INTEGRATIVE MODEL FOR EVALUATION OF DEVELOPMENT POTENTIALS OF REGIONS AND ITS APPLICATION ON AN EXAMPLE OF THE CZECH REPUBLIC

Milan Viturka

Introduction

The regional development became a frequent topic in the Czech Republic mainly after the country entered the EU. Logically, this has led to a growing demand for new theoretical and methodological approaches of regional research, also as a reaction to the unilateral approaches existing at the time defining regional policy in terms of a mix of practical tasks in Central and Eastern European countries [1]. This development represents a new challenge for regional sciences, which include especially regional economy, economic geography and spatial planning [15]. It is necessary to note that as far as direct links of the theory of regional development to general economic theory are concerned, this is a rather complicated matter. The main reason is the fact that the mainstream economic theory ignores the spatial aspect (to say nothing of the degree of information capacity of economic theories which use a gnoseological framework of closed physical systems although they relate to open social systems). The solution of this problem can be considered as a significant methodological contribution of the theory of regional development.

The above mentioned developments led to the creation of the presented model aiming for business oriented interpretation of the principles of developmental and hierarchical differentiation of social systems [11]. Their effect is in agreement with the general theory of systems connected with numerous feedbacks which provide self-control of social systems in real conditions of imperfect competition. The developmental differentiation of social systems determines the socioeconomic organisation of the society, and its main demonstration is natural selection based on competition, which in combination with purposeful cooperation of economic entities ensures optimum use of limited sources. This differentiation is closely related to hierarchical differentiation of social systems resulting in socio-geographical organisation of the society. However, this relationship is modified by strong inertia of hierarchical structures therefore the effect of both principles is not always straightforward. In this context the following principles have been applied when creating the model:

- evaluate development potentials of regions in an integrative way – from factual (integration of economic, social and environmental factors) as well as spatial (integration of territorial structures) perspectives;
- preference for the bottom-up approach following the line microregion – mesoregion – macroregion with an emphasis on the specification of the main integration processes;
- evaluate the information capacity of the model by means of testing relevant hypotheses with positive impacts on usage in a regional policy and the business sector.

1. The Theoretical Background

Location theories are the most inspiring out of supply-oriented neoclassical theories of economic growth as regards the links of the presented model to theories of regional development. Their basic premise is that a limited spatial mobility of production sources determines the

 DOI: 10.15240/tul/001/2014-4-001

creation of territory-specific economic structures (including the creation of external savings), and the aim of these theories is to find the main factors determining the location of economic activities. According to Massey [20] one can distinguish four basic directions: location decision process of companies, mutual interdependencies of location decisions, behavioural concept of location and a synthesis of economy spatial distribution, which was dealt with from the perspective of the central-place theory [14]. Further inspiration was obtained from endogenous growth theories responding to the fact that original neoclassical theories cannot explain a long-term production growth. Endogenous theories emphasise the internalisation of the significant factors of economic growth, which were within the widely known Solow's neoclassical growth model considered as the exogenous factor "technology" – it is a non-measurable residual factor to which the differences between the real GDP growth and the corresponding contribution of basic production factors are allotted [28]. Correspondingly, they are characterised by a spill-over of economic effects connected with the creation of positive externalities (capital returns then have, ceteris paribus, growing character). Most often, two examples of endogenous models are mentioned: models oriented towards an accumulation of human capital [18] and models oriented towards an accumulation of knowledge capital [27]. In this context, we also have to mention the new trade theory [17] and the micro-economic theory of competitiveness with the well-known diamond model [26]. The other main group of regional theories contains demand-oriented theories emphasizing the determining effect of demand on economic growth, which is in contrast to neoclassical theories generally considered uneven. Out of these "core-periphery theories" the most inspirational are especially the growth pole theory [24], the theory of cumulative causation [22] and the theory of uneven development [13]. The first theory points out the key role of development poles for economic growth. The other two theories significantly contributed to the clarification of the cumulative mechanism of origination of disparities in the regional development, including the diffusion of positive and negative effects. According to Myrdal, this process has three basic stages: selection of successful regions, polarization, and integration. Other significant groups of inspirational theories are institution-oriented theories, mainly the theory of learning regions [19] and time-geography [10].

Generally speaking, the main inspiration of the above-mentioned theories for the presented model are modelling of the significance of agglomeration economies, spatial diffusion of socioeconomic phenomena (including links to the concept of cluster, elaborated by Porter) and knowledge capital in the regional development. Also the concept of regional competitiveness needs to be mentioned as well as the professional discourse on the developmental role of institutional factors emphasizing the concept of regions as networks of contacts and relationships. The term of regional competitiveness, which is currently being intensively discussed, can be understood as "the ability of regions to generate, while being exposed to external competition, relatively high income and employment levels" [8]. Its maintenance is considered a major condition for the meeting of rising material and nonmaterial needs of current and future generations while adhering on to the ecological definition of sustainable development as the development which meets the present needs without compromising the fulfilment of future needs [2]. In this context we can state that the used approach respects new tendencies in the development of economic thinking emphasizing a holistic understanding of the economic development as an integral part of the complex process of social evolution.

Considering the large amount of regional theories, it is not surprising that their application within regional policy has become eclectic. As regards the still topical question whether the regional development is dominated by the processes of convergence or divergence, we are of the opinion that a permanent dominance of one of these processes would contradict the general theory of systems as it would lead to a gradual degradation of systems. In the real world, both processes overlap – processing industries located in non-metropolitan regions are considered bearers of the convergence, higher market services concentrated in metropolitan regions are considered bearers of the divergence [7].

2. Model Description and the Results of Its Application to the Czech Republic

Based on the theory and accepted principles, the main components of the model are business environment quality (BEQ), innovation potential of companies (IPC) and use of human resources (UHR). The essence of the model can be described as follows. An improvement of BEQ stimulates the development of business activities with positive impacts on IPC and UHR. Thus, the synergic effects that are generated enhance territorial integration and increase development potential and regional competitiveness, which creates the basic prerequisites for sustainable regional development. The developmental tendencies of regions then depend on whether the region gains or loses competitive advantages compared with other regions (these tendencies can also be influenced by random factors, i.e. the model is non-deterministic). The competitiveness of companies plays a crucial role in this; however, its relationship to the competitiveness of regions is not completely straightforward (e.g. reduction of staff in companies reduces the level of the UHR). We chose the microregional level as the level to be used for the primary evaluation of development potentials. In the Czech Republic this level is represented by administrative districts MEC – municipalities with extended competence of the 3rd degree. These are 205 territorial units in total with an average number of 45 thousand of inhabitants (this level does not include Prague). The following mesoregional (hereinafter regional) level is represented by 14 regions of NUTS 3 level including Prague, with the current average number of about 750 thousand of inhabitants.

The central position of the BEQ is based on the fact that it represents an aggregate result of a long-term accumulation of various influences generated by activities of entrepreneurial and non-entrepreneurial entities. The own methodology of BEQ assessment is based on territorially bound factors reflecting investment or development preferences of the companies operating in the processing industry and higher market services (information and communication; financial and insurance activities; real estate activities, professional, scientific and technical activities; administrative and support service activities), which are considered the "engines" of economic development. Both of these sectors have similar positions in the Czech economy (the not included industries provide material conditions for the society to operate and their reproduction, distribution and exchange of products and lower market services and public services; location of the remaining industries is determined by specific nature-conditioned factors – the proportion of these industries in the total production of developed economies is substantially lower than that of the development-bearing industries). This approach has been chosen for its good usability for regional comparisons of the corresponding supply. It is necessary to note that besides the field classification an individual location is influenced by many factors which are hard to quantify (companies assess the existing offer using a mixture of general factors and their own criteria).

Primary information necessary for the selection of BEQ factors and establishment of their significance levels has been gained from an extensive international survey [23] together with the results of other studies [16], [9]. The mentioned survey was conducted by means of questionnaires in which big companies listed their preferences pertaining to the choice of factors and their significance for location decisions. Due to some drawbacks of these surveys and studies, the final selection and evaluation of factors were performed using the results of other analyses as well. These were mainly the results of own application of a factor analysis focusing on the spatial relations demonstrated in foreign investments including property acquisitions and analyses of opinions held by significant foreign companies operating in the Czech Republic [25]. Based on this procedure, 16 factors in total were identified with empirically provable major significance for investment decisions of companies and their final significance levels were calculated as an average from both selected sectors. These factors are divided into sixth groups. The group of business factors contains factors of proximity to markets (3 primary indicators), concentration of significant firms (2); supporting services (3) and presence of foreign firms (2); the group of labour factors contains the factors of availability (4), quality (8) and flexibility of labour forces (2); the group of infrastructure factors contains factors of road and railway quality (12),

information and communication technology (6) and proximity to international airport (3); the group of local factors contains factors of entrepreneurial and knowledge base (24) and assistance of public administration (11); the group of price factors contains factors of real estate price (5) and price of labour (3); the group of environmental factors contains factors of urban and natural attractiveness (9) and environmental quality (8). The essential issue is then the search for suitable indicators enabling us to confront the companies' preferences with regions' supply – within our research 20 thousand records were collected and analysed from the perspective of their information value and statistical distribution.

The system for BEQ evaluation is based on five generalised classification degrees (from the excellent – 1st degree to the unfavourable 5th degree). The initial microregional evaluation is based on weighted sums of individual values of the factors respecting the results of analyses of primary indicators and interpreted by means of the created system of classification. Regional values of the BEQ were obtained by aggregating microregional values weighted by the number of inhabitants. In agreement with the main strategic objective of economic development of the Czech Republic, which is generally considered to be the transfer to knowledge economy, we used weights B for the evaluation of the significance of the factors as these correspond to an intensive type of economic development driven by innovation (see Tab. 1, which also shows weights A corresponding to the existing type of development driven by investments). When establishing weights B the preferences of economic entities active in high-tech and medium-tech industries and preferences of economic entities active in other industries considered equal (this ratio corresponds to the current situation in one of the most technologically advanced countries i.e. Germany). The corresponding changes in the regional values which appeared due to the fact we used weights B did not exceed 2%, which points to an initial stage of the development of knowledge economy in the Czech Republic. Generally, the approach used thus increases the timeless significance of BEQ assessment. The used procedure can be expressed by the following formula:

$$T = \sum_{i=1}^{n} F_v \times F_w \quad (1)$$

Where:
T = total value of BEQ
F_v = values of partial factors
F_w = weights of partial factors.

The results show that all regional centres have above average levels of BEQ (see Tab. 2). This threshold can be understood as the basic criterion for the identification of development poles with the determining effect on the development potential of microregions and regions. From the other criteria we can mention the performance of higher administrative and service functions and the above-average level of IPC. In this line, we defined categories of development poles of national significance and development poles of supranational significance comprising the most significant development poles with BEQ values 1.5 (rounded) and lower – in correspondence, Prague was identified as the main development pole of supranational significance and Brno as a secondary development pole of supranational significance (in particular in the field of exhibition industry and R&D). Eight other microregions, located almost exclusively in the Středočeský region, manifest values of BEQ slightly above average (see Fig. 1). This can be explained by the stimulating effect of Prague resulting in an origination of a highly integrated Prague metropolitan region of European significance. The microregion of M. Boleslav (centre of car industry, whose cooperation links affect not only the Středočeský region, but also the neighbouring regions) has classified as the only centre without higher administrative functions among development poles of national significance. The other microregion centres with BEQ values below average (together with the seven microregions with BEQ above average which do not achieve the significance position of development poles) were classified as centres significant for development. These centres, which only perform lower administrative functions, are divided into four levels: centres with highly favourable (7 centres), favourable (101), less favourable (82) and unfavourable (2) BEQ.

Tab. 1: BEQ factors and their importance

Factors [a]	Factors groups	Weight A	Weight B	Ratio B/A [b]
Most important factors:		***44***	***48***	▲
Entrepreneurial and knowledge base	Local factors	9	11	▲
Availability of labour forces	Labour factors	10	10	○
Proximity to markets	Business factors	9	9	○
Concentration of significant companies	Business factors	9	9	○
Quality of labour forces	Labour factors	7	9	▲
Medium important factors:		***37***	***35***	▼
Real estate price	Price factors	7	7	○
Road and railway quality	Infrastructure factors	8	6	▼
Price of labour	Price factors	6	6	○
Information and communication technology	Infrastructure factors	6	6	○
Supporting services	Business factors	6	5	▼
Urban and natural attractiveness	Environmental factors	4	5	▲
Less important factors:		***19***	***17***	▼
Presence of foreign companies	Business factors	5	4	▼
Environmental quality	Environmental factors	3	4	▲
Assistance of public administration	Local factors	4	3	▼
Proximity of international airport	Infrastructure factors	4	3	▼
Flexibility of labour forces	Labour factors	3	3	○

[a] Basic content specification of factors (the auxiliary criteria are not included):
Proximity to markets – availability of foreign and Czech regions weighted by size of GDP/PPS, expressed by gravity model within limits of effective distance in truck transport determined by labour regulations and quality of roads.
Concentration of significant companies – location of large companies.
Supporting services – proportion of economic entities classified as L, M and N by NACE.
Presence of foreign companies – proportion of companies in foreign ownership.
Availability of labour forces – aggregated data about the number of economically active inhabitants.
Quality of labour forces – aggregated data about the degree of education of workers in industry (manual and non-manual components) and higher market services (non-manual component).
Flexibility of labour forces – expressed based on the highest level of flexibility (degree of entrepreneurship).
Road and railway quality – weighted assessment of the level of connection of regions to motorways and roads of 1st class and significant railways.
Information and communication technology – perception of computer literacy of inhabitants based on data about the rate of PC availability and the dynamics of its development.
Proximity of international airport – location of airports and their accessibility within the limits of distance.
Entrepreneurial and knowledge base – the number of industrial zones, science parks, business incubators, universities and research institutions within a region (including assessment of quality).
Assistance of public administration – assessment of quality of territorial administration from the perspective of the support for development of business activities.
Real estate price – aggregated data about average prices of lands in industrial zones and average prices of net annual rent for offices.
Price of labour – aggregated data about average gross wages in industry and market services.
Urban and natural attractiveness – aggregated expression of attractiveness within the context of a region's significance for tourism.
Environmental quality – aggregated expression based on data about air quality mainly.

[b] Ratio B/A – ▲ higher weight of B, ○ balanced weights, ▼ lower weight of B.

Source: Authors' research.

Tab. 2: Aggregate BEQ values

Region	Centre	Total BEQ	Centre BEQ	Population in thous.[a]	GDP per capita In thous. Euro[a]
Praha	Praha	1.16	1.16	1,212	26.5
Středočeský	Praha [b]	2.65	2.03 [c]	1,202	11.6
Jihočeský	Č. Budějovice	2.86	1.98	633	10.6
Plzeňský	Plzeň	2.77	1.68	561	11.3
Karlovarský	K. Vary	2.99	2.31	307	8.8
Ústecký	Ústí n. L.	3.05	2.35	831	9.8
Liberecký	Liberec	2.79	2.02	434	9.5
Královéhradecký	H. Králové	2.86	1.88	552	10.5
Pardubický	Pardubice	2.94	1.81	511	10.3
Vysočina	Jihlava	3.02	2.16	514	10.4
Jihomoravský	Brno	2.78	1.54	1,141	11.3
Olomoucký	Olomouc	3.19	2.37	642	9.1
Zlínský	Zlín	3.29	2.43	591	10.1
Moravskoslezský	Ostrava	3.27	2.33	1,250	10.4
Czech Republic	***Prague***	***2.75***	***1.16***	***10,381***	***12.3***

a Values for 2007.
b Prague is seat of the regional office.
c The value is related to M. Boleslav.

Source: Authors' research, Czech Statistical Office.

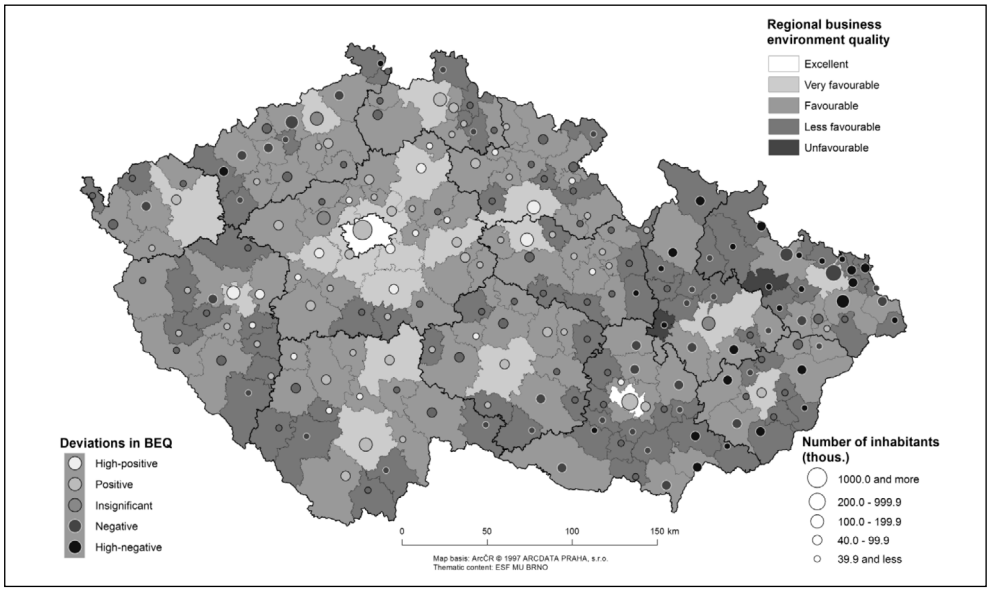
As regards the regional level, except for the specific Prague region, the differences among regions are not very considerable – the BEQ values range from +11 to -10% from the weighted average of these regions. Therefore, we have reached a strategically important conclusion that the issue of disparities predominantly concerns the relation between Prague, or Prague together with the Středočeský region (in the case of this "natural" region, the combined BEQ value would be around 1.90), and remaining regions. That is why the differences between development poles seem to be more important (gateway effect). It should also be added that the BEQ value changes assessed using weights A between the examined periods 2001/2002 and 2006/2008 ranged only within +5% for Prague and -6% for the Olomoucký region. The spatial distribution of BEQ values displays the following regularities or basic tendencies:

- macroregional level – deterioration of regional BEQ values in the direction from the west to the east (this corresponds to a similar tendency of GDP per capita, which is observed in all countries of the Visegrád Group: Czech Republic, Slovakia, Poland, Hungary);
- regional level – deterioration of microregional BEQ values in the direction to regional boundaries in the sense of core-periphery theories (selectively modified by the historical development of urbanization);
- macroregional and regional levels – creation of a system of development axes of national and regional significance with comparatively higher BEQ in relation to the diffusion of positive effects (including the stimulation of business clusters creation), induced by development poles.

The listed regularities reflect general principles of spatial organization of social

systems, which have a logical consequence in the form of disparities in regional development. Reduction of these disparities is the main aim of a traditional regional policy. It is necessary to have a verified methodology for a correct identification of disparities (in the practice intuitive or unilaterally oriented methods prevail). The results obtained allow us to accept the following conclusion: territorial disparities in regional development can be divided into the "inherited" ones, that is disparities determined by the hierarchical position of regions – their regulation would be contrary to the strong inertia of hierarchical structures and therefore inefficient – and "created" ones, that is disparities determined by the character of economic development of regions – their regulation is considered a socially justifiable application of the solidarity principle [29].

Fig. 1: Regional business environment quality (BEQ) according to the MEC regions



Source: Author's research.

The common explanation framework of the following model components i.e. IPC and UHR is formed by processes of regions' adaptation to global and regional tendencies in the development of economy, whose key factors are the ability to create innovation and maintain employment. Both the components are characterized by strong linear and nonlinear links to the development of the entrepreneurial sector in the system context of its structural adaptation. Due to certain troubles with availability of regional data, the methodological approach based on selected indicators of explored processes was chosen for the interpretation of these components. The regional evaluation of IPC component is based on eight representative indicators (mainly related to the share of innovation companies and types of innovation activities, further to expenditures and employment rate in the field of R&D, and also the space distribution of the most significant innovation companies) and UHR component on five representative indicators (mainly microregional series of unemployment and vacancy indicators and economic sensitivity indicators). However, it is necessary to note that a number of external factors affecting the development of both of these components are already comprised within BEQ factors.

The essential significance of the IPC component follows from the fact that the creation, adoption and transfer of innovation are generally considered, together with the development of science and research, the main processes affecting the existent and mainly the future competitiveness of regions and the corresponding indicators provide basic information on the development of knowledge economy. From a theoretical perspective, we have to note that the creation of innovation disrupts the process of automatic balancing of the market which is one of basic postulates of the neoclassical theory. To evaluate the component we used the following information sources: survey of the Czech Statistical Office on innovations in the entrepreneurial sector in 2004–2006 – about 8,500 companies included [5], survey on science and research in 2004–2006 [4] – all companies performing R&D included, and our own survey based on the database of the Association for Innovative Entrepreneurship and annual reports of companies, with data harmonized as of the end of 2007 – about 1,500 companies included. The advantage of surveys on innovations is their standardization within the entire EU by means of the harmonized CIS questionnaire. The disadvantages include a degree of subjectivity, and in the case of the Czech Republic also the fact that the survey from 2004–2006 is the last one by now which provides information up to the level of NUTS 3 regions. A strategically important finding is the fact that in contrast to non-innovative companies, technically innovative ones penetrate international markets much more easily (the corresponding ratio at international, national and regional markets was 0.5 : 1 : 0.6 for the former in contrast to 0.3 : 0.8 : 1 for the latter), and innovation capabilities increase with the size of companies and their internationalization. It follows the dominating orientation of Czech companies towards innovations of lower levels, as proved by the fact that only a third of expenditures on technical innovations go to R&D (the proportion of technologically demanding

Tab. 3: Selected indicators of IPC

Region	Share of innovative companies (%)	Share of companies with product innovation (%)	Share of companies with process innovation (%)	Company expenditure on R&D/GDP	Employees of companies in R&D/TNE [a]
Praha	30.9	*20.3*	*23.4*	1.04	1.34
Středočeský	27.2	*17.9*	*20.7*	2.21	0.69
Jihočeský	27.9	*18.3*	*20.8*	0.47	0.28
Plzeňský	28.2	*18.9*	*22.2*	0.52	0.36
Karlovarský	20.5	*14.0*	*17.1*	0.11	0.15
Ústecký	26.5	*16.6*	*20.5*	0.25	0.19
Liberecký	28.5	*17.1*	*24.3*	0.97	0.54
Královéhradecký	26.2	*17.2*	*21.3*	0.44	0.42
Pardubický	25.7	*20.0*	*19.2*	1.18	0.84
Vysočina	23.5	*13.7*	*19.3*	0.45	0.32
Jihomoravský	31.5	*21.9*	*23.3*	0.73	0.69
Olomoucký	29.4	*17.4*	*23.7*	0.61	0.49
Zlínský	30.2	*21.1*	*25.3*	0.88	0.61
Moravskoslezský	23.9	*15.2*	*20.0*	0.58	0.34
Czech Republic	***28.1***	***18.5***	***21.9***	***0.83***	***0.59***

[a] TNE – total number of employees.

Source: Czech Statistical Office.

industry and services in the Czech Republic is about 20%). This is also connected to a relatively low level of the exertion of intellectual property rights – however, using the indicator of the number of patents per capita for a regional comparison of Visegrád countries is disputable as most transnational corporations (TNC) file patents in the place of their headquarters, not in the place where the invention was made.

According to the evaluation results (see Tab. 3), the highest degree of the component is reached by Prague, followed by the Středočeský region and the Jihomoravský region – this is also reflected by their high migration attractiveness for college graduates. At the other end of the scale, there are the Karlovarský, Ústecký and Vysočina regions. Further analyses prove that the most significant innovation centres with more than five thousand employees in localised innovative companies are agglomerations of regional capitals (except for Č. Budějovice, Ústí n. L., H. Králové and K. Vary, which belongs to the second group). The analyses have also identified innovation zones organized in bands; two out of the four most significant zones are located in regions with a worse BEQ. It is also a fact verified in practice that in small microregions industrial innovative companies are the more important bearers of knowledge capital. Although an above-average level of BEQ is associated with a higher competition forcing companies to implement technical and nontechnical innovations with positive effects on competitiveness, its relations to the IPC components at the regional level are not completely straightforward – a strong correlation of IPC with BEQ (and also GDP) was found especially for the indicator of proportion of employees in R&D in the total number of employees. However, at microregional level we confirmed an obvious dependence between the BEQ and the presence of larger innovative companies.

The significance of the UHR component mainly follows from the socially sensitive issue of unemployment, whose solution is considered an important part of the solidarity principle application. Therefore, the selected UHR indicators can be understood as indicators of social impacts of regional economic adaptation processes. The most accurate expression of this adaptation is the development of unemployment rate, which in relation to creation of new jobs interprets the final result of regional interactions between demand and supply at labour markets. To evaluate this component, the following main information sources were used: the registered unemployment rate and the number of vacancies found by the labour offices (period 2005–2010), further the proportion of so-called economically sensitive fields in the employment as of 2005. This is a modified set of fields suffering from strong competition or long-term stagnation in the entire EU [6], mainly textile, metallurgical and food industry, selected branches of chemical and engineering industries and mining (the regulated sector of services focus on local demand mainly – in the Czech Republic the proportion of local consumption is over 90%, whereas in the case of manufacturing industry it is slightly over 35%). Analyses showed a high dependence between the unemployment rate and the level of economic sensitivity as a determining factor of structural unemployment. The highest rate of unemployment persists in regions with the highest proportion of sensitive industries – the Ústecký, Moravskoslezský, Olomoucký and Karlovarský regions. At the other end of the scale there is Prague together with the Středočeský, Plzeňský, Jihočeský and Královéhradecký regions. However, the fact that after the beginning of the recession at the end of the monitored period the structurally most affected regions manifested the lowest rise in unemployment rate indicates that the time of excessive employment rate in companies operating in sensitive fields is over. At the microregional level, a significant relationship was revealed between unemployment rates and deviations of the BEQ from theoretically applicable values derived from a power regression curve (see Fig. 2). This relationship documents the essential role of microregions in the formation of labour markets. A high unemployment rate signals a decrease in UHR, which is usually connected with selective emigration of population. This process, which should theoretically provide balance at labour markets together with capital migration, is in the practice limited by a number of factors, most importantly the differences in prices of flats (e.g. average prices in the most attractive region for work – Prague – are currently 5 times higher than in the least attractive Ústecký region). As regards support for the development of

knowledge economy, it is necessary to maintain the dynamic balance between the supply of vacancies and the quality of workforce as one of the key prerequisites of the regional efficiency of education system.

The final stage of the model application focuses on the general evaluation of development potentials of regions based on the synthesis of BEQ (key component with a double level of significance), UHR and IPC. The obtained results allowed us to identify regions with an excellent position – type A, regions with a good position – type B and regions with a less favourable position – type C (see Tab. 4). As expected, the highest development potentials have Prague and the Středočeský region. This also corresponds to the results of the latest ranking of knowledge regions according to which Prague was in the 37th to 40th position within NUTS 2 EU regions in 2005–2007 – the best position from V4 countries [3]. The weaker position of the six regions of C type indicates significant future risks for the regional development. In this context it is interesting that the number of inhabitants in these regions fell by 0.5% between the censuses of 2001 and 2011 (from +1.9% in the Karlovarský region to -2.3% in the Moravskoslezský region). On the other hand, regions of B type manifested increase by 2.5% (from 0.9% in the Královéhradecký region to 4.4% in the Plzeňský region) and regions of A type a significant increase by 11% (from 8.9% in Prague to 13.6% in the Středočeský region).

Tab. 4: Total evaluation of development potentials

Typological groups and subgroups[a]	Region NUTS 3	Region NUTS 2	Classificaton groups		
			BEQ	UHR	IPC
type A:					
I	Praha	Praha	1	1	1
II	Středočeský	Střední Čechy	2	1	1
type B:					
II	Jihomoravský	Jihovýchod	2	2	1
II	Plzeňský	Jihozápad	2	1	2
I	Pardubický	Severovýchod	2	2	2
I	Liberecký	Severovýchod	2	2	2
II	Jihočeský	Jihozápad	2	1	3
II	Královéhradecký	Severovýchod	2	1	3
type C:					
II	Zlínský	Střední Morava	3	2	2
II	Vysočina	Jihovýchod	3	2	3
II	Olomoucký	Střední Morava	3	3	2
I	Moravskoslezský	Moravskoslezsko	3	3	3
I	Karlovarský	Severozápad	3	3	3
I	Ústecký	Severozápad	3	3	3

[a] Subgroup I – balanced, II – unbalanced.

Source: Authors' research.

The information capacity of the model was primarily verified based on the hypothesis that the BEQ level is strongly related to the GDP as the main indicator of developmental differentiation. The validity of this hypothesis was confirmed for the NUTS 3 level for which GDP data is available. The mean correlation coefficient for the explored period of 2006–2008 was, despite the limited selection used for BEQ evaluation, 0.95 (0.90 when the Prague region and the Středočeský region are combined), and the logical link between conditions for business and results of business was thus confirmed. The development of regional GDP per capita in PPS has shown long-term slightly divergent tendencies with an indication of the west-east gradient reduction during the economic boom, i.e. 2001 to 2007. Based on the power regression function (individual types of regression functions were assessed with respect to the optimum progress of curve) of the dependence between BEQ and the population size of microregions the second hypothesis that the BEQ values strongly correspond to their sizes as the basic measures of their hierarchical position has been confirmed as well. The average values of BEQ according to size groups of microregions with 180 and more, 90–179, 45–89, 18–44 and less than 8 thousand inhabitants are 1.68, 2.51, 2.97, 3.51 and 3.84. It has to be noted that the power regression function best captures the regularities in the size distribution of towns referred to as rank-size rule [21]. This fact has also been proved by our analysis, in The overall consistency of the model is confirmed by statistical relations of microregional values of BEQ with the other two components – location of innovation companies (correlation coefficient 0.62) and unemployment rate (correlation coefficient -0.63). Inclusion of the model into the general framework of economic growth theories based on the production function can be demonstrated using the following expression:

$$Y_r = A\,[A_1, A_2] \,.\, f\,(I, L, K) \qquad (2)$$

Where:

Y_r – level of regional output

A – general variable with components A_1, the macroeconomic (territorially free) and A_2, the regional (territorially bound) factors of economic development

I – knowledge (innovations)

L – labour

K – capital.

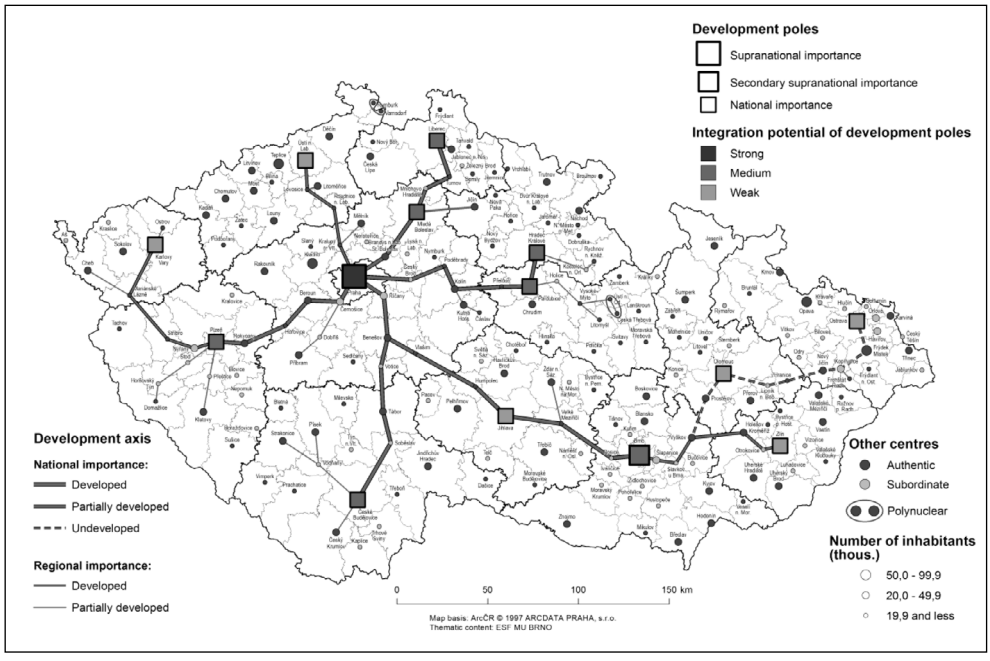
In this context, the BEQ component is a part of the general variable A (factor A_2) and the remaining two components IPC and UHR represent a sum regional reflection of endogenous factors I and L (factor K is in agreement with economic theory considered as a result of the production process).This approach corresponds to the idea that besides natural resources, capital deepening, increases in human capital and technological progress, agglomeration economies can be considered a specific source of economic growth.

4. Generalization and Conceptualization of the Results

The final part is devoted to the generalization of the obtained results and its system conceptualization from the perspective of regional policy. The main connecting element of the used approach is emphasis on integration processes as one from the most important factor of economic development. Generalization respects the principles of developmental and hierarchical differentiation of social systems forming the basic framework of spatial operation of economy, whose most important manifestation is the origination of development poles and axes. The created model, in contrast to older models, allows for their system identification: BEQ values above average (in interaction with IPC) in the case of development poles and significant positive deviations of BEQ real values from theoretical values (in interaction with UHR) in the case of development axes. Development poles generally represent the main spaces for concentration of agglomeration effects and development axes are the main spaces for the spread of positive effects. Both structures are closely related to the territorial distribution of labour whose result is the territorial differentiation according to BEQ and added value, which through the price of production factors determine its optimal territory use (more developed regions with a higher level of added value have a higher marginal productivity of production factors and thus a higher potential for innovation). The increase in territorial distribution of labour changes the ways of achieving the optimum allocation of

sources and expands limits of production capabilities of companies with adequate impacts on IPC and UHR. The complex synthesis allows us to create the first spatial model of the economic development of the Czech Republic (see Fig. 3), whose foundation stones are 14 poles and 8 developed axes of national significance.

Fig. 2: Spatial model of economic development of the Czech Republic



Note: Integration potential of development poles reflects their position in system of development axes and also the results of socio-geographical regionalisation [12].

Source: Authors' research.

Although the origination and dynamics of the development poles are mainly results of the historical development and influence of market mechanisms (attempts at an initiation of new development poles were usually unsuccessful), creation of development axes represents an excellent opportunity for an effective orientation of regional policy as the spread of positive effects from development poles contributes to both decreasing regional disparities and increasing regional competitiveness. The most important integration processes are further specified using the bottom-up approach (see Tab. 5).

Microregional level is represented by nodal regions (which can be identified with MEC regions) with the polarity of centre – hinterland, integrated by nodal processes. The most significant of these processes is commuting to work; therefore, the integration process is closely associated with creating regional labour markets. Most of commuting takes place at this hierarchical level – correspondingly, this process can be seen as integration on the basis of labour interactions. An uneven economic development leads to the subordination of weaker nodal centres to their stronger competitors; therefore, we can divide these centres to the authentic and the subordinate ones. At the regional level, there is the polarity of the regional centre (development pole) – subordinate microregions. The economic subordination depends on the dynamics of growth in development poles, overall subordination increases with a higher political and administrative function of centres.

In contrast to the prevailing opinion, in most countries local economy represented by SMEs maintains about 2/3 share in the creation of added value, therefore, we can assume that most production interactions of companies are performed at regional and national level. The most important integration process is the spread of positive effects from development poles along development axes of national significance, involving supplier-customer relationships forming a natural basis of business clusters (spread of negative effects on the contrary supports disintegration of regions) – integration on the basis of production interactions. We also have to add that the development of territorial distribution of labour in the conditions of global economy leads to an overlapping of horizontal and vertical production interactions, induced mainly by the application of specific schemes of value chains within TNC. The macroregional level differs from the previous one by a concentration of central political and administrative functions into the macroregional centre, which transforms the polarity into the usual form of the capital city (the most significant development pole) – subordinate mesoregions. Concentration of political power also stimulates the concentration of managerial functions in entrepreneurial sectors, which consequently strengthens processes of economic integration – integration on the basis of the highest managerial interactions. The highest level of economic integration is global integration with the polarity of development poles of global significance (e.g. London) versus subordinate macroregions. These main global development poles are further supplemented by auxiliary development poles of partial global significance (e.g. Frankfurt a. M.). Here, the integration process is carried out on the basis of commercial relationships and its essential geopolitical manifestation is the creation of supranational economic organisations – integration on the basis of commercial interactions. Both the above-mentioned hierarchical levels play a determining role in the creation of an institutional environment of particular countries.

Tab. 5: Basic determinants of space organisation of economy

Hierarchical level	Bearers of polarisation	Bearers of integration	Key structures
Global	Development poles of global significance	Development super-axes of global significance	International organisations, TNC
Macroregional	Development poles of supranational significance	Development axes of supranational/national significance	State administration, company headquarters
Regional	Development poles of national significance	Development axes of national/regional significance	Territorial administration, big business
Microregional	Development centres	Commuting	Employers, employees

Source: Authors' research.

The results provide potential users with information about the effect of relevant factors and processes determining the development of regions which allow them to evaluate the development potential of regions and to diagnose their strengths, weaknesses, opportunities and threats. From the perspective of the private sector, the principal use is for investment decisions (see website eCBA http://online.ecba.cz/podnikatelskeprostredi/default.aspx, presenting the results of evaluation of development potential of Czech microregions by BEQ factors including a synthetic evaluation of their attractiveness for location of new investments or extension of current investments, in division into technology-, labour-, transport- and supplier-oriented investment intentions). The main sphere of the utilization within the public sector is regional policy and in this context we are presenting a framework proposal of

a long-term concept of a regional policy of the Czech Republic.

Due to the unpredictability of economic development we chose the method of flexible development scenarios as the primary tool for regional policy conceptualization. These scenarios are based on the evaluation of development potential and perception of their demanded development and relate to the NUTS 3 level as the basic spatial framework of regional policy application. Altogether three development scenarios were designed: a progressive scenario, a growth scenario and an adaptation scenario. The main objective of the first scenario (regions A) is enhancement of quality of regional development with an emphasis on the development of knowledge economy. In agreement with the high potential of response to global stimuli, the implementation of this scenario is based on an effective use of strengths and opportunities by entrepreneurial entities. The growth scenario is suitable for less developed regions with favourable development potentials (regions B) and its main objective is improvement of quality of economic growth. A typical feature is orientation towards the use of opportunities in combination with the activation of strengths and elimination of weaknesses (the role of public interventions is significant). The main objective of the adaptation scenario (regions C) is strengthening of the competitive position, with an emphasis on diversification and reduction of the unemployment rate. Its typical feature is suppressing of threats in combination with eliminating weaknesses and activating strengths and using opportunities (role of public interventions is highly significant).

Application of the scenarios makes use of a flexible set of tools and their synchronization with appropriate programs of EU. The flexible approach means that the allocation of particular tools reflects different priorities of created scenarios (matter-of-fact correspondence) and the related system of selecting measures reflects the basic territorial framework of their potential development impacts (territorial correspondence). For regions A the main priority is enhancement of IPC and a secondary priority is improvement of BEQ (with an emphasis on quality of life); for regions B the main priorities are improvement of BEQ and enhancement of IPC and a secondary priority is improvement of UHR; for regions C the main priority is improvement of BEQ and UHR and a secondary priority is enhancement of IPC. Each of these proposed priorities can be matched with adequate measures, regarding e.g. the improvement of entrepreneurial or knowledge base in the case of BEQ (e.g. industrial zones projects) and in the case of IPC and UHR mainly support for education and creation of innovations or creation of new labour positions and workforce requalification. In harmony with the results application those measures which contribute to the development of integration processes should be preferred – especially support for the development axes of national/ /supranational and regional significance including business clusters, which are understood as a dynamic part of this processes. An identification of the function of the particular hierarchic levels allows for defining the optimum territorial framework for an assessment of potential impacts of specific measures or projects. For measures related to the UHR component, this framework is the microregional level; for measures related to the BEQ component, it is the regional level; and for measures related to the IPC component it is the macroregional level.

The definitive form of the regional policy can only be elaborated after a consensus among the main stakeholders. In this context, we have to emphasise that efficiency of its implementation is, besides creativity and entrepreneurial spirit of support receivers, considerably determined by the quality of institutional environment. It is also necessary to mention the indisputable fact that a significant condition for the permanent enhancement of regional policy efficiency is removal of relevant information deficits. In this respect we reach a positive conclusion that the elaborated model is transferrable, especially to be applied in more developed countries with polycentric settlement structure and a relevant tradition of regional policy.

References

[1] BACHTLER, J., DOWNES, R. Regional policy in the Transition Countries: A Comparative Assessment. *European Planning Studies*. 1999, Vol. 7, Iss. 6, pp. 793-808. ISSN 0965-4313.

[2] BRUNDTLAND, G. *Our Common Future.* Oxford: Oxford University Press, 1987. ISBN 019282080X.

[3] COLOMBELLI, A., FODDI, M., PACI, R. *The knowledge regions in the enlarged Europe. Working Paper.* Cagliari: CRENoS, University of Cagliari and Sassari, 2011.
[4] ČSÚ. *Věda a výzkum v regionálním pohledu*. Praha: Český statistický úřad, 2007.
[5] ČSÚ. *Inovační aktivity podniků v České republice v letech 2004-2006*. Praha: Český statistický úřad, 2008.
[6] EUROPEAN COMMISSION REGIONAL DEVELOPMENT STUDIES. *The Impact of the Development of the Countries of Central and Eastern Europe on the Community Territory*. Luxembourg: European Communities, 1996. ISBN 92-826-8802-X.
[7] EUROPEAN COMMISSION, CAMBRIDGE ECONOMETRICS. *Aggregate and Regional Impact – Regional Growth and Convergence.* Luxembourg: European Communities, 1997. ISBN 92-827-8806-7.
[8] EUROPEAN COMMISSION. *Sixth Periodic Report on the Social and Economic Situation and Development of Regions in the European Union*. Brussels: European Communities, 1999.
[9] EUROPEAN COMMISSION. *European Union Foreign Direct Investment Yearbook.* Luxembourg: European Communities, 2001. ISBN 92-894-0644-5.
[10] HÄGERSTRAND, T. Space, time and human conditions. In: KARLQVIST, A., LUNDQVIST, L. and SNIKARS, F. (eds.). *Dynamic allocation of urban space.* Farnborough: Saxon House, 1975. ISBN 978-0347010528.
[11] HAMPL, M. Teorie strukturální a vývojové organizace geografických systémů: principy a problémy. *Studia geographica.* 1988, Iss. 93, pp. 1-78. ISSN 0587-1247.
[12] HAMPL, M. *Geografická organizace společnosti v České republice: transformační procesy a jejich obecný kontext.* Praha: Karlova univerzita, 2005. ISBN 80-86746-02-X.
[13] HIRSCHMAN, A. *The Strategy of Economic Development.* New Haven: Yale University Press, 1958. ISBN 0813374197.
[14] CHRISTALLER, W. *Die zentralen Orte in Süddeutschland.* Jena: Gustaf Fischer, 1933.
[15] ISARD, W. *Introduction to Regional Science.* New York: Prentice-Hall, 1975. ISBN 0134938410.
[16] KLAASSEN, I. *Exercises in Spatial Thinking: Case Studies of Regional Development Issues.* Aldershot: Avebury Grower Company, 1988. ISBN 0566057107.
[17] KRUGMAN, P. *Geography and Trade*. Cambridge: MIT Press, 1991. ISBN 02620111594.
[18] LUCAS, R. On the mechanics of economic development. *Journal of Monetary Economics*. 1988, Vol. 22, Iss. 1, pp. 3-42. ISSN 0304-3932.
[19] LUNDVALL, B. *National systems of innovation: towards a theory of innovation and interactive learning.* London: Pinter, 1992. ISBN 1843318660.
[20] MASSEY, D. A Critical Evaluation of Industrial--Location Theory. In: HAMILTON, F., LINGE, G. (eds.). *Spatial Analysis, Industry and the Industry Environment.* New York: Wiley, 1979. ISBN 0471997382.
[21] MCCANN, P. *Urban and Regional Economics.* Oxford: Oxford University Press, 2001. ISBN 978-0-19-877645-1.
[22] MYRDAL, G. *Economic Theory and Underdeveloped Regions.* London: Duckworth, 1957.
[23] NETHERLANDS ECONOMIC INSTITUTE in co-operation with Ernst & Young. *New Location Factors for Mobile Investment in Europe.* Brussels--Luxembourg: Office for Official Publications of European Communities, 1993. ISBN 9282658597.
[24] PERROUX, F. Note sur la notion de pole de croissance. *Economique Applique.* 1955, Iss. 1-2, pp. 307-320.
[25] POMERY, Ch. *Zpráva o zahraničních investicích ve výrobním sektoru České republiky.* Praha: CzechInvest, 1998.
[26] PORTER, M. Competitive Advantage, Agglomeration Economies and Regional Policy. *International Regional Science Review.* 1996, č. 1, s. 85-94. ISSN 0160-0176.
[27] ROMER, P. Increasing Returns and Long-Run Growth. *Journal of Political Economy.* 1986, Vol. 94, Iss. 5, pp. 1002-1037. ISSN 0022-3808.
[28] SOLOW, R. A contribution to the theory of economic growth. *Quarterly Journal of Economics.* 1956, Vol. 70, Iss. 1, pp. 65-94. ISSN 0033-5533.
[29] VITURKA, M. Regionální disparity a jejich hodnocení v kontextu regionální politiky. *Geografie.* 2012, Vol. 115, Iss. 2, pp. 131-143. ISSN 1212-0014.

doc. RNDr. Milan Viturka, CSc.
Masaryk University
Faculty of Economics and Administration
Department of Regional Economics
and Administration
viturka@econ.munic.cz

Abstract

INTEGRATIVE MODEL FOR EVALUATION OF DEVELOPMENT POTENTIALS OF REGIONS AND ITS APPLICATION ON AN EXAMPLE OF THE CZECH REPUBLIC

Milan Viturka

The aim of this paper is to introduce a new model for the evaluation of development potentials of regions, including methodology, application and conceptualization of the obtained information. The main components of this model are the business environment quality, innovation potential of companies and use of human resources, interpreted using relevant factors or indicators. The model has been applied to the evaluation of Czech regions – 205 administrative districts (microregional level) and 14 NUTS 3 regions (mesoregional level). Information capacity of the model has been proved by the confirmation of the hypotheses assuming strong relationships among business environment quality and regional GDP and population size of regions. A synthesis allowed us to define the main regularities, evaluate the competitive positions of regions and create the spatial model of the economic development of the Czech Republic. Special attention has been given to the unique method for the identification of territorial systems of poles and axes of development and further to the hierarchy of integration processes (using the profile interaction method). Subsequently, we conceptualized the results from the perspective of regional policy creation using the method of development scenarios. This allows for a flexible optimization of the main priorities and tools of a regional policy (regions are defined and territorially specified by means of flexible sets of relevant measures). From a theoretical perspective, we extend the knowledge about the processes of polarization and integration as key manifestations of the principles of developmental and hierarchical differentiation of society in the conditions of increasing globalisation.

Key Words: *Regional development, business environment, innovation potential, human resources, competitiveness.*

JEL Classification: *R12, R15, R58.*

DOI: *10.15240/tul/001/2014-4-001*