Peripheral innovation systems in the Czech Republic at the level of the NUTS3 regions

Vladimir ZITEK, Viktorie KLIMOVA

Department of Regional Economics and Administration, Faculty of Economics and Administration, Masaryk University, Brno, Czech Republic

Abstract: Innovation is considered the main factor of social and economic development and the source of competitiveness of regions and countries. The research into innovation systems concentrates on innovative regions mainly and these are especially the metropolitan and urban areas. By contrast, a small attention is devoted to the innovation development in the peripheral or rural regions. The aim of the paper is to apply the theory of the regional innovation systems typology and to find relevant indicators that can be used as a basis for the determination of the peripheral regional innovation systems at the level of Czech regions. Applying the point method and the cluster analysis, it was found out that the definition of peripheral regions fits the best the regions Vysocina, Usti, South Bohemia and Karlovy Vary. In the peripheral regions, the strategy of catching up with the more developed regions is recommended for the innovation policy. These regions should focus on attracting external actors, supporting businesses to be founded, and generally, support small and medium-sized enterprises and links to external clusters and knowledge organizations. For innovations to develop in this type of regions, it is essential and of key importance to gain a long-term public support from the state or the regional government.

Keywords: cluster analysis, Czech regions, innovation, peripheral regions, point method

Innovation is currently considered the main factor of the social and economic development and the key advantage of developed regions and states. Innovation can be defined as the implementation of a new or significantly improved product (goods or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations. The minimum requirement for an innovation is that the product, process, marketing method or organisational method must be new (or significantly improved) to the firm. Innovations were realized if they had been launched to the market or used in the production or distribution process (OECD 2005). It follows that innovations are subdivided to product, process, marketing and organizational innovations. The research into this field mainly focuses on the factors that motivate or by contrast inhibit the development of innovations. However, the main attention is devoted to the regions that are considered leaders in the field of innovations, such as the Silicon Valley in the USA (e.g. Saxenian 1999), Baden-Württemberg in Germany (Cooke et al. 2000; Koch 2013), Noord Brabant in the Netherlands (Lagendijk and Boekema 2008), Tampere in Finland (Kautonen 2006) etc., i.e. mostly metropolitan or urban areas. In contrast, the researchers only devote

small attention to peripheral or rural regions. These regions achieve a lower innovation performance but they also need to strengthen their competitiveness and the support from the state is thus even more important for them. However, recently, the focus of the global research has shifted to the issue of innovation in these peripheral and rural regions. There have been studies on e.g. general options of the innovation development in peripheral regions (Doloreux and Dionne 2008), innovative small and medium-sized enterprises (Varis and Littunen 2012), the creation of innovation networks in rural regions (Esparcia 2014), the cooperation (Grillitsch and Nilsson 2015), the support for research centres (Hewitt-Dundas and Roper 2011), or the innovation in sectors typical of the peripheral regions (Arias-Aranda and Romerosa-Martínez 2010; Mezera et al. 2014). Such studies usually asses a number of innovative companies, expenditures for the innovation and research and development, revenues from innovative products, the public support of innovations, the number of cooperative innovative projects, the presence of universities and research centres and so on.

Before we can give recommendations for the innovation support in the peripheral or rural regions, we need to define them. Many regional analyses focus

on the evaluation of the quantitative and qualitative features of the particular territories and, based on them, search for "clear" types of regions, such as the rural or urban regions. It is often difficult to set boundaries for such definitions (Binek et al. 2007). In spite of this, we are of the opinion that when a combination of methods is used, we can find some regional types.

Peripheral and rural regions are usually characterized by an environment unfavourable for the innovation development and the lack of dynamics, actors, support organizations, which aid innovation and technological changes. Research (including publicly supported research) and specialized services (e.g. technology transfer) are not sufficient in them. From the perspective of the general social and economic features, these regions typically have a large proportion of rural inhabitants, a low population density, a low rate of economic activity, high employment in the primary sectors, or an industry oriented at low-tech sectors. (Doloreux and Dionne 2008)

The research, results of which are presented in this paper, is especially based on the concept of innovation systems, which is a significant part of the modern institutional theories of regional development. The concept of innovation systems has been elaborated at the national (e.g. Freeman 2002; Lundvall 2010), regional (e.g. Cooke et al. 1997) and sectoral (e.g. Malerba and Orsenigo 1997) levels. The current form of many public policies (regional policy, innovation policy, etc.) is affected especially by the thoughts of the regional innovation systems. The spatial proximity allows for an establishment of a unique competitive advantage as it facilitates sharing of tacit knowledge, cooperation, learning from each other, establishing formal and informal relationships, and sharing of infrastructure. This concept emphasizes that each region has its own unique features, history, and prerequisites for the innovation development. From the perspec-

tive of system failures at the regional level, several deficiencies of the regional innovation systems can be defined. They include mainly the organizational thinness, the lock-in effect, and fragmentation (Trippl et al. 2015). On this basis, three types of incomplete (problem) regional innovation systems were defined: peripheral regions, old industrial regions, and metropolitan (fragmented) regions (Tödtling and Trippl 2005). Tödtling and Trippl based their classification on the system failures, defined by Isaksen (2001) as the failures inhibiting innovation activities (Table 1).

The particular types of regions differ especially by the number and structure of companies and knowledge organizations, the sector structure of the economy, clusters, and the institutional background (Tödtling et al. 2013). It is assumed that most of the European regions struggle with some of these problems and their regional innovation systems can be thus described as incomplete (Adámek et al. 2007).

The listed deficiencies should be understood as the dominant, not the only problems in these types of regions. Regions are in fact faced with a greater range of deficiencies or innovation deficits, which together make up a certain combination. The following text elaborates on the innovation deficits in peripheral regions in detail. Their basic overview is presented in Table 2.

Organizational thinness in peripheral regions means that the key elements of regional innovation systems are missing or are present to a small extent. In particular, there is a weak representation of clusters and an insufficient presence of key organizations. Key organizations are innovative companies which are critically missing in the region, and other organizations such as universities, research institutes or supporting organizations. (Trippl et al. 2015) Knowledge providers are less specialised and are not linked to each other through networks. Peripheral regions are also characterized by a low (below-average) level of

Table 1. Classification of barriers to regional innovation systems

The problem of the regional innovation system	The main problem	A typical problem region
Organizational thinness	Lack of relevant local actors	Peripheral areas
Fragmentation	Lack of regional cooperation and mutual trust	Metropolitan regions, some regional clusters
Lock-in	Regional industry specializes in obsolete technologies	Old industrial regions and peripheral areas built on the acquisition of raw materials

Source: Isaksen (2001), adapted

Table 2. Problem areas and deficiencies of peripheral regional innovation systems

Enterprises and regional clusters	
Characteristics/problems of clusters	Clusters are often missing or weakly developed
	Dominance of SMEs
Innovative activities	Low level of R&D and product innovations, emphasis on incremental and process innovations
The creation and dissemination of knowledge	
University/research organizations	Few or low level
Education/training	Emphasis on low to medium qualifications
Knowledge transfer	Some services are available, but generally in a thin structure; lack of more specialized services
	Often too small orientation at demand
Networks	
Characteristics/problems of networks	Few in the region due to the weak clustering and the thin institutional structure

Source: Tödtling and Trippl (2005)

research and development, innovation and patenting activities. This is partly due to the dominance of small and medium-sized enterprises, and large companies which only have branches in these regions, not their headquarters. Innovations are rather of an incremental and process character. There are innovative companies, but not enough for the dynamic development of clusters. If there are some clusters, they are formed for traditional industries with a low level of research and innovation activities. The low level of research leads to a low absorption capacity of the companies, which may result in the insufficient absorption of interregional knowledge flows and public support for innovation. (Tödtling and Trippl 2005) In other words, a regional innovation paradox occurs in these regions. The regional innovation paradox expresses a state when some regions with a lower innovation performance and higher investment needs exist but at the same time, these regions are not able to gain the offered resources. (Klímová and Žítek 2015) There may be organizations for the technology transfer in the regions, but they often do not work well enough or their services do not reflect the demand of companies. Workers with low and medium qualifications are easily available for the employers, but there is a lack of workers with specialized qualifications. (Tödtling and Trippl 2005) It should be noted that the structure of social capital in the region, which has a considerable influence on the development of the territory, is historically conditioned (Majerová et al. 2011); therefore, its change is a long-term process.

The examples of peripheral regions in Europe often mentioned are Centro, Portugal; Mezzogiorno, Italy; Salzburg, Austria; Seinajoki, Finland; Twente, the Netherlands, or Hultsfred, Sweden (Adámek et al. 2007).

DATA AND METHODS

Based on the theories described above, we can now define the peripheral regional innovation systems (RIS) at the level of the Czech regions. All other steps are based on the approach presented by Tödtling and Trippl (2005). For this purpose, it is necessary to select the statistical indicators that, either directly or in the converted form, will characterize the particular peripheral RIS, as assumed by the concept presented. It is important to get such a range of indicators that will represent this type of regions in a sufficiently comprehensive way.

The aim of this paper is to apply the theory of the RIS typology and to find relevant indicators that can be used as a basis for the determination of peripheral regional innovation systems at the level of Czech regions. Using a variety of methods, these indicators will serve for the identification of peripheral regional innovation systems. In particular, the usage of the point method seems to be appropriate – this method ranks the regions based on the cumulative score – in combination with the cluster analysis, thanks to which it is possible to define groups of similar regions, or

to classify as peripheral also those regions where the result of the point method is not clear.

Most of the selected indicators are converted so that the regions could be compared at the level of each of the indicators. However, in some cases such a conversion makes no sense; therefore, absolute values are used. The indicators are primarily taken from the sources of the Czech Statistical Office (2013a, b, 2014) and subsequently converted. Further, the data of the CzechInvest (2014) are used. The indicators on the representation of the particular industries in the regions are taken from the Albertina database (2014). The sample includes trading companies with 10 or more employees with the predominant activity in the sector concerned. All data are as of the end of 2012, only the statistics on innovation activates (Czech Statistical Office 2014) are based on the 3-year reference period 2010–2012.

The following ten indicators have been chosen as the characteristics or features of peripheral regions:
– population density per km^2 (DEN),
– the number of research and development centres per 100 000 inhabitants (RDC),
– the amount of public subsidy granted under the scheme Innovation and Potential programs (OPPI) in CZK per 1 inhabitant[1] (SUB),

– the expenditures for technical innovations in CZK per 1 inhabitant (ETI),
– the number of technically innovative companies (TIC),
– the share (%) of employees with university degrees in the total number of the employed in – the national economy (UDE),
– the share (%) of the employed in agriculture in the total number of the employed in the national economy (AGR),
– the total expenditures for research and development carried out in the Czech Republic (the government, university, corporate, and non-profit sectors included) expressed as a percentage (%) of GDP (ERD),
– the share (%) of urban population in the total population (URB),
– the share (%) of businesses in low-tech (NACE 10–18) industrial sectors in the total number of businesses in the manufacturing industry (LTI).

The indicators AGR and LTI are assumed to reach high values ("more is better") in terms of the characteristics of peripheral regions. All the other indicators are assumed to reach low values ("less is better"). The values of these indicators are listed in Table 3.

Table 3. Evaluation indicators of peripheral regions

Code	Region	DEN	RDC	SUB	ETI	TIC	UDE	AGR	ERD	URB	LTI
CZ010	Prague	2 513	5.47	x	16 824	445	39.09	0.4	2.67	100.0	3.68
CZ020	Central Bohemia	117	1.94	3 033	13 849	333	19.79	2.6	1.45	45.3	7.74
CZ031	South Bohemian	63	1.76	1 310	6 672	223	17.55	6.0	1.30	50.2	10.61
CZ032	Pilsen	76	2.08	1 912	11 900	233	19.12	3.9	2.03	53.9	8,24
CZ041	Karlovy Vary	91	0.73	1 316	2 582	67	13.23	2.4	0.26	60.3	8.49
CZ042	Usti	155	1.24	1 217	6 635	207	13.76	2.5	0.46	68.9	8.21
CZ051	Liberec	139	2.05	2 547	8 962	215	16.41	2.0	2.29	53.7	8.62
CZ052	Hradec Kralove	116	2.42	3 529	3 432	158	17.43	3.6	0.92	51.4	8.73
CZ053	Pardubice	114	2.77	3 155	6 978	211	14.99	5.1	1.86	53.1	9.53
CZ063	Vysocina	75	1.72	2 325	7 242	214	15.78	7.6	0.59	55.9	13.15
CZ064	South Moravian	162	3.99	2 355	7 285	477	24.78	3.3	3.63	53.8	7.82
CZ071	Olomouc	121	2.10	1 982	6 127	208	17.68	5.9	1.96	52.1	9.73
CZ072	Zlin	148	2.92	3 795	8 373	372	16.64	2.8	1.22	47.5	9.11
CZ080	Moravian-Silesian	226	2.16	1 777	10 249	321	18.14	2.1	1.17	64.8	6.22

Source: Czech Statistical Office (2013a, 2013b, 2014), CzechInvest (2014), Albertina (2014), recalculated, authors' elaboration

[1]For Capital City Prague, the evaluation considers the maximum value of subsidy, which in the sense of the peripheral regions definition reflects the fact that the entities in this region cannot apply for subsidies within these programs due to the level of development of this region.

With regard to the aim and nature of the indicators, which are expressed in different units and gain different values, it seems appropriate to use the point method. However, since its results are to a large extent affected by the potential major differences in the values of one or more indicators, it can be further combined with the cluster analysis.

The point method (M. K. Bennett is usually presented as the author of it) is based on finding the region which in the case of the analysed indicator reaches the maximum or the minimum value (Kutscherauer et al. 2010; Jílek 1996). The minimum value is relevant if the indicator decline is considered positive (the less, the better); the maximum value in the opposite case, an increase in the indicator value is positive. (Melecký and Staníčková 2011)

The point value of the specific indicator is set:

– For Capital City Prague, the evaluation considers the maximum value of subsidy, which in the sense of the peripheral regions definition reflects the fact that the entities in this region cannot apply for subsidies within these programs due to the level of development of this region.

– in the case of the maximum using equation

$$B_{ij} = \frac{x_{ij}}{x_{i\,max}}$$

– in the case of the minimum using equation

$$B_{ij} = \frac{X_{i\,min}}{x_{ij}}$$

where B_{ij} is the point value of the *i*-th indicator for the *j*-th region, x_{ij} is the value of the *i*-th indicator for the *j*-th region, $x_{i\,max}$ represents the maximum value of the *i*-th indicator and $x_{i\,min}$ is the minimum value of the *i*-th indicator.

The region with the maximum (minimum) value of the indicator is assigned with a certain number of points within the point evaluation of each (100 in the calculations carried out here); other regions are rated according to their indicator values (0–100). The main advantage of this method is the possible establishment of integrated indicators – a group of indicators expressed in different units is summarized in one characteristic, a dimensionless quantity (Kutscheraurer et al. 2010).

The point values of the individual parameters can further be used as data for the cluster analysis. By means of this analysis, regions can be grouped into clusters based on their resemblances (e.g. Poledníková and Lelková 2012). Non-hierarchical clustering is used; specifically, for this purpose, the method of k-means with the Euclidean distances is appropriate.

RESULTS AND DISCUSSION

The values of the indicators are converted using the point values so that the maximum value of 100 points corresponds to the minimum or the maximum value, depending on the expected interpretation (whether less or more is the better) of the indicator for the peripheral RIS.

The evaluation of peripheral regions (Table 4) significantly points out the Karlovy Vary Region, which reached 833 points out of 1000 possible (it gained the maximum of 100 points in five indicators). Another region with a high total score is the Vysocina Region (655 points). The following two regions above average are the South Bohemian and Usti nad Labem Regions. These four regions appear as peripheral; the resemblances have to be investigated in the case of her regions. At the other end of the evaluation, there are regions Capital City Prague, the South Moravian and the Moravian-Silesian Region, which therefore cannot be considered peripheral.

In order to decide which regions are peripheral, it is necessary to conduct still another analysis. For this purpose, the cluster analysis seems to be suitable. It relatively reliably distributes regions into clusters based on their similarities. The hierarchical method of k-means with the Euclidean distances is used. A prerequisite for this method is to set the number of clusters the regions should form. With regard to the results of the point method and within the pursuit of a highly accurate distribution, a higher number of clusters should be considered. We have chosen the distribution into six clusters.

In the case of six clusters, the situation is as follows (the ranking of the clusters is subjected to the mean values of the point score of the sub-indicators in the individual clusters):

– 1st cluster – Karlovy Vary Region,
– 2nd cluster – Usti nad Labem Region,
– 3rd cluster – South Bohemian and Vysocina Region,
– 4th cluster – Pilsen, Hradec Kralove, Pardubice and Olomouc Regions,
– 5th cluster – Central Bohemia, Liberec, South Moravian, Zlin and Moravian Silesian Regions,
– 6th cluster – Capital City Prague.

The results of the cluster analysis show that the regions in the first, second and third clusters can be

Table 4. The results of the evaluation of the peripheral regions – the point method

Code	Region	DEN	RDC	SUB	ETI	TIC	UDE	AGR	ERD	URB	LTI	Total
CZ041	Karlovy Vary	69	100	92	100	100	100	32	100	75	65	**833**
CZ063	Vysocina	84	42	52	36	31	84	100	44	81	100	**655**
CZ031	South Bohemian	100	41	93	39	30	75	79	20	90	81	**648**
CZ042	Usti	41	59	100	39	32	96	33	57	66	62	**585**
CZ071	Olomouc	52	35	61	42	32	75	78	13	87	74	**549**
CZ052	Hradec Kralove	54	30	34	75	42	76	47	28	88	66	**543**
CZ053	Pardubice	55	26	39	37	32	88	67	14	85	72	**516**
CZ032	Pilsen	83	35	64	22	29	69	51	13	84	63	**512**
CZ051	Liberec	45	36	48	29	31	81	26	11	84	66	**457**
CZ072	Zlin	43	25	32	31	18	79	37	21	95	69	**451**
CZ020	Central Bohemia	54	38	40	19	20	67	34	18	100	59	**448**
CZ080	Moravian-Silesian	28	34	68	25	21	73	28	22	70	47	**416**
CZ064	South Moravian	39	18	52	35	14	53	43	7	84	60	**406**
CZ010	Prague	3	13	32	15	15	34	5	10	45	28	**200**

Source: authors' elaboration

definitely considered peripheral. The fourth cluster consists of regions with the score corresponding to the fifth to eighth position in the ranking. It can be therefore concluded that these regions represent a transitional type – the characteristics of the peripheral regions do not reach highly conclusive values. Figure 1 shows the peripheral regions.

The innovation policy can be specifically aimed based on the definition of peripheral regions. The strategy recommended for them is to learn by catching up, to attract external companies (and to make the effort at their rooting in the region), to support the establishment of innovative companies and to support the linking of innovative companies to external clusters and knowledge organizations (Tödtling and
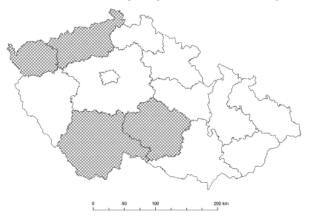

Figure 1. Peripheral regions

Source: authors' elaboration

Trippl 2005). Their insufficiency of the R&D human capital and technological know-how can be complemented by foreign investments (Blažek and Šafrová Drášilová 2013). Disparities in development can be most effectively reduced through specific programs (Viturka 2010). It is obvious that a targeted public support always leads to the desired effect in the form of a quantitative increase in outputs of the activities supported (e.g. Chen et al. 2015). However, the key question is the sustainability of the effects in the peripheral and rural regions after their public support finishes (Hewitt-Dundas and Roper 2011; Esparcia 2014). Recommendations for the innovation policy in peripheral regions are shown in Table 5.

Peripheral regions (Karlovy Vary, Vysocina, Usti and South Bohemian) have a relatively little or no research tradition. This is especially true of the sectors that drive the current economic development and are able to create innovations. Similarly, this applies to education. In České Budějovice (South Bohemian Region) and Ústí nad Labem (Usti Region), there are public universities which have the potential for the application sphere; however, it is limited to a large extent. Jihlava (Vysocina Region) has a relatively young public university without traditions and experience; there is no public university in the Karlovy Vary Region. Therefore, the innovation policy must primarily focus on attracting companies with their own research platforms, or seek to provide seat to branches of other national research institutions. However, mainly the

Table 5. Recommendations for the innovation policy in peripheral regions

The strategic orientation of the regional economy	Strengthening/upgrading of the regional economy
Innovation strategy	Learn by catching up (organizations, technologies) Improve strategic and innovative capacities of SMEs
Company and regional clusters	Strengthen potential clusters in the region Link companies with clusters outside the region Attract innovative companies Found new companies
Knowledge providers	Attract branches of national research organizations with relevance to the regional economy
Education/skills	Train skills to an intermediate level (e.g. technical faculties, technical schools, management schools) Plans (programs) of mobility (e.g. "innovation assistants" for SMEs)
Networks	Companies' links to knowledge providers and technology transfer agencies in the region and outside, demand oriented approach:

Source: Tödtling and Trippl (2005)

orientation to the promotion of innovative SMEs, their networking, in particular in the form of clusters – both regional and supra-regional (connection of SMEs in the region to functioning clusters outside the region) – and the connection to external research and training (cooperation) are of a key significance.

Additionally, the support for research centres, both public and private, is recommended for the peripheral regions. Empirical studies (e.g. Hewitt-Dundas and Roper 2011 or Doloreux and Dionne 2008) show that the support should be equally balanced between the two types of research centres. The support for universities brought greater effects in the terms of technology changes, but they were not sustainable in the long term. By contrast, support for private centres brought a rather incremental strengthening of the existing technological capacities, but the obtained effects are sustainable. From the perspective of technological novelty and sustainability, support for collaborative projects between universities and the industry which will have a long-term character (horizon of 10 to 15 years) seems to be the most appropriate. (Hewitt-Dundas and Roper 2011) Companies in the innovative regions are innovative only to the extent to which they are able to compensate for the deficiencies of the peripheral innovation systems by a mutual cooperation (Grillitsch and Nilsson 2015; Doloreux et al. 2007). However, the process of support granting must sufficiently consider the unique features of each region and its real potential. For example, the support provider must assess whether in the given term a sufficient number of researchers and qualified employees will be available; or whether the region has other prerequisites for research in the

given sector. Research should be promoted in the sectors that have a tradition in the region, such as agriculture or the food industry.

To sum up the above listed recommendations, the development of innovation systems in peripheral regions is not possible without adequate public resources that will strengthen the local and regional knowledge networks in the context of global knowledge networks. The support for local talents, good infrastructure and links with external actors is essential. Additionally, a mutual proximity (geographical, cognitive, and institutional) is important for innovations; therefore, the mobility should be supported as it is necessary to overcome the physical and other forms of distance. (Lagendij and Lorentzen 2007) The role of public organizations and the public support as the drivers of innovation processes and economic changes in the peripheral regions is irreplaceable (Doloreux and Dionne 2008).

CONCLUSION

Peripheral regions are characterized by an environment unfavourable for innovation development and lack of dynamics, actors, support organizations, which aid innovation and technological changes. The aim of this paper was by applying the theory of the Regional innovations system typology to find relevant indicators characterized peripheral regions and identify this type of region at the level of Czech NUTS3 regions.

In the Czech Republic four regions can be considered peripheral: Karlovy Vary, Vysocina, Usti and South

Bohemian. These regions have a little or no research tradition and similarly, this applies to education. The innovation policy can be specifically aimed based on the definition of peripheral regions. We recommend them to learn by catching up, attract external companies, found new companies and support the linking of innovative companies to external clusters and knowledge organizations, in particular. In other words, the innovation policy must primarily focus on attracting companies with their own research platforms, or seek to provide seat to branches of other national research institutions. The development of innovation systems in peripheral regions is not possible without adequate public resources.

REFERENCES

Adámek P., Csank P., Žížalová P. (2007): Regionální inovační systémy a jejich veřejná podpora. (Regional innovation systems and their public support.) CES VŠEM, Praha.

Albertina (2014): Databáze firem a institucí ALBERTINA CZ Gold Edition. (Database of companies and institutions ALBERTINA CZ Gold Edition.) Bisnode, Praha. [DVD database]. (Accessed Nov. 2014).

Arias-Aranda D., Romerosa-Martínez M.M. (2010): Innovation in the functional foods industry in a peripheral region of the European Union: Andalusia (Spain). Food policy, 35: 240–246.

Binek J., Toušek V., Galvasová I., Věžník A., Kunc J., Seidenglanz D., Halásek D., Řehák S. (2007): Venkovský prostor a jeho oživení. (Rual area and its recovery.) GaREP, Brno.

Blažek L., Šafrová Drášilová A. (2013): Nadnárodní společnosti v České republice. Vývojové trendy, organizace a řízení, kultura a odpovědnost. (Multinational companies in the Czech Republic: trends, organization and management, culture and responsibility.) C.H. Beck, Praha.

Cooke P., Boekholt P., Tödtling F. (2000): The Governance of Innovation in Europe. Pinter, London and New York.

Cooke P., Uranga M.G., Etxebarria G. (1997): Regional innovation systems: Institutional and organisational dimensions. Research policy, 26: 475–491.

Czech Statistical Office (2013a): Statistické ročenky krajů 2013. (Statistical yearbooks of the Czech regions 2013.) CZSO, Praha. Available at www.czso.cz (accessed Sep. 2014).

Czech Statistical Office (2013b): Ukazatele výzkumu a vývoje podle krajů České republiky 2005–2012. (Research and development indicators of the Czech Regions 2005–2012.) CZSO, Praha. Available at www.czso.cz (accessed Sep. 2014).

Czech Statistical Office (2014): Inovační aktivity podniků v ČR – 2010 až 2012. (Innovation activities of enterprises in the Czech Republic 2010–2012.) CZSO, Praha.

CzechInvest (2014): Statistika čerpání dotací z programů OPPI. (Statistics of drawing subsidies from OPEI programs.) CzechInvest, Praha. Available at www.czechinvest.cz (accessed Dec. 2014).

Doloreux D., Dionne S. (2008): Is regional innovation system development possible in peripheral regions? Some evidence from the case of La Pocatière, Canada. Entrepreneurship and Regional Development, 20: 259–283.

Doloreux D., Dionne S., Jean B. (2007): The evolution of an innovation system in a rural area: the case of La Pocatiere, Quebec. International Journal of Urban and Regional Research, 31: 146–167.

Esparcia J. (2014): Innovation and networks in rural areas. An analysis from European innovative projects. Journal of Rural Studies, 34: 1–14.

Freeman C. (2002): Continental, national and sub-national innovation systems – complementarity and economic growth. Research policy, 31: 191–211.

Grillitsch M., Nilsson M. (2015): Innovation in peripheral regions: Do collaborations compensate for a lack of local knowledge spillovers?. The Annals of Regional Science, 54: 299–321.

Hewitt-Dundas N., Roper S. (2011): Creating advantage in peripheral regions: The role of publicly funded R&D centres. Research Policy, 40: 832–841.

Chen Y.-H., Wan J.-Y., Wang C. (2015): Agricultural subsidy with capacity constraints and demand elasticity. Agricultural Economics – Czech, 61: 39–49.

Isaksen A. (2001): Building regional innovation systems: is endogenous industrial development possible in the global economy? Canadian Journal of Regional Science, 24: 101–120.

Jílek J. (1996): Metody mezinárodního srovnávání. (Methods of international comparing.) Vysoká škola ekonomická, Praha.

Kautonen M. (2006): The Regional Innovation System Bottom-up: A Finnish Perspective. [Academic dissertation.] University of Tampere, Tampere.

Klímová V., Žítek V. (2015): Inovační paradox v Česku: ekonomická teorie a politická realita. (Innovation paradox in the Czech Republic: economic theory and political reality.) Politická ekonomie, 2015: 147–166.

Koch A. (2013): In a Nutshell: Innovation in Baden-Württemberg. In: International Seminar on Knowledge and

Innovation. Barcelona: Association of Catalan Public Universities, Barcelona.

Kutscherauer A. et al. (2010): Regionální disparity v územním rozvoji České republiky – pojetí, teorie, klasifikace a hodnocení. (Regional disparities in territorial development of the Czech Republic – conception, theory, classification and evaluation.) VŠB-TU Ostrava, Ostrava.

Lagendijk A., Boekema F. (2008): Global circulation and territorial development: South-East Brabant from a relational perspective. European Planning Studies, 16: 925–939.

Lagendijk A., Lorentzen A. (2007): Proximity, knowledge and innovation in peripheral regions. On the intersection between geographical and organizational proximity. European Planning Studies, 15: 457–466.

Lundvall B.A. (2010): National Systems of Innovation. Toward a Theory of Innovation and Interactive Learning. Anthem Press, London.

Majerová V., Kostelecký T., Sýkora L. a kol. (2011): Sociální kapitál a rozvoj regionu. (Social Capital and Regional Development.) Grada Publishing, Praha.

Malerba F., Orsenigo L. (1997): Technological regimes and sectoral patterns of innovative activities. Industrial and corporate change, 6: 83–118.

Melecký L., Staníčková M. (2011): Hodnocení konkurenceschopnosti regionů České republiky v kontextu Lisabonské strategie. (Evaluation of competitivenes of Czech regions in the context of the Lisbon Strategy.) Ekonomická revue, 14: 183–200.

Mezera J., Němec R., Špička J. (2014): Support of strengthening the cooperation and efficiency factors accelerating innovation processes in the food industry. Agriultural Economics – Czech, 60: 295–300.

OECD (2005): Oslo manual. The Measurement of Scientific and Technological Activities, Proposed Guidelines for Collecting and Interpreting Technological Innovation Data, 3rd ed. OECD, Paris.

Poledníková E., Lelková P. (2012): Evaluation of regional disparities in Visegrad Four countries, Germany and Austria using the cluster analysis. In: 15th International Colloquium on Regional Sciences. Conference Proceedings. Masarykova univerzita, Brno.

Saxenian A.L. (1999): Comment on Kenney and von Burg "Technology, Entrepreneurship and Path Dependence: Industrial Clustering in Silicon Valley and Route 128". Industrial and Corporate Change, 8: 105–110.

Tödtling, F., Skokan, K., Höglinger, C., Rumpel, P., Grillitsch, M. (2013): Innovation and knowledge sourcing of modern sectors in old industrial regions: comparing software firms in Moravia-Silesia and Upper Austria. European Urban and Regional Studies, 20: 188–205.

Tödtling F., Trippl M. (2005): One size fits all? Towards a differentiated regional innovation policy approach. Research Policy, 34: 1203–1219.

Trippl M., Asheim B. Miorner J. (2015): Identification of regions with less developed research and innovation systems. Center for Innovation, Research and Competences in the Learning Economy, Lund University, Lund.

Varis M., Littunen H. (2012): SMEs and their peripheral innovation environment: Reflections from a Finnish case. European Planning Studies, 20: 547–582.

Viturka M. (2010). Regional disparities and their evaluation in the context of regional policy. Geografie, 115: 131–143.

Contact address:

Viktorie Klimova, Department of Regional Economics and Administration, Faculty of Economics and Administration, Masaryk University, Lipova street 41a, 602 00 Brno, Czech Republic
e-mail: klimova@econ.muni.cz