ACTA UNIVERSITATIS CAROLINAE
2005 GEOGRAPHICA, Nos. 1–2, PAG. 89–108

The West-East gradient and regional development: The case of the Czech Republic

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Abstract

This paper empirically examines the role of West-East gradient (i.e. position of the regions of the Czech Republic in the European system) for regional development. The research is focused on the case of the Czech Republic. Despite problems with consistency of the data, the authors made an attempt to establish long-term time series of at least basic data covering the following spheres: demography, economy and social sphere. Data cover period up to 80 years, but particular emphasis was put on the transition period. The paper is organized as follows: Firstly, the question of relevance of geographic position for regional development of post-communist countries is introduced. Section II contains theoretical context of the research. Authors stress the subject versus structure dilemma and discuss two contrasting views on the role of geographic distance as they are presented in the relevant literature. Section III is dedicated to explanation of used methodology. Empirical outcomes are provided and discussed in section IV. Finally, section V includes conclusions. The results are rather varied, but the main conclusion is that despite a clear manifestation of the role of West-East gradient in several spheres, there is no fatalism (determinism) stemming from geographic position of the regions but quite a wide space for activity of individual actors.

1. Introduction

The post-communist countries in Central-East Europe have been under the process of transition from the command economy to the market economy for more than fifteen years. Despite different transition strategies employed in the particular countries, at the time of their accession into the European Union (in May 2004) they exhibited many similarities in their political, economic and institutional structures. From geographic point of view one of the most important common features of development of these countries is a significant sharpening of regional disparities in achieved level of socioeconomic development during the transition (see e. g. Hampl et al. 2001; Bachtler et al. 2000).

Among the main conclusions of many studies on regional development in post-communist countries is that one of the key factors of regional development in the period of transition is the geographic position of the regions (see Blažek, 2002; Dostál and Hampl, 2002; Illner, 2001; Bachtler et al. 2000; Gorzelak, 1996 etc.).

More specifically, in the case of the Czech Republic, Dostál and Hampl (2002) identified three basic factors of regional development during the transition period of which two relate to geographic position:

1) Principal importance is given to the position of the region (of its prime city) in national settlement hierarchy. It concerns the duality between metropolitan and rural regions including the differences in economic and social structures – e.g. educational structure of population.

2) Second key factor is macro-geographic position. Dostál and Hampl (2002) conceptualized this type of geographic position as a spatial distance of a region from the borders with more developed states and their regions – especially with Bavaria in Germany and Ober-östereich in Austria and also from Prague as a most important economic centre of the Czech Republic.

3) Inherited economic specialisation of a region is the third key factor. Its importance arises particularly in the regions, which were preferred under the communist period. Their economic structure was characterised by the largest share of non-competitive industries which products were absorbed by unsaturated markets of the command economies of COMECON countries. These old industrial regions dominated by branches of heavy industries were after the collapse of communism suddenly confronted with the need of the radical transformation of their economic, social and institutional structures.

In this article the authors focus on the examination of the role of horizontal geographic position (often called "West-East gradient") in the process of regional development. The second component of geographic position – the vertical geographic position (i.e. the position of the region and of its major centre in national settlement hierarchy) is controlled for by testing the relevance of West-East gradient to the same type of regions (i.e. metropolitan versus non-metropolitan regions).

There are several reasons to analyse significance of horizontal geographic position for regional development after the collapse of communism. After the World War II, countries in central-eastern Europe with traditionally westward orientation of economic and political ties were suddenly cut-off from their contacts with the most developed part of Europe. Afterwards, they experienced several decades of the command economy, which was artificially oriented towards the USSR and its satellites. One of the main proclaimed aims of communist countries was spatial equalisation of the level of social-economic development. The equalisation policy was seemingly successful as at the end of 1980's the former Czechoslovakia belonged to the countries with the smallest inter-regional differentiation of social-economic development not only in Europe, but even also in the whole world (Fuchs and Demko 1979). However, after the collapse of communism the traditional westward geopolitical and geo-economic orientation was swiftly renewed due to operation of market mechanisms and removal of redistributive policies. Therefore, one can consider central-eastern European countries as a unique laboratory for analysing trends and factors of regional development.

The main objective of this paper is to take the role of West-East gradient in the process of regional development under closer scrutiny. The authors believe that

Tab. 1 The rate of partial illiteracy according to historical lands (ordered in West–East direction) comprising Czechoslovakia in 1921.

Historical Land	**Rate of illiteracy %**
Bohemia	2.4
Moravia	3.1
Silesia	3.7
Slovakia	15.0
Carpathian Ukraine	50.2

Source: Census of population in 1921.

the Czech Republic is an especially suitable case due to its location in Central Europe between the "true West" and the "true East". Moreover, the Czech Republic represents the western part of the former Czechoslovakia, which was characterised with extreme scale of West-East gradient of social-economic development during the first half of the twentieth century (see Table 1).

Several basic hypotheses have been formulated at the outset of the research. Firstly, the authors assumed that the role of West-East gradient would manifest itself in a higher level of socioeconomic development in western regions with favourable geographic position and that its relevance would differ according to particular spheres and also in time. More specifically, a gradual weakening of relevance of West-East gradient, since the collapse of communism, was envisaged. The authors also expected that the role of West-East gradient should be stronger in case of new and/or progressive phenomena (e.g. financial services, foreign direct investment etc. – see Blažek 2004). Assumption, that there could be a partial shift in orientation of West-East gradient, represents the second main hypothesis. The authors expected the shift from traditional Northwest-Southeast direction (see Pavlík et al. 1986) to new axis in direction of Plzeň–Ostrava (i.e. nearly exactly from the West to the East) in respect to growing influence of West European core areas like Munich, Frankfurt, Paris or Brussels on the Czech Republic.

2. Research context

The study of the role of geographic position in the process of regional development is related at least to two fundamental dilemmas. First of them is the traditional dilemma in social sciences – the dilemma "agency versus structure" (e.g. Giddens 1984). The second dilemma concerns the role of geographic distance in general.

The conception of geographic position can be considered as a special kind of structural limitation/enhancement in the case of unfavourable/favourable geographic position of the particular regions. Every agency is influenced to a certain degree by its surrounding environment. If there are regularities in the geographic organization of society, then the position of a region, where given actor is located, can systematically influence the potential ways of development of this actor (see also concept of

Windows of Locational Opportunity e.g. Boschma and Knaap 1999). The region can be defined as a spatially bounded group of interrelated actors. Therefore, the position of a region (group of actors) in the macro-geographic system can be viewed as a structure in the sense of above mentioned dilemma. From this point of view the fundamental question sounds: To what extent is the role of geographic position in the process of regional development deterministic? In other words: How can actor operate regardless of its institutional and cultural milieu, in which it is embedded? In case of geographic systems, which are highly complex and open, one can not expect a high degree of determinism. Moreover, it is logical to anticipate significant spatial differences in the degree of determinism (cfr. controlling vs. controlled regions – see Friedmann 1972, or Massey 1984).

The second dilemma is the one about the role of geographic distance in contemporary world. Financial sector has undergone fundamental transformation in last decades. Rapid progress in information and communication technologies has led to development of new, sophisticated methods in various procedures of financial management (e.g. borrower-screening, risk-management etc.). These sophisticated techniques together with immense increase in capability of data processing have been facilitating standardization of various financial products. Due to extensive standardization, financial institutions are reaching substantial scale-economies gains. This encourages them to enter into geographically (in some cases also culturally) distant markets far removed from their headquarters and core business (Alessandrini et al. 2003: 23).

Therefore, in the continuing wave of liberalisation on world financial markets, many financial institutions have found themselves more capable to make business all over the world. As they are more and more becoming able to expand geographically, they are less and less perceptive to the role of distance.

With enduring neoliberal approach of key decision-makers in the world economy and together with conditions of time-space compression, global economic integration, and further expanding of information and communication technologies, the significance of distance is becoming less and less important also in non-financial industries. The best example of this fact is the growing pace of outsourcing in the world economy, which can be observed during the last decades.

On the other side, many hold the position that geography matters. According to some authors geography even matters more than hitherto: "…the globalisation of economic exchanges does not imply that geographic proximity loses its importance. On the contrary: regional, location-specific factors become even more important in the context of world-wide competition based on costs and innovativeness. This is proved by increasing regional differentiation of production and technological capabilities" (Archibugi et al. 1999, quoted in Cooke et al. 2004: 369). More generally: "…the greater the substantive complexity, irregularity, uncertainty, unpredictability and uncodifiability of transactions, the greater their sensitivity to geographical distance". (Storper and Scott 1995, quoted in Heidenreich 2004: 371).

In 1980's, an extensive research programme called Changing Urban and Regional System (CURS) took place in Britain. The overall objective of the pro-

gramme was to explore the impact of economic restructuring at national and local levels (Cooke et al. 1989). Consequent discussions often called "locality debate" pointed out that in the highly differentiated world many processes produce fundamentally different impacts in different regions. Almost any locality in the world is gradually becoming a part of international networks of production and trade.

The shift in the factors of global competitiveness, which was sparked by technological innovations, has induced rapid increase in importance of factors, which are deeply rooted (embedded) in local institutions (e.g. ability to innovate, networking etc.). Due to general trend of decreasing significance of transport costs (as a share of total costs) in production systems, there is decreasing importance of traditional resources (raw materials, sufficiency of labour force etc.), which the region is endowed with. Crucial importance is given to the ability of subjects, located in the region, to combine local tacit know-how with resources, which can be relatively cheaply imported, in the most efficient ways. Therefore, the capability of subjects in a region and the ways, how they organize production of innovations and knowledge, play fundamental role (see e.g. Mackinnon et al. 2002; Malmberg et al. 2000; Porter 1999). If there is significant spatial differentiation in such factors, geography still matters.

3. Data and methodology

Data

In order to examine more systematically the relevance of West-East gradient for contemporary regional development an extensive dataset of regional data has been compiled. A special focus has been paid on the transition period since the year 1989. The data were collected at the level of 77 districts – NUTS IV level. Data for higher geographical levels were calculated from them.

The authors refrained from analysing data on NUTS II level (8 cohesion regions) due to their limited number and due to the fact that shape of these single purpose planning units[1] does not allow sensible evaluation of West-East gradient. Older data (i.e. data related to years preceding year 1960 in which a major administrative reform has been executed) have been re-calculated on current administrative division.

The data were selected in order to cover the following spheres:

1) demography
2) social sphere
3) economy

[1] These regions have been established in 1999 only for the sake of implementation EU cohesion policy by artificial merging 1–3 self-governing regions.

On the basis of previous regional research undertaken by the authors of this article (Blažek 2004, 2001, 2000, etc.) and other authors dealing with regional development in post-communist countries (Dostál and Hampl 2002; Hampl et al. 2001, 1999; Bachtler et al. 2000; Gorzelak 1996) and on the basis of data availability, the following indicators of the level of demographic and socioeconomic development of the districts were selected:

1) life expectancy at birth (five year averages for periods 1981–1985, 1986–1990, 1991–1995, 1996–2000, separately for men and women) source: Czech Statistical Office,
2) infant mortality rate (three year averages for periods 1920–22, 1929–1931, 1949–1951, 1960–1962, 1969–1971, 1979–1981, 1990–1992, 1999–2001, source: calculated by Burcin (2003) on the basis of Czech Statistical Office data,
3) average wages for years 1967, 1975, 1982, 1989, 1996, 2000, 2004 source: Czech Statistical Office (CSO); data for 2004 are not fully comparable due to different methodology used by CSO from 2003,
4) share of economically active persons on working age population, years 1921, 1930, 1950, 1961, 1970, 1980, 1991, 2001, source: Censuses of population, Czech Statistical Office,
5) share of economically active persons working in tertiary sector, years 1921, 1930, 1950, 1961, 1970, 1980, 1991, 2001, source: Censuses of population, Czech Statistical Office,
6) index of education – calculated according to methodology outlined by Hampl (1996) as a share of people with secondary degree + double of share of persons with university degree on population older than 15 years, years 1921, 1930, 1961, 1970, 1980, 1991, 2001, source: Censuses of population, Czech Statistical Office,
7) unemployment rate, years 1933, 1938, 1994, 1997, 2000, 2004, source: Czech Statistical Office,
8) per capita tax revenues paid by physical persons, years: 1922, 1926, 1930, 1933, 1994, 1998, 2001, 2005 source: internal materials of Ministry of Finance,
9) economic aggregate (product of average wages and of number of working opportunities which can be interpreted as a proxy for GDP which is not available at the level of districts), years 1967, 1975, 1982, 1989, 1996, 2001; methodology is outlined in Hampl (2005, 2001, 1999); source: Censuses of population, Czech Statistical Office; Counties of the Czech Republic, Czech Statistical Office.

The selection of above given indicators has been constrained by need to guarantee sufficient consistency in data over the investigated period. Nevertheless, despite methodological problems and data limitations, the data covers at least basic demographic and socioeconomic spheres.

The aim of the research was to investigate the relevance of West-East gradient on selected key indicators of socioeconomic development. Calculations at macro-regional (historical lands), meso-regional (14 NUTS III units) and micro-regional (NUTS IV units) levels were realised and taken under scrutiny. On the basis of these results the following two levels were selected for the purpose of further research:

1. Macro-regional level.
2. Micro-regional level.

Macro-regional level is represented by historical division of the Czech Republic into two historical lands – Bohemia and Moravia[2]. The comparison of these historical lands gives us useful general information about the spatial distribution of given phenomenon in the Czech Republic. It can also signalize the potential of existence and also of the magnitude of the West-East gradient at micro-regional level. The role of West-East gradient is constantly accompanied by the effect of vertical geographic position (the hierarchical position of the city or region in the national settlement system). Therefore, the comparison between Bohemia and Moravia includes three different dimensions:

1. historical lands (comparison of Bohemia and Moravia),
2. metropolitan regions[3] (comparison of Bohemian and Moravian metropolitan regions),
3. non-metropolitan regions (comparison of Bohemian and Moravian non-metropolitan regions).

The resulting values for each category have been standardized by conversion into percentage of national average in order to allow mutual comparison of different data.

Micro-regional level is represented by 77 districts (NUTS IV level). It is necessary to cope with the effect of vertical geographic position also at this level. Therefore, districts are divided into two separate groups of units – metropolitan regions vs. non-metropolitan regions (see footnote nr. 3). The first group involves 13 metropolitan regions which are comprised by 24 districts (see figure 1 and appendix 1 for delimitation of metropolitan regions). The second group represents 53 non-

[2] The authors use title Moravia for area composed from historical lands Moravia and Silesia. These lands were not analysed separately since their size differs sharply.

[3] The delimitation of metropolitan regions was adopted from Hampl (2001) with one difference – Jihlava district was included into the group of metropolitan regions.

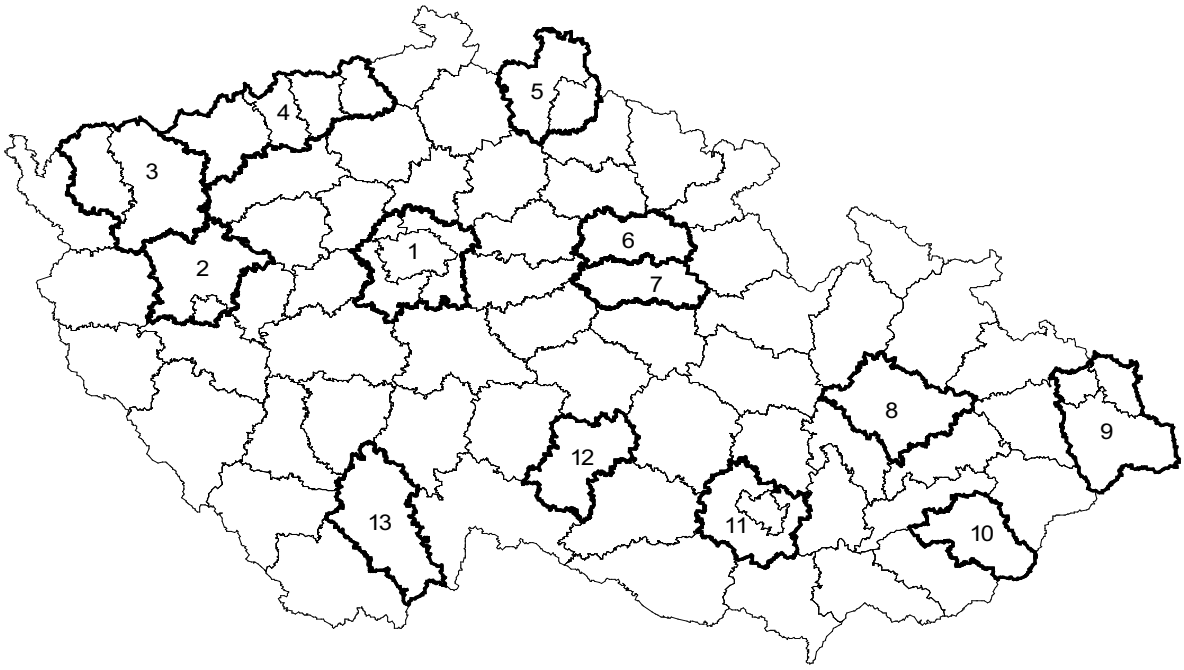

Fig. 1 Delimitation of the metropolitan regions in the Czech Republic. Source: Adjusted by the authors on the basis of Hampl (2001)

metropolitan districts. The West-East gradient is measured for each group of regions separately. This helps to moderate the effect of vertical geographic position. The existence of West-East gradient can be expected especially in the group of non-metropolitan regions where relatively similar (in terms of the regional system of the Czech Republic) spatial units are compared. On the other hand, in case of metropolitan regions a significant role of vertical geographic position can be expected.

The same method of measurement of West-East gradient was applied for both groups of regions. Firstly, the horizontal geographic position for each region was quantified. In line with proposed hypotheses of likely partial shift of direction of traditional Northwest-Southeast gradient two alternatives were quantified. The position of a given region in traditional northwest-southeast direction is expressed as the distance of regional centre from the state border with German region Sachsen[4]. The distance is expressed in kilometres (only motorways and first class roads are taken into account) from the nearest border-crossing localised at the given border. The same method is used to quantify the geographic position of a region in the "new" West-East direction of horizontal gradient. This new direction is measured from the border-crossings localised at state border with Bavaria. Values of geographic position were standardized on the scale 0–100 (the most remote region in given direction was given 100) in order to make comparison of assessed gradient.

[4] Sachsen is neighbouring region in direction from which developmental impulses diffused during the industrialization of the area of the Czech Republic during 19th century.

Secondly, all data collected at the level of individual districts or regions have been relativized by conversion into percentage of national average in order to allow mutual comparison of different data. The national average is not calculated as the arithmetical average of individual spatial units. It is represented by the value for the Czech Republic (i.e. unemployment rate of the Czech Republic was taken as the national average in case of unemployment). This relativization enables comparison of regions according to different characteristics. Standard deviation is used to express the magnitude of regional disparities. It can be also used for comparison, because the percentage of national average is the unit of standard deviation in all analysed indicators.

At this phase, graphs presenting the relation between value of individual indicators and horizontal position of individual regions were produced. These graphs depict the character of dependence between value of indicator in question and geographic position of a region. If one adds regression curve into the graph, the slope of the curve measures the magnitude of West-East gradient[5].

Thirdly, the slope of regression curve for each indicator is calculated. However, also the correlation coefficient was calculated in order to confirm the statistical dependence between geographic position in the sense of West-East gradient and given indicator. If the correlation is significant, the slope of regression curve expresses the magnitude of really existing gradient. This method can be used to compare magnitude of gradients among different indicators as well as between two different directions of horizontal gradients (i.e. West-East and Northwest-Southeast).

Fourthly, the standard deviation is calculated in order to catch the magnitude of regional disparities. The absence of gradient does not mean that significant regional disparities do not exist. Regional disparities can have the shape of either horizontal gradient or pattern of a mosaic.

This method is relatively crude, nevertheless, allows for obtaining generalized trends of changes of level of investigated phenomena with changing horizontal geographic position.

4. The empirical analysis of West-East gradient

The analyses have been performed for all above described variables and always for both macro-level (i.e. historical lands) and for micro-level (NUTS IV level). At micro-level metropolitan and non-metropolitan regions were analysed separately and in each case for both Northwest-Southeast and West-East directions. The performed analyses resulted in large number of graphical outputs, which are impossible to reproduce in full due to space limitations. Therefore, graphical outputs will be presented only for the most relevant results – either supporting or denying proposed hypotheses. In the same time an effort was made to perform a typology of in-

[5] The key prerequisite to compare the slope of curves between the two different directions of horizontal gradient is the standardization of horizontal distance.

Tab. 2 Spatial disparities in economic aggregate per capita at macro-regional level.

Region/Year	1967	1975	1982	1989	1996	2001
Bohemia – total	101.4	102.3	101.5	101.6	107.1	109.8
Moravia – total	97.8	96.3	97.6	97.5	88.9	85.8
Bohemia – MR*	116.0	116.0	115.8	110.7	127.9	133.2
Moravia – MR	122.6	115.9	117.0	111.9	105.1	100.3
Bohemia – nMR**	87.4	89.0	87.6	92.5	86.2	84.6
Moravia – nMR	76.3	78.9	80.1	84.4	74.1	73.3
Czech Republic	100.0	100.0	100.0	100.0	100.0	100.0

Source: The authors' own calculations on the basis of used data (see section III for primary data sources).
Note: Data are relativized to national average. National average equals 100.0.
* MR – metropolitan regions, ** non-metropolitan regions

Tab. 3 West-East gradient at micro-regional level – economic aggregate per capita.

metropolitan regions

Direction gradient		1967	1975	1982	1989	1996	2001
NW-SE	Slope	–0.003	–0.021	–0.022	0.043	0.020	0.003
	Pearson	–0.006	–0.062	–0.061	0.197	0.032	0.004
	sig.	0.983	0.837	0.841	0.516	0.916	0.991
W-E	Slope	0.165	0.091	0.081	0.077	–0.126	–0.164
	Pearson	0.308	0.226	0.187	0.294	–0.175	–0.185
	sig.	0.307	0.459	0.542	0.328	0.567	0.545
Std. Deviation		14.67	10.96	11.86	7.13	19.73	24.25

non–metropolitan regions

Direction gradient		**1967**	**1975**	**1982**	**1989**	**1996**	**2001**
NW-SE	Slope	–0.238	–0.208	–0.153	–0.127	–0.154	–0.194
	Pearson	–0.467	**–0.483**	**–0.403**	**–0.455**	**–0.398**	**–0.491**
	sig.	0.001	0.000	0.003	0.001	0.004	0.000
W-E	Slope	–0.091	–0.093	–0.055	–0.081	–0.126	–0.166
	Pearson	–0.162	–0.196	–0.132	–0.262	**–0.295**	**–0.381**
	sig.	0.256	0.167	0.355	0.063	0.035	0.006
Std. Deviation		14.26	12.05	10.60	7.82	10.84	11.06

Source: The authors' own calculations on the basis of used data (see section III for primary data sources).
Note: The values in bold represent statistically significant (95% level) correlation between economic aggregate and the horizontal geographical position of regions.

dicators according to the resulting patterns. Consequently, a graphical output of a representative of each group will be provided.

The presentation of achieved results begins with the indicators in which the first hypothesis (which states that western regions with advantageous horizontal geographic position would enjoy more favourable level of socioeconomic development than eastern ones) was confirmed. Significant West-East gradient was detected particularly in case of selected economic indicators. Relatively strong horizontal gra-

dient has been found in economic aggregate per capita (a proxy of GDP – see section III for description of indicator and data sources).

Table 2 presents the disparities in economic aggregate per capita at the macro-regional level. At the end of analysed period (in 2001) one can see substantial disparity between Bohemia (almost 110% of national average) and Moravia (slightly over 85%) in the economic product per capita. However, important is the trend over the last decades. During the period of command economy the disparity between Bohemia and Moravia was almost negligible and did not change. This disparity significantly increased between 1989 and 1996 when the "new" spatial pattern of socio-economic development (re)-emerged. It can be reasonably expected that the magnitude of the disparity is currently (year 2006) even higher.

In 2001 the disparity at the level of metropolitan regions was much stronger compared with the level of non-metropolitan regions. However, the disparity has been predominately brought about by Prague (180% of national average in 2001 vs. 117% in 1989!). Only two other Bohemian metropolitan regions have improved their position (České Budějovice and Plzeň).

In case of non-metropolitan regions the relative level of per capita product (measured by economic aggregate – see chapter 3) had been increasing during the period of the command economy. On the contrary, this group of regions has been facing significant decrease in the relative level of per capita product. Why? There are probably interrelated causes. Firstly, various redistributive (equalization) policies were cut. Secondly, the significance of the position in the national settlement system (i.e. vertical geographic position) for socio-economic development has increased during the transitional period.

Table 3 presents the results of analysis for economic aggregate at micro-regional level. Statistically significant correlation (Pearson) shows that there is strong relation between the level of per capita product and West-East gradient. The value of slope (see methodology in section III) measures the magnitude of the gradient. It is important especially for the comparison among different indicators. Standard deviation captures the magnitude of regional disparities.

Results in table 3 show that significant West-East gradient manifested itself only in case of non-metropolitan regions. The values in table 3 are in line with the first hypothesis – the more advantageous horizontal geographical position of a region (it means the shorter distance of a region in NW-SE, respectively W-E direction to western borders) the higher achieved level of economic aggregate per capita.

The results concerning the second hypothesis (expected shift in the direction of gradient from traditional NW-SE axis to new W-E axis) are relatively complicated. The traditional NW-SE axis of gradient has been dominating throughout the analysed period. However, the expected new axis in the direction of West-East has significantly strengthened during the transition. Such a trend is in line with the second hypothesis. Increasing value of the slope of regression curve signalises that the increasing disparities have not only mosaic pattern, but that the pattern follows the West-East gradient.

Tab. 4 Spatial disparities in unemployment rate at macro-regional level.

	1933	1938	1994	1997	2000	2004
Bohemia – total	97.3	99.1	75.0	84.1	83.0	84.4
Moravia – total	105.8	101.9	140.3	126.0	127.3	125.0
Bohemia – MR	118.6	106.8	52.6	67.6	77.3	78.1
Moravia – MR	94.3	81.1	122.5	120.7	132.0	129.2
Bohemia – nMR	81.3	93.3	98.3	100.9	88.7	90.6
Moravia – nMR	113.2	115.2	157.4	131.0	123.0	121.1
Czech Republic	100.0	100.0	100.0	100.0	100.0	100.0

Source: The authors' own calculations on the basis of used data (see section III for primary data sources).
Note: Data are relativized to national average. National average equals 100.0.

The West-East gradient in economic aggregate/product per capita can be well compared with the results for unemployment rate. This indicator can be analysed only for the transition period and also for the period before the communist era. Data in table 4 show strong disparity between Bohemia and Moravia in unemployment rate during the transition period. Unemployment rate in Bohemia reaches levels well below the national average whereas Moravia has by a quarter higher rate of unemployment compared to the national average (even 140% of national average in 1994). The disparity between Bohemia and Moravia follows the character of the disparity as recorded in the case of economic aggregate. The magnitude of the disparity has slightly decreased from 1994, however, it has been still considerably high at the end of analysed period (2004).

Table 4 shows that the disparity between Bohemia and Moravia in unemployment rate is substantially higher at the level of metropolitan regions compared with non-metropolitan ones. This is mostly attributable to the effect of Ostrava metropolitan region (177% of national average). Population of this region represents 50% of the total population of Moravian metropolitan regions. The other metropolitan regions in Moravia reach the levels below national average in 2004 (with exception of Olomouc metropolitan region – 103%).

The comparison between inter-war (1933, 1938) and transition periods can be only approximate due to the differences in the character and structures of economy between these periods. The disparity between Bohemia and Moravia was relatively weak at the level of entire historical lands. However, the data in table 4 show quite different situation at the level of both metropolitan and non-metropolitan regions. Bohemian metropolitan regions in total had the highest unemployment rate among evaluated categories (even higher compared with Moravian non-metropolitan regions!). The explanation probably relates to the most severe impacts of world economic crisis which afflicted industrial economies during the first half of 1930s. Those days, the highest unemployment rate was typical for the most industrialized districts (Liberec, Ústí nad Labem, Děčín, Karlovy Vary etc.). On the contrary, the Moravian metropolitan regions had much lower unemployment rate than their non-metropolitan counter-

parts. The possible explanation can be as follows: unemployment in Bohemia had the structural character whereas Moravian non-metropolitan regions had constantly higher unemployment rate due to their lower level of economic development. The structural unemployment temporarily exceeded the level of unemployment in peripheral regions. Data for year 1938 support this explanation.

Table 5 shows significant negative correlation between West-East gradient and unemployment rate in case of metropolitan regions. This is not in line with the first hypothesis. However, such a gradient can be found only for the inter-war period. This gradient is caused by high levels of unemployment rate in Bohemian metropolitan regions bordering with Sachsen. The explanation of high unemployment in these regions during the inter-war period was described above. Relatively similar situation can also be seen during the transition period. Ústecký kraj (the NUTS III region bordering with Sachsen) has been reaching the highest unemployment rate among NUTS III regions since the end of 1990s'.

This region inherited economic structure deformed during the period of the command economy. The economic policy employed during the communist period artificially changed the structures of entire economy of the Czech Republic. However, there are two major regions where the negative effect of this policy was much stronger – Ostravian and North-Bohemian basins with their coal resources experienced excessive industrialization during the communist period. It was mono-structurally oriented only on "heavy industry" (mining, metallurgy, petrochemistry etc.). Moreover, the industrialization was based on political not economic criteria which resulted in economic inefficiency. Consequently, these regions have been facing the most severe economic problems during the transition period. The outdated economic structure together with low quality of labour force had caused high level of structural unemployment. Similar problems are hindering development of Ostrava metropolitan region.

During the transition period, the West-East gradient was statistically confirmed only at the level of non-metropolitan regions. The data in table 5 confirm the first hypothesis – the unemployment rate increases with the growing distance of a region from Western borders both in NW-SE and W-E direction of horizontal gradient. The existence of gradient was not statistically significant only in 1997. The reason consists in the character of the development of spatial pattern of unemployment rate in the Czech Republic. Namely, due to transformation strategy applied in the first period of transition, the negative impacts manifested firstly in the rural regions while since the mid of 1990's the most affected regions become old industrial regions.

These regions are predominantly two structurally affected NUTS III regions (namely Ústecký kraj and Moravskoslezský kraj). Due to the geographic position of Ústecký kraj (and several other structurally affected regions – e.g. district Sokolov) the existence of West-East gradient temporarily disappeared in the second half of 1990's. Depicted change in the regional pattern of unemployment rate in the Czech Republic can be presented in more detail with the data covering the whole period of economic transition (see table 6).

Tab. 5 Horizontal gradient at micro-regional level – unemployment rate.

metropolitan regions

Direction gradient		1933	1938	1994	1997	2000	2004
NW-SE	Slope	–0.850	–1.215	0.377	–0.017	0.113	0.032
	Pearson	***–0.582***	***–0.590***	0.249	–0.011	0.080	0.023
	sig.	0.037	0.034	0.413	0.971	0.795	0.940
W-E	Slope	–0.634	–1.039	0.701	0.495	0.584	0.541
	Pearson	–0.367	–0.427	0.391	0.264	0.350	0.335
	sig.	0.217	0.146	0.187	0.384	0.241	0.264
Std. Deviation		47.28	66.62	49.08	51.33	45.63	44.20

non-metropolitan regions

Direction gradient		1933	1938	1994	1997	2000	2004
NW-SE	Slope	0.245	0.198	0.763	0.294	0.379	0.311
	Pearson	0.115	0.112	**0.435**	0.213	***0.290***	***0.289***
	sig.	0.462	0.382	0.001	0.115	0.030	0.031
W-E	Slope	0.682	0.283	0.860	0.395	0.530	0.456
	Pearson	***0.291***	0.146	**0.444**	0.259	**0.367**	**0.384**
	sig.	0.030	0.567	0.001	0.053	0.005	0.003
Std. Deviation		59.51	49.36	50.00	39.29	37.26	30.67

Source: The authors' own calculations on the basis of used data (see section III for primary data sources).
Note: The values in bold represent statistically significant (95% level) correlation.

Tab. 6 The development of horizontal gradient in unemployment during the transition period (registered rate of unemployment).

Direction gradient – year		1990	1991	1992	1993	1994	1995	1996	1997
NW-SE	Slope	0.789	0.993	1.036	1.036	0.763	0.502	0.396	0.294
	Pearson	**0.427**	**0.616**	**0.529**	**0.534**	**0.435**	**0.288**	0.252	0.213
W-E	Slope	0.605	0.908	0.957	1.034	0.860	0.644	0.552	0.395
	Pearson	**0.297**	**0.510**	**0.443**	**0.483**	**0.444**	**0.335**	**0.318**	0.259
Std. Deviation		52.57	45.92	55.73	55.23	50.00	49.58	44.75	39.29

Direction gradient – year		1998	1999	2000	2001	2002	2003	2004	2005
NW-SE	Slope	0.299	0.298	0.379	0.350	0.307	0.278	0.311	0.330
	Pearson	0.256	**0.275**	**0.290**	**0.281**	**0.263**	0.255	**0.289**	**0.297**
W-E	Slope	0.394	0.440	0.530	0.521	0.475	0.460	0.456	0.443
	Pearson	**0.306**	**0.368**	**0.367**	**0.379**	**0.370**	**0.383**	**0.384**	**0.361**
Std. Deviation		33.31	30.85	37.26	35.48	33.19	30.98	30.67	31.63

Source: The authors' own calculations on the basis of used data (see section III for primary data sources).
Note: The values in bold represent statistically significant (95% level) correlation. The values of significance are not shown in order to streamline the table.

Tab. 7 Spatial disparities in rate of economic activity at macro-regional level.

	1921	1930	1950	1961	1970	1980	1991	2001
Bohemia – total	102.1	102.2	101.9	101.8	102.0	101.6	101.2	101.5
Moravia – total	95.7	95.5	96.6	96.8	96.7	97.5	98.2	97.6
Bohemia – MR	106.1	106.0	104.0	102.4	104.1	102.9	102.3	103.3
Moravia – MR	99.2	97.9	98.0	95.4	96.4	97.8	98.7	98.2
Bohemia – nMR	99.4	99.3	100.1	101.4	100.1	100.2	100.0	99.8
Moravia – nMR	93.6	93.9	95.5	98.0	96.9	97.3	97.7	97.0
Czech Republic	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: The authors' own calculations on the basis of used data (see section III for primary data sources).
Note: Data are relativized to national average. National average equals 100.0.

Table 6 captures the development of West-East gradient of unemployment rate during the transition period in more detail. It contains data for registered unemployment rate obtained from Ministry of Social Affairs while unemployment rate in table 5 is computed by the authors on the basis of primary data on the number of unemployed and the number of economic active persons. Data from Ministry of Social Affairs are not available for the units of metropolitan regions. However, the data used in table 5 are not available for the whole transition period.

Only the level of non-metropolitan regions is taken into analysis to eliminate effects of specific situation of structurally affected metropolitan regions. Results in table 6 are in line with both hypotheses formulated above. There has been quite strong gradient in unemployment rate for the entire transition period. The reason for temporal "disappearance" of the gradient (see year 1997) was explained above. Moreover, even in year 1997 the value of Pearson correlation coefficient was 0.259 in case of West-East gradient which is just bellow the limit for statistical significance (0.262) at 95% level.

The results clearly support also the second hypothesis (expected shift in the direction of gradient from traditional NW-SE axis to new W-E axis). The traditional NW-SE direction of the gradient was stronger until 1994. The new W-E gradient has become stronger since 1994. The shift in the direction of the gradient has two general causes. Firstly, the area between Prague (as super-dominant economic centre) and the south-western border of Bohemia has experienced (together with Prague and Central Bohemia) substantially better economic performance compared to the rest of the country. Secondly, Northern Bohemia represents one of the most affected regions during the transition period.

Above presented findings show that the gradient exists in the case of non-metropolitan regions.

The magnitude of the disparity between Bohemia and Moravia captured in Table 7 is much smaller compared with the case of economic aggregate or unemployment. The highest magnitude of the disparity has been recorded in the inter-war period. Afterwards, it had been gradually decreasing during the period of the com-

Tab. 8 Horizontal gradient at micro-regional level – economic activity rate.

metropolitan regions

Direction gradient		1921	1930	1950	1961	1970	1980	1991	2001
NW-SE	Slope	–0.118	–0.105	–0.098	–0.059	–0.088	–0.064	–0.051	–0.049
	Pearson	–0.520	–0.500	–0.517	–0.388	***–0.680***	**–0.692**	**–0.764**	**–0.708**
	sig.	0.068	0.083	0.071	0.191	0.011	0.008	0.002	0.006
W-E	Slope	–0.077	–0.070	–0.043	–0.041	–0.074	–0.055	–0.050	–0.059
	Pearson	–0.287	–0.281	–0.191	–0.230	–0.485	–0.508	***–0.626***	–0.716
	sig.	0.338	0.355	0.535	0.445	0.092	0.074	0.022	0.006
Std. Deviation		7.35	6.80	6.16	4.92	4.18	2.97	2.17	2.24

non–metropolitan regions

Direction gradient		1921	1930	1950	1961	1970	1980	1991	2001
NW-SE	Slope	–0.104	–0.111	–0.073	–0.044	–0.055	–0.045	–0.040	–0.057
	Pearson	**–0.454**	**–0.494**	**–0.433**	***–0.347***	**–0.478**	**–0.571**	**–0.561**	**–0.582**
	sig.	0.001	0.000	0.001	0.013	0.000	0.000	0.000	0.000
W-E	Slope	–0.022	–0.005	–0.012	–0.023	–0.036	–0.032	–0.031	–0.057
	Pearson	–0.086	–0.022	–0.062	–0.166	***–0.284***	**–0.373**	**–0.393**	**–0.535**
	sig.	0.549	0.879	0.661	0.243	0.045	0.007	0.004	0.000
Std. Deviation		6.41	6.28	4.74	3.53	3.23	2.21	2.02	2.72

Source: The authors' own calculations on the basis of used data (see section III for primary data sources).
Note: The values in bold represent statistically significant correlation.

Tab. 9 Summary of results for the other analysed indicators.

	First hypothesis: West–East gradient manifests itself in higher level of socio-economic development in western regions with favourable geographic position		**Second hypothesis:** The orientation of West–East gradient has shifted from traditional Northwest-Southeast to straight West-East orientation of the gradient
Indicator	NW-SE direction	W-E direction	Year
Share of economically active population working in tertiary sector	Yes 1921–2001	Yes 1970–2001	×
Revenues from income tax on entrepreneurs	Yes 1926, 1930, 1994, 1998, 2004	Yes 1922, 2005	×
Average monthly wage	Yes 1996–2004	No	×
Index of education	Yes 1921, 1930	Yes 1921	×
Life expectancy at birth	Yes 1981–1990	Yes 1986–1995	1986–1990
Infant mortality	Yes 1930, 1950	Yes 1991	×

Source: The authors' own calculations on the basis of used data.
Note: symbol "×" stands for that the strenth of West-East gradient has not exceeded the strenght of Northwest--Southeast gradient.

mand economy. Although the magnitude has slightly increased in the transition period, the change can be considered as negligible. The disparity between Bohemia and Moravia is discernible especially in the case of metropolitan regions. The crucial component of this disparity is represented by the disparity between Prague (105% of national average) and Ostrava (96%). On the other hand, the disparities in economic activity rate are insignificant at macro-regional level.

Regional disparities in the rate of economic activity are much smaller then in case of other indicators (see table 8). The value of standard deviation in 2001 amounts 2.72 compared with the one for unemployment rate (30.67) and economic aggregate per capita (11.06). Nevertheless, despite low level of variability, the data suggest that West-East gradient has been persisting throughout entire analysed period. The character of the gradient is in line with the first hypothesis – the higher the distance of a region in analysed directions of the gradient, the lower the economic activity rate. However, the magnitude of the gradient (the value of the slope of regression curve) has been continuously decreasing since 1930.

More important finding following from the table 8 concerns the second hypothesis. The data demonstrate the emergence of the anticipated new gradient in West-East direction already in 1970. The magnitude of this "new" gradient has substantially increased from 1991 to 2001 and reached the same value as traditional NW-SE gradient.

Varied results have been achieved in the case of remaining indicators. These results are summarized in table 9 which shows whether the results are in line or not with the formulated hypotheses. Concerning the first hypothesis, the existence or non-existence of the envisaged orientations of the gradient is shown (Yes/No). It is complemented with time period when the gradient proved to be statistically significant. The last column in table 9 shows the period when the West-East direction of the gradient has been stronger.

The results in table 9 confirm the existence of significant W-E gradient in economic phenomena. However, the gradient in case of average monthly wage has only emerged since 1996. This "delay" can be attributed to the fact that during the communist period Moravia enjoyed higher average wage than Bohemia. The concentration of politically preferred heavy industries together with high wages in agriculture caused artificially inverse gradient during the command economy.

Although W-E gradient has been found also in demographic indicators, the gradient is weak and not persistent. In case of index of education the gradient existed only during inter-war period. Regional disparities in attained level of education have had quite different spatial pattern since 1960s. The major discovered disparity was the one between metropolitan and non-metropolitan regions, but not between the West and East as suggested our hypothesis.

The results summarized in table 9 do not support the second hypothesis. The shift in the direction of the gradient has been found only in case of life expectancy. However, the range of spatial disparities in life expectancy is negligible. Therefore, this result should be taken with caution.

5. Conclusions

The aim of the article was to analyze the relevance of horizontal geographic position (i.e. so called West-East gradient) for major demographic, social, and economic indicators over period of up to 80 years. The following two basic hypotheses have been formulated: firstly, the authors expected more favourable development in Western/Northwestern regions than in Eastern/Southeastern regions; secondly, a shift of geo-economic axis from Northwest-Southeast to directly West-East direction has been envisaged.

The results depend firstly on hierarchical level of analysis – on macro level (i.e. in the case of the Czech Republic the macro-level is represented by two historical lands – Bohemia and Moravia) the role of horizontal geographic position is clearly discernible. At micro level, the results are more varied. The role of "vertical" geographic position was controlled for in the analysis of West-East gradient at micro level. To moderate the effect of vertical geographic position, the existence of the gradient was analysed separately for metropolitan and non-metropolitan regions. In case of non-metropolitan regions a significant West-East gradient has been found. On the contrary, no spatial gradient has manifested itself in case of metropolitan regions. However, this result is attributable to the effect of structurally affected Ústecký metropolitan region localised in North-Bohemian brown cold basin. If this region was omitted, the West-East gradient would be more discernible. Consequently, the West-East gradient has been clearly confirmed by indicators representing economic sphere.

Concerning demographic sphere, the results are rather ambiguous. Although the gradient has been found, it is not statistically significant and persistent over the whole studied period. In case of social indicators, the gradient has been found only in inter-war period. However, social sphere was represented only by a single indicator – by the index of education. Therefore, analysis of more indicators is needed to investigate further into the existence of the gradient in demographic and social spheres.

Absence of the gradient in case of metropolitan regions can be explained from two distinctive perspectives. Firstly, the group of metropolitan regions represents heterogeneous regions with substantially different position (function) in geographic organization of society. Secondly, concerning the structure vs. agency dilemma, the concentration of decision-making subjects and activities into metropolitan regions gives them much more favourable conditions to overcome the role of existing structures. Therefore, in case of metropolitan regions the role of vertical geographic position seems to be much more important.

Acknowledgement

Research was carried out with the financial support of Research Programme No. MSM 0021620831 sponsored by the Czech Ministry of Education, Youth and Sport. This support is greatly appreciated.

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Appendix 1

Metropolitan regions are created from following districts (NUTS IV level):

1. Prague: Praha město + Praha východ + Praha západ
2. Plzeň: Plzeň město + Plzeň sever
3. Karlovy Vary: Karlovy Vary + Sokolov
4. North-bohemian metropolitan region: Ústí nad Labem + Chomutov + Most + Teplice
5. Liberec: Liberec + Jablonec nad Nisou
9. Ostrava: Ostrava + Karviná + Frýdek Místek
11. Brno: Brno město + Brno venkov

Remaining metropolitan regions are represented by the district of given metropolis:

6. Hradec Králové
7. Pardubice
8. Olomouc
9. Zlín
12. Jihlava
13. České Budějovice

Résumé

Západo-východní gradient a regionální rozvoj: Případová studie České republiky

Článek empiricky zkoumá roli západo-východního gradientu (tj. polohu krajů České republiky v rámci Evropského systému) v regionálním rozvoji. Výzkum je soustředěn na případ České republiky. Navzdory problémům s konzistencí dat, se autoři pokusili ustanovit dlouhodobé časové řady přinejmenším pro základní data v následujících oblastech: demografie, ekonomika a sociální sféra. Data pokrývají období 80 let, přičemž důraz je kladen především na období transformace. Článek má následující strukturu: Nejprve je představena otázka relevance geografické polohy pro regionální rozvoj postkomunistických zemí. Druhá část obsahuje teoretický rámec výzkumu. Autoři kladou důraz na dilema mezi subjektem a strukturou a diskutují dva kontrastní pohledy na roli geografické vzdálenosti tak, jak je prezentována v relevantní literatuře. Třetí část je věnována vysvětlení použití metodiky. Empirické výstupy jsou uvedeny a diskutovány ve čtvrté části. Pátá část shrnuje závěry. Tyto jsou celkem rozmanité, ale hlavním výsledkem je že i přes jasně prokázanou roli západo-východního gradientu v různých sférách, neexistuje fatalismus (či determinismus) vycházející z geografické polohy jednotlivých krajů, ale spíše široký prostor pro aktivitu individuálních subjektů.