in CEECs, which particularly relate to the economic and political dimensions of state socialism that serve today as the institutional legacies affecting regional development.

The old industrial and peripheral types are highly relevant in CEECs, where, on the one hand, industrial production based on over-investment in outdated technologies resulted in uncompetitive productive structures on the open market and, on the other hand, peripheral economies supported by non-market redistributive structures collapsed following the economic and political transition (Ehrlich 1991; Berend 2006; 2009; Lux 2009). In CEECs, the fragmented type of region has hardly been explored, but we can expect that through different processes of political and economic transition between countries, the institutional possibilities for cooperation and trust are highly variable between, for example, the most and least liberalised states.

CEECs are, for the most part, currently considered to be economically lagging in Europe (European Commission 2014), with many socialist-industrialised regions being associated with economic, social and environmental degradation (Lux 2009). Whereas some research has shown that state socialism led to higher cohesion in some respects compared to Western Europe (Noguera-Tur et al. 2009), regional polarisation has increased in CEECs since the 1990s despite more than two decades of economic growth and international convergence (Monastiriotis 2014).

Under the current EU Cohesion Policy regime, most CEE regions have been designated as convergence zones eligible for investment based on a relatively low GDP per capita (less than 75% of the EU average), with the common exception of capital regions. The aim of Cohesion Policy in these countries can be stated to reduce economic, social and territorial disparities appearing between the capital regions and the peripheries (European Commission 2014). An understanding of the historical processes leading to the relatively low economic development of CEECs within Europe is fundamental to the effective application of Cohesion Policy in hopes of further social, economic and territorial cohesion.

To address this, the concept of path dependence is used to frame regional development in CEE since early industrialisation, through the command economy of the socialist period, to the restoration of the market economy of the current era of capitalism and globalisation. Economic backwardness to the (north-western) European core has been the case since early conceptualisations of CEE, thus indicating the region's longstanding peripherality within Europe (Okey 1992; Kuus 2004). Nevertheless, the socialist period of rapid industrialisation can be considered a divergence from the longer term patterns of regional development from 19th century laissez-faire capitalism and continuing through catching-up processes of capitalism in the late 20th century.

The effect of the socialist period on regional development mainly entailed the transformation of agriculture- to industrial-based regional economies and widespread provision of social services. Socialist industrialisation was characterised by the social appropriation of the means of production and the planned, centralised economy administered by the government (Szczepański 1977). In terms of regional development, the socialist period can be divided into three parts that corresponded with (1) urban and industrial take-off, (2) deconcentrated industrial location and (3) the beginnings of post-industrialisation in the most developed regions (Enyedi 1990). These development trajectories resulted in old industrial regions and productive structures that could no longer be supported in the competitive economy, i.e. state-supported industry, in peripheral areas.

While rapid and heavy industrialisation has taken a toll on CEE regions, its impact on spatial structures may have been surprisingly weak. Development patterns continue to resemble the 19th century imperial legacies that transcend modern borders (e.g. Austro-Hungarian, Prussian and Russian empires in the territory of Poland). The perseverance of such patterns has been noted by researchers who saw more recent trends (i.e. regional polarisation) as a continuation of 19th century industrialisation (Illner, Andrle 1994). The longstanding gradient of decreasing development levels can still be seen as one moves eastwards across the region (European Commission 2014) and within individual countries such as Poland (Korcelli 1995; Czyż 2001; Stryjakiewicz 2009), across Czechia and Slovakia (Illner, Andrle 1994) and in Hungary (Horváth 1998). Moreover, rural areas in Czechia, the historical industrial core, have been found to be economically diversified, while the remainder of rural areas in CEECs are largely agrarian (Copus, Noguera 2010).

Estimates of GDP per capita and other proxies of development for the period 1820 to 2002 (Good, Ma 1999; Maddison 2003) showed that the early periods of socialism posted relatively high growth rates; however, these declined over the long term, partly due to slower technological advances. From 1900–1989, for example, Czechoslovakian and Hungarian per capita GDP growth rates of 1.8 and 1.6% per year, respectively, were lower than the advanced and middle income country average growth rates of 2.1 and 2.0% (Maddison 1991). Other comparisons of GDP per capita ranged from 21% of US levels in Romania to 27% in Poland, 30% in Bulgaria, 31% in Hungary, and 42% in Czechoslovakia in 1980, while the United Kingdom, France and Sweden were at approximately 58, 64 and 78% of US levels, respectively (Ehrlich 1991). The average development of European market economies in 1980 was still half that of the United States, and the CEE planned economies were developed to a comparable level with Southern Europe (ibid.).

By the fall of socialism, CEE regions were more industrialised but still lagging as they lacked innovation in technology and processes (Berend 2009; Chojnicki et al. 2009). Moreover, high specialisation between the countries of the Council for Mutual Economic Assistance led to overspecialisation and investment in obsolete technologies – a hallmark of 'old industrial'

regions – withering CEECs' competitiveness amidst globalisation. Berend (2009) has argued that the oil crises in the 1970s, representing the creeping globalisation in both East and West, manifested economic failure in most CEECs. The impact of industrial collapse had devastating effects for many regions that are characteristic of 'old industrial' regions, not only in CEECs but also in Western Europe (Lux 2009). Thus, while the forced industrialisation strategy during socialism produced many of the territorial problems faced in CEECs, socialist policies are not sufficient in themselves to explain the creation of 'old industrial' regions, which are also related to globalisation and widened spheres of competition. These movements revealed weaknesses in CEECs' industrial structures leading up to and following the collapse of socialism.

The transition period in CEECs concerned both political and economic reforms, re-establishing local (and regional, as the case may be) self-governments through comprehensive administrative reforms (Kaczmarek 2016) as well as the market economy. Thus, territorial decentralisation and municipal fragmentation became the norm, which was potentially detrimental to regional development due to lacking frameworks for regional planning and cooperation (Illner 1997; Swianiewicz 2010). The re-creation of the regional level became a pressing need for EU accession, which was approached with some variation across CEECs (Brusis 2002; Bruszt 2008). The countries generally underwent two stages of reforms, the first for re-establishing their democracies and the second for EU compliance and accession. These opened a new paradigm for regional development based on private sector actors with minimal public intervention, through new assistance from the EU by way of pre-accession instruments and, later, through EU Structural Funds including Cohesion Policy.

Cohesion Policy itself underwent its own transformations from a relatively welfare to competitiveness-based model, the so-called 'Lisbonisation', emphasising the place-based approach (Barca 2006; Barca et al. 2009; Farole et al. 2011; Mendez 2012). By the time of CEECs' accession, this policy shift would place many so-called 'backward' and uncompetitive regions in a position where the promise of regional development funds would in principle be tied to improving

economic competitiveness over social welfare and public services. This presents potential problems for CEE regions, in particular. Evaluations from the first full programming period, 2007–2013, showed lack-lustre performance (European Commission 2013), partly due to the effects of the financial crisis. Indeed, there remains striking variation in the competitiveness landscape across Europe, including within CEECs (Annoni, Dijkstra 2013), which continues to drive the debate on the objectives and effectiveness of Cohesion Policy (Avdikos, Chardas 2016). In the next sections, the overall impact of EU Cohesion Policy and the potential of the current programming period (2014–2020) are presented.

EU Cohesion Policy as an opportunity for CEECs

After switching regime in 1989, many CEECs targeted accession to the EU (Scherpereel 2010), and succeeded to become full members and beneficiaries of EU Cohesion Policy[1]. The main aim of Cohesion Policy is to foster growth and competitiveness of the EU through investments in development factors specific to each region. The name of the policy comes from targeting social, economic and territorial cohesion at the EU level in order to reduce disparities between EU countries and regions (European Commission 2014). In the targeted countries, Cohesion Policy is realised through the coordination of a range of financial instruments including the structural funds and specifically earmarked Cohesion Fund.

As many CEECs have benefitted from EU Cohesion Policy during the past 12 years, it is important to look at changes in economic growth that took place after they joined the EU. GDP per capita in purchasing power standard (PPS) increased both nominally and as percentage of the EU-28 average in almost all CEECs (Fig. 1 and 2). The highest relative increases were found in the Baltic states as well as in Poland, Romania and Slovakia, while countries that had the highest nominal levels in 2004 (Czechia and Slovenia)

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[1] Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia acceded to the EU in 2004, Bulgaria and Romania in 2007, and Croatia in 2013.
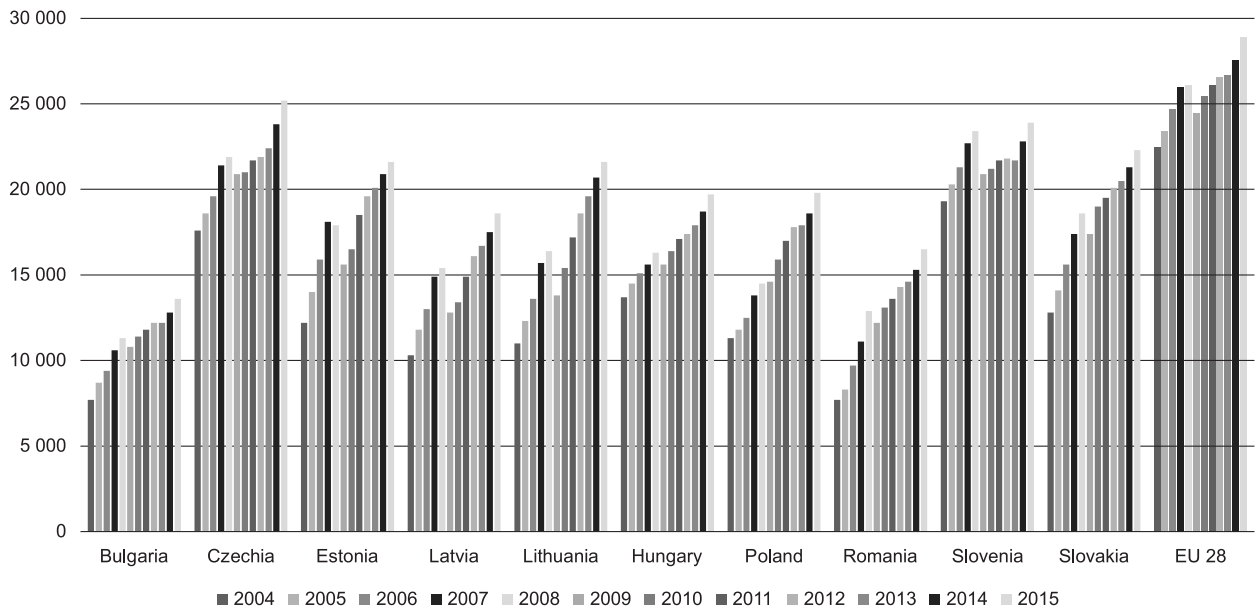
Fig. 1. GDP per capita in PPS in CEECs and in EU 28, 2004–2015.
Source: own calculations based on Eurostat (2017).

experienced smaller changes. The newer members, Bulgaria and Romania, still have the lowest values. Certainly, GDP per capita in PPS is only a general indicator of development, and there is a debate on the 'beyond GDP' indicators putting more emphasis on quality of life (Costanza et al. 2009). However, it is a basis for comparison in the EU, and it is believed that a higher indicator will lead to a generally higher welfare of people (Barca 2009).

Despite the above trends of national convergence, CEECs were still faced with one of the highest regional inequalities in the EU before entering the current programming period, 2014–2020. Therefore, in line with the thematic objectives of the Europe 2020 Strategy (European Commission 2010a), CEECs changed their Cohesion Policy driven regional strategies to focus on: sustainable development (e.g. Czechia, Lithuania, Slovakia, Poland); living conditions in rural areas (e.g.
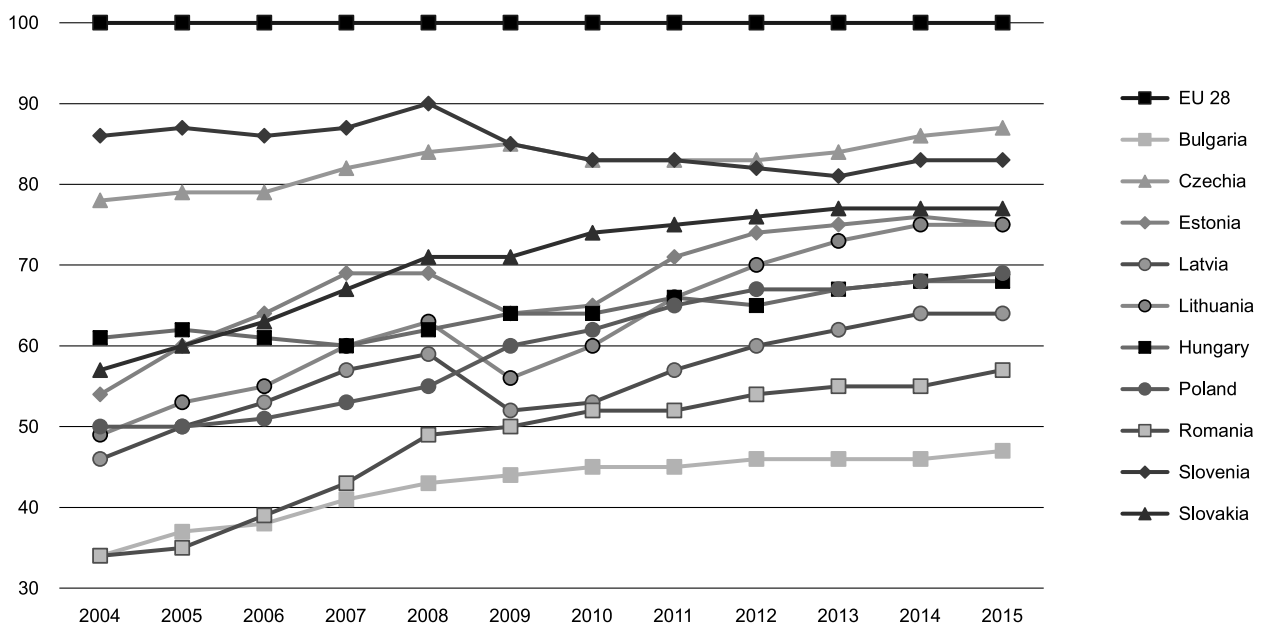

Fig. 2. GDP per capita in PPS in CEECs as percentage of the EU average, 2004–2015.
Source: calculation based on Eurostat (2017).

Table 1. The structure of Cohesion policy budget by thematic objectives in CEECs 2007–2013 (% from budget of Member States allocated to selected aims, based on annual implementation report 2013).

Thematic objectives/Member State	PL	HU	RO	CZ	SK	BG	LT	LV	SI	EE	CEECs
Transport, Energy & IT	47	36	26	37	37	30	36	33	29	23	38
Environment	10	17	24	11	13	26	15	16	24	22	15
Social issues	10	16	10	10	21	10	14	19	9	21	12
Innovation & RTD	14	6	6	17	11	5	14	15	19	19	12
Capacity building	3	4	18	4	4	12	4	3	3	2	6
Human capital	7	4	3	8	5	6	6	3	5	3	6
Other SME and business support	5	10	3	4	3	6	4	2	5	5	5
Culture, heritage and tourism	3	4	2	5	3	2	3	1	5	5	3
Urban and territorial dimension	2	3	8	4	3	3	5	8	1	0	3
Total (100%)	100	100	100	100	100	100	100	100	100	100	100
Total (in billion EUR)	63.9	28.6	23.6	21	11.8	7.4	6.7	4.3	4.3	3.3	174.9

Note. Some of the thematic objectives are aggregated:
Transport, Energy & IT = Rail + Road + Other transport + Energy + IT services and infrastructure
Social issues = Labour market + Social Inclusion + Social infrastructure
Source: own calculations based on European Commission (2017a).

Latvia, Lithuania, Slovakia); employment and polycentric development (e.g. Bulgaria, Estonia); and efficiency of public administration (e.g. Czechia, Latvia). Some countries chose to focus on improving urban regions, which contribute to national growth, and others on decreasing regional disparities (Davies et al. 2015)[2].

Regarding the thematic objectives of Cohesion Policy in the completed programming period of 2007–2013 (Table 1), it is possible to analyse CEECs' specific priorities believed to have had an impact on their regional development. Since the country size is emphasised within the allocation of the Cohesion Policy budget, Poland gained the highest amount among the CEECs, while Estonia, Latvia and Slovenia gained the smallest (in total numbers). Most of the countries prioritised thematic objectives like: *Transport, Energy & IT, Environment, Social issues and Innovation and R&D*. Less emphasis was placed on *Culture, heritage and tourism* as well as on *Urban and territorial dimension*.

The evaluation of the 2007–2013 programming period shows that, overall, one million jobs and one trillion euros additional GDP were created in the EU (European Commission 2013). There is room to increase efficiency, by increasing the possibilities to use financial instruments, and effectiveness, according to the specific intervention

logic, result indicators, project selection according to the programme, etc., in delivering the results (European Commission 2013, 2016).

The 2007–2013 programming period was not only about positive economic effects, albeit interrupted by the crisis. It was also a time of institutional learning, and the lessons nevertheless helped CEECs to prepare for the 2014–2020 period with fewer regional programmes and higher thematic concentration. Regarding the thematic objectives of Cohesion Policy in the 2014–2020 period (Table 2), we can see that the absolute amount of the Cohesion Policy budget for most of the countries has increased compared to the previous programming period, 2007–2013, and there are some changes in the order of the CEECs on the basis of the amount of budgets. The highest sums of money from the Cohesion Policy budget in CEECs during the 2014–2020 period is devoted to *Network Infrastructures in Transport, Energy & ICT, Climate & Environment* and *Education & Employment*. The shares of funds devoted to each sector differ between countries. It is not possible to compare the changes and relative shares of thematic objectives across countries and between the two programming periods because the programmes do not sufficiently correspond.

The strategic measures shown through the thematic objectives are supposed, in turn, to have an influence on the development patterns in particular countries and regions. However, as the shares of thematic objectives differ between the CEE countries, one can expect that

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[2] Further reading about regional policies – strategic objectives, funding, geographical focus, instruments and institutional frameworks – can be found in Davies et al. (2015).

Table 2. The structure (% from budget of Member State) of the Cohesion policy budget by thematic objectives in CEECs 2014-2020, based on finances planned).

Thematic objectives/Member state	PL	CZ	RO	HU	SK	HR	BG	LT	LV	EE	SI	CEECs
Network infrastructures in transport, energy & ICT	35	32	31	19	29	19	20	21	31	14	11	29
Climate & Environment	21	23	33	27	25	33	38	27	25	21	24	25
Education & Employment	13	14	14	22	12	13	12	20	14	19	17	14
Research & Innovation	11	14	4	10	17	8	7	10	11	22	15	11
Social inclusion	8	8	8	9	9	8	9	8	10	10	7	8
Competitiveness of SMEs	9	5	3	9	3	12	8	8	7	7	19	7
Technical assistance	3	3	3	1	4	4	4	3	2	3	4	3
Efficient public administration	0	1	3	3	2	2	3	2	0	3	2	2
Total (100%)	100	100	100	100	100	100	100	100	100	100	100	100
Total (billion EUR)	90.0	28.7	27.4	25.3	17.7	9.8	8.6	7.8	5.1	4.9	3.7	229.1

Note: Some of the thematic objectives are aggregated:
Climate & Environment = Climate Change Adaptation & Risk Prevention + Environment Protection & Resource Efficiency + Low-Carbon Economy,
Education & Employment = Educational & Vocational Training + Sustainable & Quality Employment,
Network Infrastructures in Transport and Energy & ICT = Network Infrastructures in Transport and Energy + Information & Communication Technologies.
Source: own calculations based on European Commission (2017b).

the development patterns should differ between the CEECs and their regions. In the next section, the links between EU Cohesion Policy performance and selected socio-economic indicators are analysed.

Methods for measuring the impact of EU Cohesion Policy on development in CEE regions

The analysis seeks to examine the impacts of the 2007–2013 programming period of EU Cohesion Policy on the development of CEE regions. On the one hand, the well-known n+3/n+2 rule allows drawing financial resources even after 2013 and it is a known fact that some effects of Cohesion Policy interventions lagged for years or even decades (Zdražil, Applová 2017), while on the other hand, the research is limited by a lack of recent regional data, as well as by the change in development interventions since the start of the next programming period, 2014–2020. Hence, we examine the period from which the data are available and that should not be biased by new interventions, i.e. 2007–2014[3]. The analysis focuses on the NUTS-II level of regions, since that is

the main level at which EU Cohesion Policy performs. Within the 10 CEECs under examination, we are therefore working with a sample of 53 NUTS-II regions[4].

The analysis consists of two parts. First, we focus on the disparity in economic performance of CEE regions and its dynamics, since this indicator holds an exclusive position within the evaluation of EU Cohesion Policy. We apply the conventional approach of measurement, so-called Beta-convergence, that is based on works of Baumol (1986), Barro and Sala-i-Martin (1992; 2004), Mankiw et al. (1992), and many others, which allows us to evaluate growth patterns simultaneously. The Beta-convergence approach is built on the assumption of the inverse relationship between the level of production and growth, while generally using estimations through various forms of linear, or linearised, regression models. Even though the Beta-convergence concept is rather adapted for a long turn, it is conventionally used even for examination of shorter

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[3] In fact, interventions covered by the 2014–2020 programming period did not start in CEE regions before 2015.

[4] The CEECs contain the following number of NUTS-II regions: Bulgaria, 6; Czechia, 8; Estonia, 1; Hungary, 7; Latvia, 1; Lithuania, 1; Poland, 16; Romania, 8; Slovenia, 1; Slovakia, 4. Even though Slovenia contains two NUTS-II regions, the source database of regional policy expenditures maintained by the European Commission Directorate-General for Regional Policy (DG REGIO)(2017) provides data only for the whole country, i.e. 1.

periods of EU Cohesion Policy (Pike et al. 2006). This analysis employs the general validation model as given by (1) (Barro, Sala-i-Martin 2004):

$$\frac{1}{t} \times \ln\left(\frac{Y_{i,t}}{Y_{i,0}}\right) = \alpha + \beta \times \ln(Y_{i,0}) + \varepsilon_i \qquad (1)$$

where ($Y_{i,0}$) and ($Y_{i,t}$) refer to the GDP per capita levels at the interval borders (i); constant term (α) and convergence coefficient (β) are the parameters to be estimated; and (ε_i) is the error term.

Another part of this analysis focuses on the connections between the expenditures of EU Cohesion Policy and the relevant socio-economic indicators to examine whether and how the interventions could impact development in CEE regions. Following endogenous growth theories (Romer 1986; Lucas 1988; Rebelo 1991) and principles of New Economic Geography (Krugman 1991), our endeavour is to examine traditional economic indicators like capital and labour, as well as 'modern' development indicators such as human capital, knowledge and innovation potential. In particular, we examine changes in selected development indicators in terms of expenditures of EU Cohesion Policy. Considering that one part of our analysis is based on results of the cluster analysis (see below), we examine only development indicators that we have found to be uncorrelated. The list of both selected and unselected indicators is captured in Table 3. The source data have been linked from datasets provided by DG REGIO (2017) and Eurostat (2017).

Since we seek to reveal whether there are universal or specific patterns in impacts of EU funding, we provide an intentional analysis of different groups of regions, classified by similarities in development over the examined period.

The groups of regions resulted from the k-means clustering procedure, which has been applied on standardised data of changes in selected development indicators (Table 3). The optimal number of clusters (three) has been determined empirically to obtain large enough and relatively balanced groups of the examined samples. This typology of similarly developing regions allow us to deduce possible differences in Cohesion Policy impacts on the actual forms of development. For tracking the connections between EU Cohesion Policy funds and selected development indicators, we employ the non-parametrical approach based on Spearman's rank-order correlation (ρ), which can be computed as (2):

$$\rho = 1 - \frac{6 \times \sum_{i=1}^{n}(r_i - s_i)^2}{n^3 - n} \qquad (2)$$

where (r_i) is the ranking position of the analysed region (i) within the first variable, (s_i) is that within the second variable and (n) refer to the number of observations.

Finally, we found the development of some regions to be far different. Hence, we identified and eliminated outliers to increase the accuracy of results and decrease the probability of errors in our research. In particular, we applied the conventional non-parametrical approach of Tukey's fence (3) (Tukey 1977):

$$[Q_1 - k(Q_3 - Q_1); Q_3 + k(Q_3 - Q_1)] \qquad (3)$$

where (Q_1) and (Q_3) are the lower and upper quartiles, (k) is a degree of outlaying. We apply the measure for 'standard outliers', i.e. (k) = 1.5 as Tukey suggests (1977).

Table 3. Development indicators under examination

Selected (mutually uncorrelated)	Unselected (correlated)
gross fixed capital formation (GFCF); employment (EMP); participation in education and training (PET); gross expenditure on research and development of the business enterprise sector (GERB); gross expenditure on research and development of the non-business enterprise sector (GERN)*	gross domestic product; productivity of labour; compensation of employees; population size; age dependency ration; median age of population; education levels attained; employment in R&D; human resources in science and technology

Notes: All the indicators were weighted by the size of population; all monetary terms were expressed in EUR.
* where the vast majority is allocated from the government sources.
Source: own elaboration.

Effects of Cohesion Policy on CEE regions

Let us briefly describe the position of regions of CEECs within the EU, especially through comparison with the 'old' EU countries (EU-15). As shown in Fig. 3, the levels of GDP per capita (in EUR) were lower in CEE regions before the 2007–2013 programming period. However, the average annual growth rates of CEE regions between 2007 and 2014 were generally much higher. The performance of all CEE regions rose, while many regions reached the average annual growth rate of between 4 and 7%. At the same time, the regions of the EU-15 rose slower or even declined (especially the regions of Greece, Spain, Italy and the United Kingdom). These simple facts show that the gap between the economic performance of EU-15 regions and CEE regions decreased. In particular, these facts play an important role in the convergence process across the EU-27 regions that result from a negative slope. We have to point out that, based on the coefficient of determination, this model has been found to be significant at the 0.01 (t-test has been applied to resolve the statistical significance). In addition, the model estimates the average 'speed of convergence' across

the EU at 1.83% per year. In general, the findings of catching-up process of CEECs towards the EU-15 are in one line with other recent studies (Matkowski et al. 2016; Dobrinsky, Havlik 2014), and help to accept the first hypothesis.

Furthermore, based on Fig. 4, which focuses exclusively on the CEE regions, we can conclude again that the Beta-convergence process has been confirmed at the significance level of 0.01. In addition, the average convergence rate of 1.96% per year is even slightly higher than in the case of the all EU regions. As can be seen in Fig. 4, the least developed and most growing regions refer to regions of Bulgaria and Romania, while the more developed regions of Czechia and Hungary grew slower. Again, we can say that these conclusions follow and extend the previous findings of many recent studies (Zdražil, Applová 2016; Gligoric 2014; Spruk 2013).

As the results of the disparity measurement have shown, CEE regions converged towards the EU-15 regions, as well as to each other. We must note, however, that the convergence across the investigated years showed some fluctuations concerning GDP growth. As recent studies confirmed (Matkowski et al. 2016; Stanisic 2016), regional disparities inside some CEECs decreased during the years of crisis and have since returned
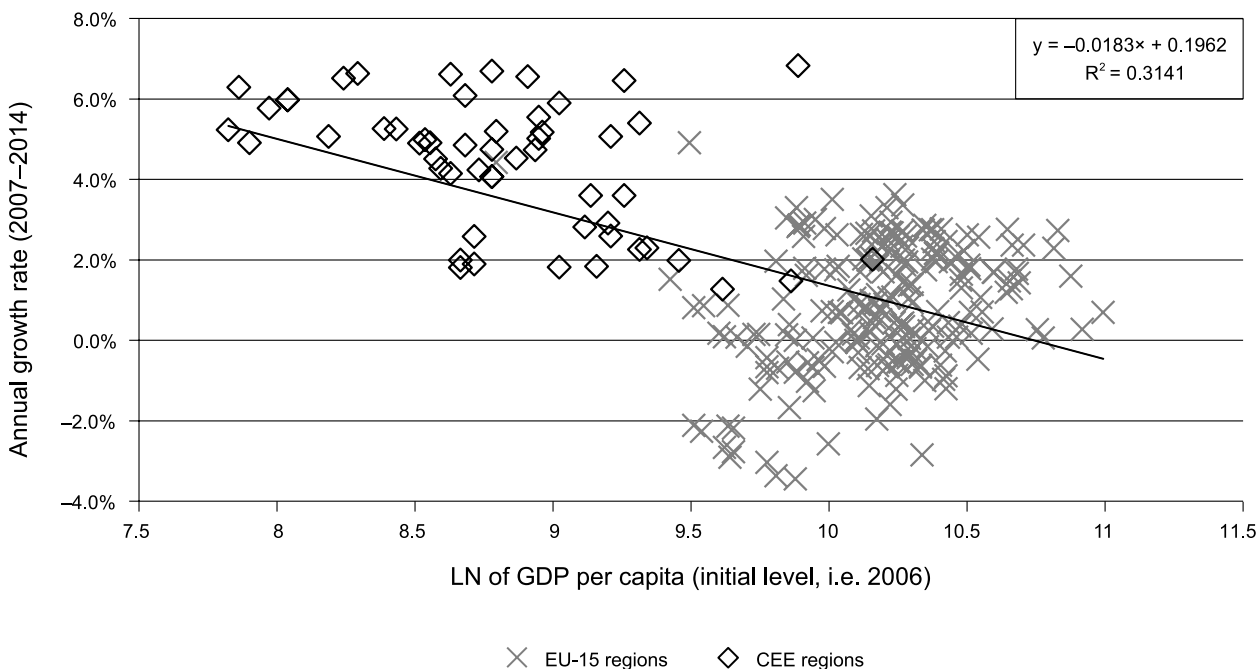

Fig. 3. Beta-convergence of EU regions (2007–2014).
Note: 272 regions, i.e. without the outliers of Inner London - West and Luxembourg.
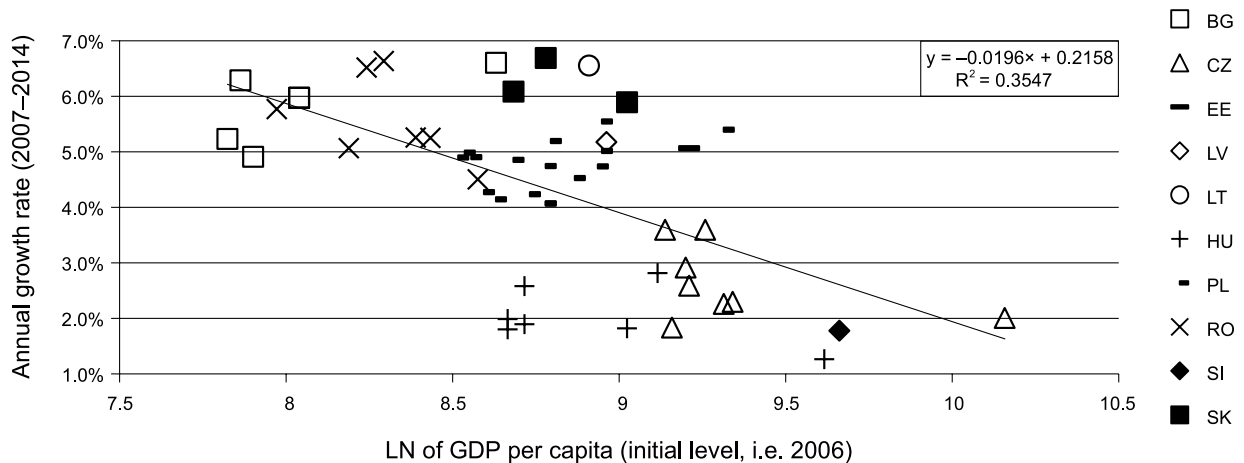Source: own calculations based on Eurostat (2017).

Fig. 4. Beta-convergence of CEE regions (2007–2014).
Note: 51 regions, i.e. without outliers of Bratislava and Bucuresti – Ilfov.
Source: own calculations based on Eurostat (2017).

to pre-crisis levels. The decrease in regional disparities occurred because the crisis affected the export- and construction-oriented regions, while self-reinforcing agglomeration effects took the regional disparities to the same level as before the crisis (Davies et al. 2015).

Nevertheless, our findings suggest that one of the main goals of EU Cohesion Policy for the 2007–2013 programming period, i.e. economic development while reducing inequalities between the EU countries and regions, was fulfilled to a certain extent. However, we may ask whether and how these actual figures were influenced by the real interventions of EU Cohesion Policy. In fact, there are many other relevant factors affecting the development of CEE regions (e.g. the economic integration of EU membership, business cycles, etc.). Hence, we seek to examine relationships between the expenditures of EU Cohesion Policy and the relevant socio-economic indicators below to deduce general conclusions about its efficiency.

Territorial differences in the effects of Cohesion Policy in CEE regions

In this section, we have excluded the outlaid regions of Bratislava, Bucuresti – Ilfov, Prague, Slovenia and Southeast (in Czechia); hence, the following analysis contains 48 regions. The capital regions (including Slovenia) are outliers in terms of GFCF and, for the most part, GERB and/ or GERN. However, we can conclude that such

a result seems logical, since the headquarters of important companies and institutions responsible for large shares of investments are usually located in capital cities. Also, the reason for excluding the Czech region of Southeast is very similar – extremely high (positive) changes in GERB and GERN. We suppose this is due to the city of Brno, which recently grew up into one of the most important IT research and innovation centres in Europe with many headquarters and large branch offices of global companies.

Let us start with the overall view on connections between the expenditures of EU Cohesion Policy per capita (EEUCP) and development indicators across the CEE regions, the results of which are presented in Table 4. One should interpret the positive significant correlation between the EEUCP and GERB as a result in favour of EU Cohesion Policy since EU funding aims at invoking investments in knowledge and innovation in the business sector. On the other hand, connections to the other relevant indicators have not been approved.

Focusing on particular groups of regions, the k-means procedure allows us to identify three different types (groups) of development among

Table 4. Correlations between the expenditures of EU Cohesion policy and development indicators across CEE regions.

	GFCF	EMP	PET	GERB	GERN
EEUCP	0.008	0.227	0.001	0.544**	0.224

Notes: ** significant at the 0.01.
Source: own calculations based on DG REGIO (2017) and Eurostat (2017).

Table 5. Mean values of clustered groups in relation to the CEE average (in %; CEE = 100).

	No. of regions	GFCF	EMP	PET	GERB	GERN	EEUCP
Group 1	21	108.8	73.9	93.1	57.2	97.6	80.0
Group 2	13	237.8	182.9	13.7	113.7	123.8	101.9
Group 3	14	–41.2	62.2	190.5	151.4	81.4	128.3

Source: own calculations based on DC REGIO (2017) and Eurostat (2017).

CEE regions. In general, the regions of the largest cluster – Group 1 experienced average (i.e. ± 10%) increases in GFCF, PET and GERN, and below-average increases in EMP and low increase in GERB. Moreover, regions of this group usually consumed less European funding – the whole group shows about 80% of the CEE average. The figures of Group 2 show above-average increases in all indicators except PET, which is very low and the least favourable across the CEECs. On the other hand, dominance in traditional economic factors, GFCF and EMP, is very high. The consumption of Cohesion Policy funding of regions classified in Group 2 usually reached average values. Finally, the regions of Group 3 share major increases in PET and GERB while below-average increases in GERN. However, these regions experienced a very unfavourable development in the traditional factors of economic growth and development, since only 4 of 14 regions experienced (a slight) increase in GFCF and the least favourable increase in EMP. In addition,
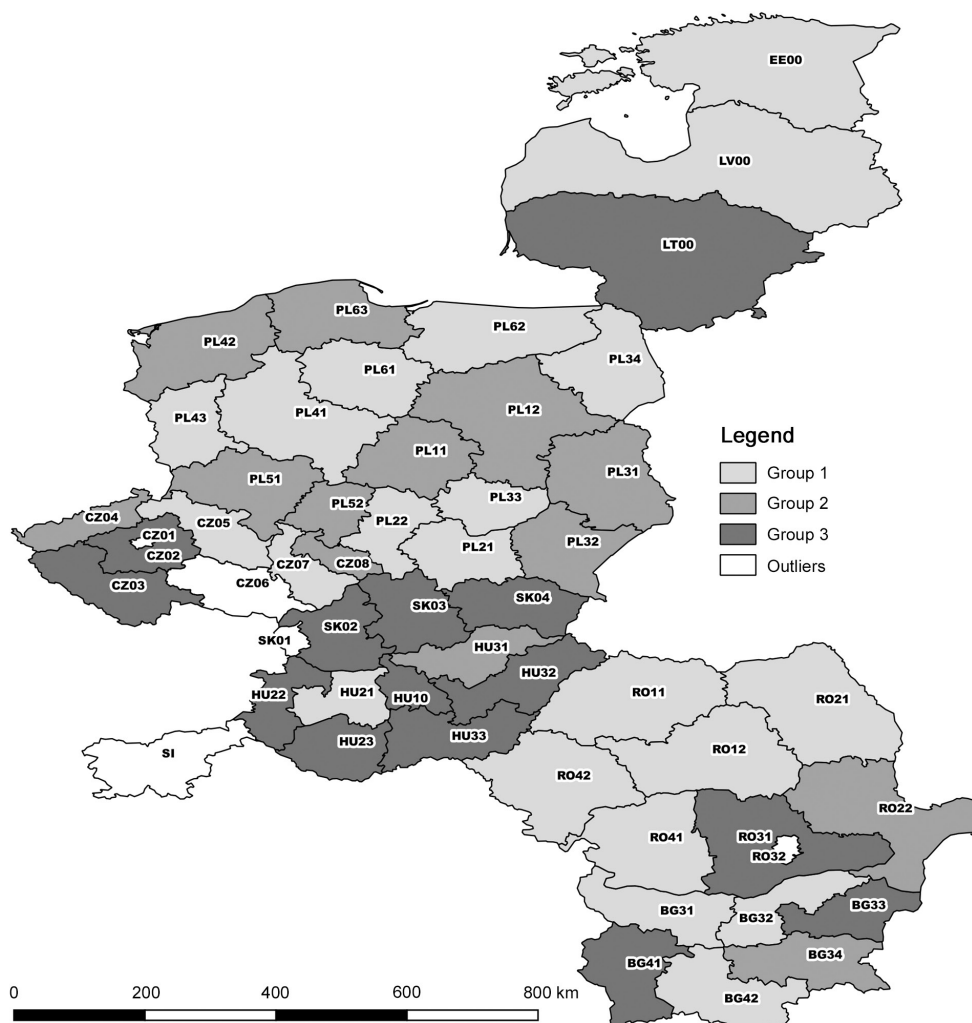

Fig. 5. K-means clustering of CEE regions.
Source: own calculations based on Eurostat (2017).

Table 6. Correlations between EU funding and development indicators in groups of CEE regions

		GFCF	EMP	PET	GERB	GERN
Group 1	EEUCP	0.165	−0.009	−0.051	0.664**	0.471*
Group 2	EEUCP	0.418	0.319	0.204	0.692**	0.275
Group 3	EEUCP	0.218	0.490	−0.057	0.103	−0.064

Notes: * significant at the 0.05; ** significant at the 0.01
Source: own calculations based on DC REGIO (2017) and Eurostat (2017).

the regions of Group 3 consumed above-average amounts of EU funding. All details can be found in Table 5.

As can be seen in Fig. 5, many regions of particular countries are classified together (e.g. 5 Romanian in Group 1; 5 Hungarian and all Slovak in Group 3; Polish regions are equally divided between Group 1 and 2). We can consider that this is due to an influence of the above-discussed path-dependent development trajectories that are shaped by traditions, national strategies, legal frameworks, etc. However, one can see that the k-means procedure helped to identify some cross-border geographical regions with similar development patterns – in particular, Group 1 (Bulgarian and Romanian regions) and Group 3 (Hungarian and Slovak regions). In fact, from the long term perspectives and historic facts, the similarities in the development of Hungarian and Slovak regions are interesting. However, in this analysis, we can only speculate whether this is due to long term effects of path-dependence processes, randomness or another reason.

The results of correlation analysis per groups are summarised in Table 6. In general, the number of significant correlations between EU funding and development indicators is low. There is a significantly positive connection to GERB within Groups 1 and 2 and to GERN within Group 1. All of those can be seen as desirable results and the possible products of EU Cohesion Policy. However, one could consider the number of confirmed relationships between EU funding and development indicators to be rather low.

Considering the results above, we can suppose that regions of CEECs experienced variegated types of development over the examined period, and the EU funding patterns were variegated as well. We can suggest the resources of Cohesion Policy might be ineffective in 'traditional' areas of regional growth and development, i.e. capital and labour, while there are possible connections to the 'modern' areas, especially the R&D

investments. In particular, it seems that R&D investments of the business sector might be invoked by EU funding in a large number of CEE regions. Secondly, the innovation potential of regions with rather lower dynamics in most of the development indicators (Group 1) might be largely influenced by the amount of Cohesion Policy resources. Indeed, this potential might even rise with an increase in EU funding or a drop in the case of a decrease in resources. Unfortunately, the amount of EU support that these regions consumed over the 2007–2013 programming period was low in comparison to the other CEE regions. Similarly, the potential of R&D business sector in regions that experienced the largest development in the traditional areas, as well as solid development in R&D investments (Group 2), might be positively influenced by additional funding. Finally, the results also suggest that the regions with the worst development of 'traditional' areas but highest dynamics of 'modern' areas of regional growth and development are the highest consumers of EU resources (Group 3). However, no connection between the Cohesion Policy resources and education with R&D investments has been measured in this case. We can interpret this conclusion as a lower dependency of regions on Cohesion Policy support or the existence of other strong determinants that influence the development, respectively.

With all of the above in mind, we can conclude that EU resources tend to behave differently in different types of regions. This analysis revealed that regions with higher absorption of EU funding show higher performance in knowledge and innovation potential. Rather curiously, we found some connections between those indicators only among the regions with lower shares of funding. However, as we found only positive relationships between EU funding and development indicators, EU Cohesion Policy seems to be an important determinant that should help in the long process of transformation of obsolete

economic structures of CEE regions. In particular, as the Cohesion Policy effects seem to be mostly positive in terms of R&D, CEECs should try to catch this opportunity to re-shape the ongoing development trajectories by looking for strong economic, competitive advantages. Hence, if the CEECs make an effort to empower their competitiveness on the global markets and improve living conditions of inhabitants, they should endeavour to use as much of the resources as possible that have been allocated for the current 2014–2020 programming period of EU Cohesion Policy. Finally, as the allocation of European resources will most likely significantly decrease for many CEECs after the current programming period, they have to explore new ways to continue in their established development trajectories in the future.

Conclusions and challenges for the future development of CEE regions

In this paper, we showed the historical and economic conditions for the development of CEE regions at the beginning of the 21st century and changes that took place there as a result of the European Union Cohesion Policy. The study showed that since their entrance to the EU, GDP per capita in PPS has been systematically increasing in CEECs, both nominally and as percentage of the EU average, and therefore countries were catching up in this field to the 'old' EU countries (EU-15). Moreover, the beta-convergence analysis conducted for all regions in the EU-28 countries as well as exclusively for CEE regions suggests that there is a diminishing gap between the investigated area and the more developed European countries.

We acknowledge that other factors such as globalisation, opening of the European markets, results of other national and European policies, as well as simply starting from the initial lower starting point, could be as important in development and convergence processes as EU Cohesion Policy. However, EU Cohesion Policy seems to be an important determinant in the long process of transforming CEE economies; it played an important role in regional development in CEECs by opening more financial opportunities and providing new thematic objectives. This policy is

responsive to path dependence in regional economies, as the recent developments in CEE regions have been shown to follow from historical development patterns stemming as far back as the 19th century. Contrary to the notion that the socialist period would produce a more equitable development across CEECs that could disrupt capitalist patterns of development, it rather tended to result in inefficient spatial development, leaving environmental damage as well as social and economic problems to be re-addressed in the capitalist period. Entry to the EU at the beginning of the 21st century created a chance for CEE regions to benefit from the use of EU funds under Cohesion Policy to seek new economic opportunities and break from their historical development paths. Therefore, we suppose that Hypothesis 1 can be accepted.

At the same time, the study proved different performance patterns of EU Cohesion Policy in various types of regions. In general, for the three groups of regions with different levels of initially uncorrelated socio-economic indicators (such as employment, participation in education and trainings, expenditures on research and development), different impacts of EU funding under Cohesion Policy on these indicators were observed. For example, regions with higher absorption of EU funding showed no correlation with development indicators, while the performance in knowledge and innovation potential was higher. On the other hand, regions with rather average and lower absorption of funding showed some positive correlations between EU resources and development indicators. However, unambiguously arguing about more statistical patterns of the effects of structural and investment funds on the groups of regions seems to be difficult. This allows us to confirm Hypothesis 2, that the impacts of Cohesion Policy on development potentials differ among CEE regions. It seems that positive impacts of EU Cohesion Policy could be observed by looking at each CEE region and type of indicator separately.

Positive, although territorially diversified, results of Cohesion Policy on regional development in CEECs are even more visible on the regional and local scale (other examples are presented by Kozak 2011; Bienias, Gapski 2014; Churski, Stryjakiewicz 2016; Zdražil, Applová 2017). At the same time, public development administration

units and policies in CEECs were totally reformulated to absorb and optimally use EU structural and investment funds. However, obtaining and spending EU money for regional development must not be perceived as the optimal and final model of regional policy in the investigated countries (Churski, Ratajczak 2010; Gorzelak et al. 2010). There are also potential traps in using external support: over-investing in infrastructure, attributing the same support for all kinds of regions, seeking cohesion at all costs, and financing projects that play a social rather than developmental role (Gorzelak 2010; Molle 2012).

Among the future challenges for CEECs, we see the need to develop and implement country level comprehensive models of regional policies that would operate without large external support from the EU budget, as the EU funds will eventually decrease or finish (Avdikos, Chardas 2016). The model should be based on integrated territorial (spatial) and socio-economic development and should include: efficient institutions (organisations and regulations), alternative sources of funding for new development projects (such as public-private partnerships, financial institutions etc.) as well as considered strategies for maintaining the infrastructure and facilities built and capacities gained since the integration with the EU.

CEE regions should continue to follow the recent paradigm of regional policy, which is: a) place-based, context-specific and geared to different types of regions rather than 'one-size-fits-all'; b) multi-level and including various actors (public, private, NGOs) rather than centralised; as well as c) proactive for potential – focusing on endogenous local assets and knowledge rather than reactive to problems – based on exogenous investments and transfers (Bachtler, Yuill 2001; Tödtling, Trippl 2005; Barca et al. 2012; Vanthillo, Verhetsel 2012). Such a model would continue to respond to the widely discussed need for renewed territorialisation and regionalisation of development policies while looking for competitive advantages (Porter 1998; OECD 2010, 2012; Capello, Fratesi 2011; Szlachta 2011; Asheim et al. 2011). One of the most promising tools for shaping regional competitiveness in economic terms is smart specialisation, whereby sectors having the highest future growth potentials are discovered and adopted by each country and region

(Foray 2009; Karo, Kattel 2015). The strategy, having been widely implemented in the 2014–2020 programming period, cannot yet be evaluated for CEE regions. Nevertheless, our findings from the 2007–2013 programming period support its underlying principles. The regional economic development processes through smart specialisations should be supported by higher R&D spending (as a percentage of GDP), deliberate innovation strategies, and better cooperation between business and research or education institutions.

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