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Human and demographic capital in peripheral and core municipalities and regions and its development (northwest Bohemia)

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Abstract

The paper compares the human and demographic capital of central, suburban, semi-peripheral and peripheral municipalities of the Karlovy Vary Region and also the regions of Czechia and neighbouring regions in Germany. Peripheral municipalities are considerably distant from meso- and micro-regional towns in terms of time spent on public transport. The demographic capital of municipalities is assessed according to indicators of population development, natural and migration balance, and age structure. In the evaluation of human capital, indicators of education, unemployment, foreclosures, entrepreneurship, and housing construction are used. The assumption of low human capital in peripheral municipalities compared to more geographically exposed municipalities was not confirmed. Suburban municipalities have the highest human and demographic capital. Although the studied region borders the developed regions of Germany, it has the least favourable values of human and demographic capital of all Czech regions and neighbouring German regions. This is a consequence of the complete population exchanges after World War II, the existence of the Iron Curtain on the region's borders with the West during the socialist (communist) period, the peripheral location of the region within Czechia, the inappropriate development of industry under socialism, and the problems of this sector and weak cross-border cooperation in the post-socialist period. The paper also presents strategies and measures to support human capital in the types of municipalities of the region and throughout the region.

Keywords: Human capital, regional development, settlement centres, periphery, semi-periphery, small towns

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Introduction

The Karlovy Vary Region is located in the very west of Czechia, on the borders with the developed Bavaria and with Saxony in Germany. It has a peripheral location within Bohemia and Czechia and is part of one of the inner peripheries of Central Europe. The region has great internal socio-geographic heterogeneity due to physical-geographical conditions and specific and problematic political, ethnic, economic and social developments (Hampl, M. 2003; Lipovská, Z. *et al.* 2012). These characteristics of the region are then reflected in its current level of development and in the demographic and human capital of its municipalities and the region as a whole (also Wielechowski, M. *et al.* 2021). For these reasons, it is important to recognize, understand and positively direct its demographic and human capital.

The *aim of the paper* is to identify and explain differences in human capital (in people's abilities, skills and activity) and in demographic capital (in demographic stability and development of population structure) in peripheral, semi-peripheral, suburban and central municipalities (meso- and micro-

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regional towns) of the Karlovy Vary Region, sub-regions of this region, and also between this region and other Czech and neighbouring German regions. It also includes the proposal of strategies and measures for the further development of human capital in the region and its municipalities.

As for the research questions, the first is auxiliary – it asks about the distribution of higher and lower settlement centres, suburban zones, semi-peripheries and peripheries of the region, the second is the main one and is aimed at identifying and comparing human and demographic capital of types of municipalities and sub-regions on the territory of the region, and the third is focused on comparing the region with other Czech regions and neighbouring German regions.

The introduction of the paper is followed by a theoretical part defining the issue of human and demographic capital and their development effect and also the issue of peripherality. The next part of the paper presents the specifics of the Karlovy Vary Region. In the methodological part of the paper, the procedure for defining settlement centres and other types of municipalities is given, and the human and demographic capital indicators used are defined here. A comparison of the human and demographic capital of the monitored types of municipalities, sub-regions and regions is made in the results part of the paper. This is followed by a Discussion with proposals for strategies and measures for the development of human capital in the region and a Conclusion.

Theoretical background

American economist Gerry Becker defined *human capital* as the sum of people's abilities and skills and the application of those abilities and skills, and also pointed out the importance of education and health in human capital (Becker, G. 1964). The concept of human capital was then often used by sociologists (e.g. Coleman, J.S. 1988) and also human geographers in studies devoted to the new economic geography, regional disparities and regional development (Krugman, P.R. 1991; Elhorst, J.P. 1998, and others). Some developmental elements of social capital were also included in human capital (Svendsen, G. and Sørensen, J.F. 2006; Weaver, R.D. and Habibov, N. 2012). In developed countries, developed or stable *demographic capital* (Sagan, I. and Masik, G. 2014; Wieczerzak, J. 2018) can be considered such a natural and migratory balance of the population that leads to long-term stability in the number of the population and the balance of its structure. The question is whether to consider demographic capital as part of human capital or as a separate issue.

Investments and other supports in youth and adult education contribute to economic growth (Mincer, J. 1984; Blundell, R. *et al.* 1999 and many recent studies). Growth in education benefits the entire country, its regions and their communities (Agarwal, S. *et al.* 2009; Weaver, R.D. and Habibov, N. 2012, and others). Also, in the business and employer sphere, the state and development of working knowledge, abilities and skills is important (Bontis, N. and Serenko, A. 2007; Ployhart, R.E. *et al.* 2014). In countries, regions and municipalities of developed countries with low birth rates, high emigration and a high proportion of elderly people, strategies and measures to gradually improve these unfavourable demographic characteristics must be sought (Sleebos, J. 2003; Adsera, A. 2004; Lutz, W. 2006).

The literature lacks a unified view of *"periphery"* in the territory. According to some authors, it is the socio-economically underdeveloped part of the region (Leimgruber, W. 2004), according to others, it is a part of the area quite distant from the city or town (this paper), or it may be a combination of both views (Agarwal, S. *et al.* 2009; Bernard, J. and Šimon, M. 2017). In the peripheries, weak human capital is usually assumed (Musil, J. and Müller, J. 2008; Novotná, M. *et al.* 2013). However, some peripheral municipalities far from larger towns can benefit from their location near a border crossing,

near an important road, in an area with significant tourism or high cultural capital and identity (Kubeš, J. and Podlešáková, N. 2021; PRKK, 2021). In this paper, human capital will be evaluated on the continuum: micro-regional towns – suburban – semi-peripheral – (remote) peripheral municipalities.

The Karlovy Vary Region

The Karlovy Vary Region is one of the 14 territorial-administrative regions of Czechia. It is located in the westernmost Bohemia, on the border with Bavaria (Upper Franconia and Upper Palatinate regions) and Saxony (Chemnitz region) in Germany. The region has a peripheral location within Bohemia and Czechia and is part of one of the inner peripheries of Central Europe. The border area with Saxony is mountainous with narrow valleys, in the central part there is an elongated west–east basin with the Ohře river flowing through it, and in the southern and south-eastern parts there are highlands.

The region has a population of just under 300,000 (in 1930 it was 500,000). The regional (meso-regional) centre is the city of Karlovy Vary, with only 50,000 inhabitants, larger towns are Sokolov (centre of the brown coal area) and Cheb. There are a total of 134 municipalities of various population sizes in the region. In this paper, municipalities are divided into meso- and micro-regional towns (10), (very) small towns (11), townships (11) and functionally less significant municipalities (see the methodological and results part of the paper).

In the 19th century, world-famous spa towns developed near mineral springs, especially Karlovy Vary and Mariánské Lázně. During the industrial revolution, brown coal mining and related industries developed in the heart of the region. Based on coal mining and related industries, smaller towns and townships were established here, supplemented by panel housing estates during the socialist period. The southern and south-eastern parts of the region had and still have a rural character. The almost complete removal of the German-speaking population from the region after World War II and the insufficient settlement of the region by Czech people is still evident today. During the socialist period, an impenetrable Iron Curtain existed on the border with Bavaria. Post-socialist public administration representatives are trying to restore cross-border relations with neighbouring German regions, but so far not very successfully (Teufel, N. *et al.* 2022). The region's post-socialist economy is suffering from the end of coal mining and the problems of the local textile, glass and porcelain industries.

Research methodology

When delimiting the peripheries, it is first necessary to define the higher settlement centres. According to Hampl, M. and Marada, M. (2015), the 50,000-person city of Karlovy Vary is a meso-regional city, albeit a very weak one. Micro-regional towns are one hierarchical level lower. In their micro-region, they have a relatively closed daily commute to work and services. In the environment of Czechia, a micro-regional town should have a gymnasium or another high school for pupils aged 15–18, at least 10 specialist doctors, a food supermarket, 2000 occupied jobs, 1000 commuters for work and study (verified on the territory of the Pilsen Region – Kubeš, J. and Podlešáková, N. 2021) and at least 5,000 inhabitants (Hampl, M. and Marada, M. 2015). The ranking of micro-regional towns (and also lower settlement centres) was created using four indicators – number of inhabitants, number of types of services (the presence of thirty administrative, school, health, purchasing, financial and cultural services), number of people commuting to work or study, and the number of bus and train connections arriving on a working day. The numerical data are then converted to point values, where the data for the city of Karlovy Vary represent 100 points. The last two interrelated indicators have half the weight,

as they are interconnected. Lower settlement centres are (very) small towns and townships with low point values.

In the second step, peripheral municipalities need to be defined. In this paper they are delineated in the territory behind the 30-minute isochrone when travelling by bus or train to the time-nearest meso- or micro-regional town in working days. If the journey to the stop and the journey from the stop to work are added to the half hour and the return journey is also included, then this commute is at the limit of long-term endurance. If clusters of neighbouring peripheral municipalities have at least three municipalities and an area of more than 50 km^2, they form a peripheral area at the micro-regional level. Two types of these peripheral areas can be distinguished – state-border (outer) and between Czech meso-regions (inner). Suburban municipalities are characterized by a large presence of houses of a suburban character, they are located in the immediate hinterland of larger towns. Semi-peripheral municipalities lie between peripheral and suburban municipalities. In addition to the above, the territory of the Karlovy Vary Region was divided into 9 sub-regions.

In the third step, 6 demographic-capital and 6 human-capital indicators for the level of municipalities are used *(Table 1)*. Municipalities should not have a population decline, they should have a zero or positive natural and migratory population balance, a sufficient proportion of children and a not too high proportion of elderly people*. Residents of municipalities should be educated and active in business, should build (finance) new housing and should not be in debt and unemployed. Indicator values in the first quartile of descending values are considered favourable, values in the last quartile as unfavourable.

Table 1. Used indicators of demographic and human capital

Code	Indicators
	Indicators of demographic capital
LD	Index of long-term population development 2022/1991[1,2,3]
SD	Index of short-term population development 2022/2018[1,2,3]
NT	Average annual natural balance of population per 1000 inhabitants 2017–2021[1,2,4]
MT	Average annual migration balance of population per 1000 inhabitants 2017–2021[1,2,4]
CH	Percentage of children under 14 in 2022[1,2]
SE	Percentage of seniors aged 65+ in 2022[1,2]
LEM	*Life expectancy at birth in years in 2022*[2,3]
	Indicators of human capital
EE	Percentage of the population over 15 years of age with at most elementary education in 2021[1,2,5]
UE	Percentage of inhabitants older than 15 years with tertiary education in 2021[1,2]
NA	Number of new apartments 2018–2022 per 1000 inhabitants in 2022[1,2]
NE	Number of business entities per 1000 inhabitants aged 15 and over in 2022[1,2]
EX	Percentage of inhabitants in foreclosure in 2022[1,2]
UN	Percentage of unemployed inhabitants older than 15 years in 2022[1,2]
MSC	*Average gross monthly salary in thousands of CZK in 2022*[2]
SAR	*Number of people working in science and research per 1000 economically active people in 2022*[2]
GDP	*GDP in purchasing power standard (in thousands of EUR) in 2023*[2,3]
UEX	*Percentage of inhabitants aged 25–64 years with tertiary education in 2022*[3]
HTS	*Percentage of employment in high-technology sectors in 2022*[3]

[1]Indicator used for comparison types of municipalities of Karlovy Vary Region. [2]Indicator used for comparison of Czech regions. [3]Indicator used for comparison of neighbouring German and Czech regions. [4]The year 2022 was affected by arrival of Ukrainian refugees. [5]It includes primary and lower secondary education.

At the level of regions of Czechia, indicator of life expectancy, gross monthly wages and employment in science and research were added to the above indicators (LEM, MSC and SAR

* In Czechia, these parameters may not be favourably evaluated in municipalities with large socially excluded localities.

in *Table 1*). The comparison of the Karlovy Vary Region with neighbouring German and Czech regions is limited due to the unavailability and incomparability of some data. It includes these indicators – LD, SD, LEM, GDP (GDP in purchasing power standard), UEX (percentage of inhabitants aged 25–64 years with tertiary education) and HTS (percentage of employment in high-technology sectors) (see *Table 1*).

Data and indicators for assessing the demographic and human capital should be contextual (associated with these capitals), complete (covering all components of these capitals), representative (indicators should be constructed to produce values close to reality), and correct (also actual) – see Chytil, M. K. (1982). Ensuring "completeness" at the municipal level is difficult due to the unavailability of some data at this level. Creating a summary indicator that would include the values of individual indicators is not appropriate, because both the demographic and human capital of a municipality or region are complex and multidimensional concepts, the individual dimensions of which need to be expressed by separate indicators (Hendrick, R. M. 2004). Therefore, a separate assessment of demographic and human capital and their individual aspects was carried out in the paper.

Results

The meso-regional city, micro-regional towns, (very) small towns and townships of the Karlovy Vary Region are shown in *Figure 1* and *Table 2*. The map also shows suburban, semi-peripheral and peripheral municipalities. Peripheral municipalities create two state-border peripheral areas ("a" and "b") and two larger peripheral areas between meso-regions ("α" and "β" in *Figure 1*). The peripheral areas α and β extend beyond the borders of the region into neighbouring Czech regions and, thus, co-create an extensive inner rural periphery in the west of Czechia (Kubeš, J. and Podlešáková, N. 2021).

Table 3 shows the situation with demographic and human capital in higher and lower settlement centres, other types of municipalities and in nine sub-regions of the Karlovy Vary Region. Meso-, micro- and small towns are losing residents mainly due to low birth rates and migration to the suburbs of the region and to other regions of Czechia (see LD, SD, NT, MT). Of the sub-regions, those adjacent to advanced Bavaria had a more favourable population development. They have important border crossings and roads that help with commuting to work to Bavaria. The urbanized sub-regions of Sokolov and Kraslice, heavily affected by deindustrialization, had a greater relative decrease in population than rural peripheries α and β. The balance of migration (MT) over the past few years indicates a strong suburban migration and documents the decline of the population in towns. The high migration loss of the Ostrov nad Ohří sub-region can be attributed to the loss of the population of mountain settlements of this sub-region. The city of Karlovy Vary has the oldest population (CH, SE), even among all cities in Czechia. So far, the suburban municipalities have a young population, because mainly young families with children moved there from the relevant town and other towns.

In the next part of *Table 3*, the human capital of types of municipalities and sub-regions is compared. The values of the education level indicators (EE, UE) are particularly favourable for the meso-regional city of Karlovy Vary, where university-educated medical doctors (including spa doctors), various managers, teachers and key public administration employees are concentrated. However, the city has the second lowest value of university education among cities in Czechia (after the industrial city of Ústí nad Labem) (see also Minařík, B. and Borůvková, J. 2014). Due to the arrival of young educated suburbanites, some of the suburban municipalities in the vicinity of the city of Karlovy Vary achieve a higher level of education than the city. The construction of apartments (NA) stands out in suburban municipalities (mainly apartments in family houses) and in some mountain municipalities with the construction

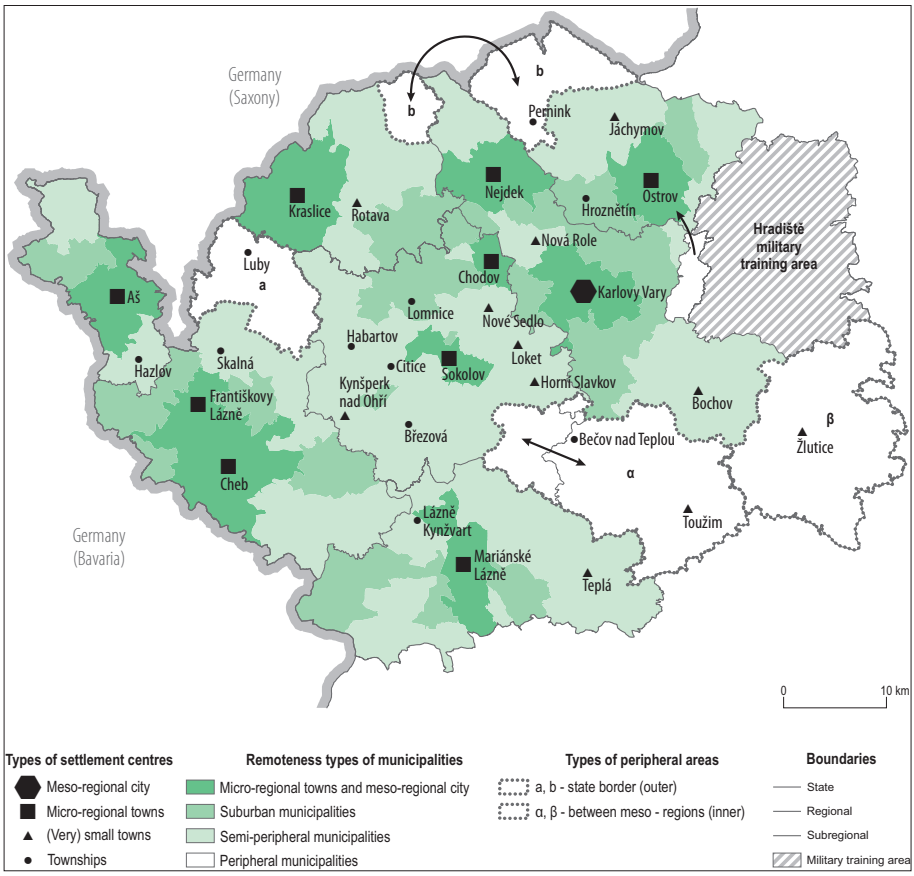

Fig. 1. Settlement centres, peripheral areas and sub-regions of the Karlovy Vary Region, 2022. *Source*: Authors' own processing based on the procedure in the research methodology (GIS by Křenek, P.).

Table 2. Definition of higher settlement centres of the Karlovy Vary Region, 2022

Settlement centres	Population in 2023* persons	Number of types of services, 2023	Number of commuters, 2021*	Number of bus and train connections, 2023**	Weighted average score	Strength of higher settlement centre
Type: meso-regional city						
Karlovy Vary	52,081	55	15 055	362	100.00	very strong
Type: micro-regional town						
Cheb	31,954	41	5432	249	62.78	strong
Sokolov	26,211	37	8078	234	58.92	strong
Ostrov nad Ohří	15,894	29	3622	177	39.91	medium strong
Mariánské Lázně	16,591	30	3522	133	38.82	medium strong
Chodov	13,157	15	1996	198	28.84	weak
Aš	12,804	24	792	55	26.15	weak
Františkovy Lázně	5,707	11	1315	230	22.36	very weak
Nejdek	7,772	15	1494	69	18.90	very weak
Kraslice	6,614	16	694	68	17.83	very weak

Sources: *Databases of the Czech Statistical Office, **IDOS timetables.

Table 3. Human and demographic capital in types of municipalities and sub-regions of the Karlovy Vary Region, 2022

Types of municipalities Sub-regions	Values of demographic capital indicators						Values of human capital indicators					Fourth/*first* quartiles[1]
	LD	SD	NT	MG	CH	SE	EE[2]	UE[2]	NA	NE	EX	UN	
Types of municipalities – average values													
Meso-regional city (Karlovy Vary)	0.88	1.01	-4.93	0.50	14.0	24.2	*12.3*	*15.8*	11.6	*448*	9.1	5.2	5/3
Micro-regional towns	0.94	0.99	-3.90	-2.02	14.8	21.5	17.0	8.8	6.4	292	10.5	4.0	2/0
Suburban municipalities	1.80	1.06	-1.74	15.97	16.0	17.7	15.0	10.6	28.5	342	6.5	2.5	0/4
Semi-peripheral municipalities	1.13	1.01	-2.79	1.55	15.8	19.0	19.7	7.1	12.7	293	10.3	4.0	0/0
Peripheral municipalities	1.09	1.01	-1.86	1.28	16.5	20.2	19.8	6.4	22.2	335	11.8	4.8	1/1
Small towns	0.94	0.98	-2.91	-3.96	15.4	20.3	19.9	6.8	7.4	264	11.3	4.8	2/0
Townships	1.04	1.00	-5.86	4.94	15.1	20.9	18.6	7.8	13.1	276	9.7	3.5	1/0
Sub-regions – total values													
Aš sub-region	1.04	0.97	-3.73	1.64	15.7	19.5	21.3	5.9	5.2	268	13.2	2.4	2/0
Cheb sub-region	1.04	1.00	-3.78	1.43	15.0	19.8	16.8	9.3	15.3	304	10.5	3.2	0/0
Mariánské Lázně sub-region	0.98	*1.05*	-4.24	2.64	14.9	22.7	15.2	*11.0*	13.7	*394*	8.4	5.2	2/3
Sokolov sub-region	0.92	1.00	-3.25	-2.40	15.5	19.8	18.9	7.7	6.9	234	9.0	5.4	4/0
Kraslice sub-region	0.91	0.98	-4.16	-1.14	15.5	22.3	18.7	5.9	6.3	262	14.0	6.5	4/0
Nejdek sub-region	1.01	1.00	-4.14	3.15	14.6	20.8	17.1	7.2	10.6	262	7.8	3.4	0/0
Karlovy Vary sub-region	0.96	1.02	-3.86	2.57	14.7	23.0	*12.8*	*14.9*	14.7	*428*	8.1	4.7	1/3
Toužim-Žlutice sub-region	0.95	0.98	-2.03	-2.28	15.5	21.1	19.8	6.5	5.7	286	10.3	5.2	2/0
Ostrov nad Ohří sub-region	0.96	0.96	-3.45	-5.12	15.1	21.3	17.8	9.00	10.4	306	9.1	4.1	2/0

Notes: Description of indicator codes are in *Table 1*. Underlined value: the value lies in the fourth quartile in terms of values sorted in descending order; Value in italics: the value lies in the *first* quartile. [1]Number of values in the fourth/*first* quartile. [2]Data from the 2021 Census. *Sources:* Databases of the Czech Statistical Office, but EX: data are from the Executor's Chamber of the Czech Republic. Authors' own calculations.

of apartments intended for recreation. The incidence of business entities (SV) is high in Karlovy Vary (economic centre of the region, business in the care of spa guests), Mariánské Lázně (care for spa guests) and in suburban municipalities (immigration of entrepreneurs from towns). The assumption of the highest incidence of foreclosures (EX) in the predominantly working-class settlements of the Sokolov sub-region was not confirmed. The most foreclosures are in the state-border Aš and Kraslice sub-regions. Unemployment (UN) is low and not very different, it is higher only in the deindustrialized Kraslice sub-region.

In the last column of *Table 3*, an attempt is made to provide an overall assessment of demographic and human capital. The meso-regional city of Karlovy Vary has no good values of demographic capital, but it has predominantly favourable human capital. The collapse of a number of industrial enterprises in micro-regional and small towns has an adverse impact on the human and demographic capital in these towns, also suburbanization negatively affects the demographic capital of these towns. Suburban municipalities enriched by younger, educated and well-earning people have favourable demographic and human capital values. Individual semi-peripheral and peripheral municipalities are different in terms of the values of the monitored indicators. If they have quality lead-

ership and no environmental burden, they can have favourable values. The sub-regions of Karlovy Vary and Mariánské Lázně have the most favourable values for sub-regions, also thanks to their spa character.

The Karlovy Vary Region did not fare well in the comparison of human and demographic capital of 14 (territorial-administrative) regions of Czechia, despite the fact that it borders developed Bavaria. According to the average ranking of the values of 7 demographic indicators, the region ranked last with an average of 12.5 (*Figure 2*). The region was placed in the top ten regions of Czechia only in the case of the representation of senior citizens (SE). The Karlovy Vary Region also finished last in the evaluation of human capital using 8 indicators (average ranking 12.9) *(Figure 3)*. The region has particularly unfavourable values in the indicators of the level of education (EE, UE), gross monthly salary (MSC) and employment in science and research (SAR). Close behind the monitored Karlovy Vary Region is the Ústí Region (average rank in human capital 12.6), which is also struggling with the post-socialist transformation of its brown-coal industry. Žítek, V. and Klímová, V. (2016), Wielechowski, M. *et al.* (2021) or Hamplová, E. *et al.* (2021) confirm the poor position of the Karlovy Vary Region among Czech regions.

A somewhat simplified comparison of the demographic and human capital of the Karlovy Vary Region and neighbouring regions in Bavaria, Saxony, and Bohemia is offered in *Table 4*. The Karlovy Vary Region is losing population slightly, but the population development in the eastern German region of Chemnitz is significantly worse due to the departure of young people to the western parts of Germany. The relatively advanced Czech healthcare system contributes to the small differences in life expectancy between Czech and German regions. However, there are fundamental differences in the wealth (GDP) of the Bavarian regions on the one hand and the Saxon and mainly Czech regions on the other, especially in the case of the Karlovy Vary Region. The need to retain university graduates, create a university, and develop science, research, and high-tech industries in the studied region is documented by the unfavourable values of the UEX and HTS indicators for the region.

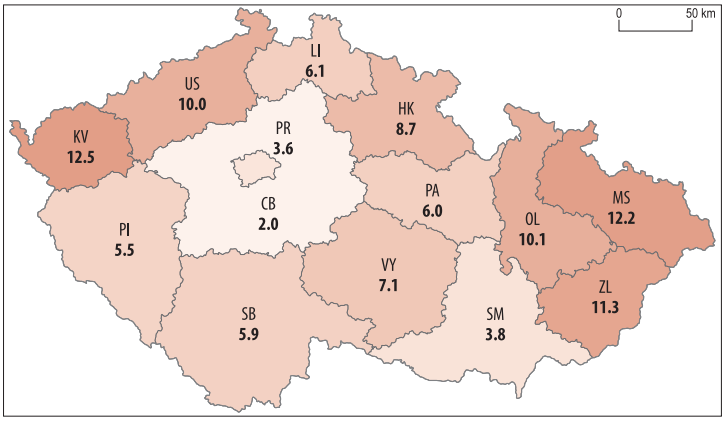

Fig. 2. Average order of indicator values of demographic capital in the regions of Czechia, 2022. The list of indicators is in *Table 1*. Region codes: PR = Prague; CB = Central Bohemia Region; SB = South Bohemia Region; PI = Pilsen Region; KV = Karlovy Vary Region; US = Ústí Region; LI = Liberec Region; HK = Hradec Králové Region; PA = Pardubice Region; VY = Vysočina Region; SM = South Moravian Region; OL = Olomouc Region; ZL = Zlín Region; MS = Moravian-Silesian Region. *Sources*: Databases of the Czech Statistical Office, and authors' own calculations.

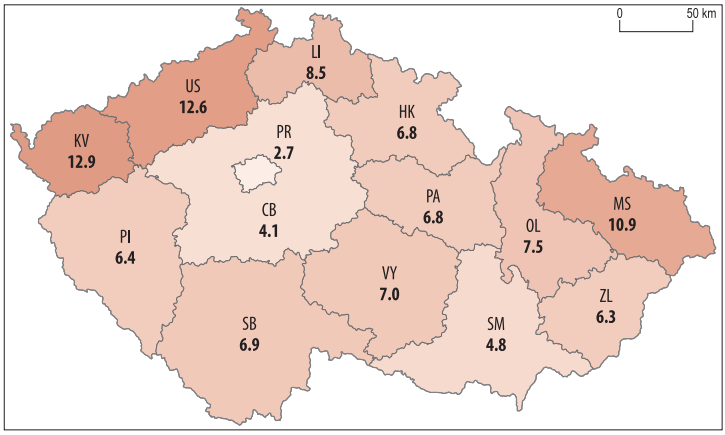

Fig. 3. Average order of indicator values of human capital in the regions of Czechia, 2022. For explanations and sources see *Figure 2*.

Table 4. Human and demographic capital in the Karlovy Vary Region and neighbouring Bavarian, Saxon and Czech regions according selected indicators, 2022

Region, country	NUTS EU region	Values of demographic capital indicators			Values of human capital indicators		
		LD	SD	LEM	GDP	UEX	HTS
Chemnitz (Saxony, Germany)	NUTS2	0.76	0.98	80.3	29.6	25.1	3.4
Upper Franconia (Bavaria, Germany)	NUTS2	1.07	1.00	80.0	38.8	27.5	3.8
Upper Palatinate (Bavaria, Germany)	NUTS2	1.12	1.00	80.5	43.7	30.6	5.0
Germany	*NUTS0*	*1.04*	*1.01*	*81.5*	*48.6*	*32.0*	*5.3*
Karlovy Vary Region (Bohemia, Czechia)	NUTS3	0.97	1.00	78.1	19.3	14.0	1.5
Ústí Region (Bohemia, Czechia)	NUTS3	0.99	0.99	77.5	23.5	16.2	2.9
Pilsen Region (Bohemia, Czechia)	NUTS3	1.08	1.04	79.6	26.2	23.6	4.7
Czechia	*NUTS0*	*1.05*	*1.02*	79.7	27.6	*26.7*	*5.1*

Note: Description of indicator codes are in *Table 1*. *Sources*: Databases of the Czech Statistical Office and Eurostat. Authors' own calculations.

Discussion and strategies and measures for the development of human capital

The above-mentioned unfavourable demographic-capital and human-capital values of the Karlovy Vary Region are the result of a number of factors operating both in the past and in the present. Immediately after World War II, there was a population exchange – the displacement of the vast majority of German-speaking residents and the arrival of mostly poor Czech and Slovak new settlers without ties to the local settlements and landscape. This non-rootedness and residential instability of the region's inhabitants is now no longer as strong, but it still exists. The region's human capital was subsequently adversely affected by the political, social and economic measures of the socialist (communist) governments between 1948–1989. The Iron Curtain of barbed wire with high electric voltage built near the border with Bavaria prevented

cross-border relations. The problematic post-socialist development and subsequent not very successful post-socialist transformation of the brown-coal, textile, glass and porcelain industries in the region led to low wages, job losses and the departure of many young and educated residents from the region.

Economic transformation and further economic development in the post-socialist countries of Central Europe led to an intensification of economic, social and demographic contrasts between the cores and the peripheries within regions and on the east-west gradient within these countries, with more positive developments in the cores (including their suburban zones) and in the western regions of the countries (while eliminating the influence of the capital cities) (Downes, R. 1996; Blažek, J. and Csank, P. 2005; Matlovič, R. *et al*. 2018). However, this may not be the case for those regions that entered the post-socialist transformation with the significant weight of coal mining and processing, textile and metallurgical industries, as these sectors have been going through crises here since the 1990s. In Czechia, this applies to the Ústí and Karlovy Vary regions located in the west of the country.

The Karlovy Vary Region and the neighbouring regions in Bavaria and Saxony (Upper Franconia, Upper Palatinate and Chemnitz) have a peripheral location within Central Europe, as they are far from large settlement agglomerations and economic cores and axes of Czechia and Germany (it is a "macro-regional" periphery). This peripherality leads to the migration of young and educated people to the aforementioned major agglomerations, cores and axes, where they find interesting and well-paid work (Brixy, U. *et al*. 2022), diverse services and culture. If the municipalities of these regions are also characterized by meso-regional and micro-regional peripherality (they are located far from the meso-regional city and micro-regional towns), then this migration is even stronger. However, we cannot forget the not yet very strong migration counter-current – counter-urbanization, which in recent years has been bringing some people from towns and agglomerations to rural and ecologically valuable areas (Šimon, M. and Bernard, J. 2016 in Czechia, Steinführer A. *et al.* 2024 in Germany).

The key strategy for developing human capital in the Karlovy Vary Region is to develop the education of the population, including *university education*. There is no public university here, but its establishment is being prepared. The organizational form of the planned school is now being decided – whether it will be a full-fledged university or polytechnic college, or just a separate faculty of a university located outside the region, in Pilsen or Prague. The school's focus should respect the specifics of the region and the needs of employers in the region. So far, economic, ICT, public administration, balneology and rehabilitation fields are planned. It would be good to add bachelor's degree technical fields that would support the maintenance and development of mechanical engineering in the region (Gál, Z. and Páger, B. 2017). This is what representatives of these companies in the region want (PRKK, 2021). A problem can be the region's small population base (300,000 inhabitants), which affects the number of potential students and the variety of potential fields of study.

The region has a sufficient network of schools providing diverse *upper secondary education* (for students aged 15–18) in micro-regional towns, the exception is the peripheral Toužim-Žlutice sub-region in the south-east of the region. Manufactory factories producing unique, world-renowned products in the region for more than 100 years – musical instruments, unique and serial porcelain and glass products – should retain the relevant craft disciplines and lecturers. A greater expansion of dual education can be recommended – education in schools and at the same time directly in industrial companies, as proposed by local industrialists (Vaishar, A. *et al.* 2012).

Primary and lower secondary education ("elementary education" in Czechia) in the region should be of high quality and accessible even

in rural peripheries and in socially excluded localities. In the rural periphery of the central, southern and south-eastern parts of the Karlovy Vary Region, where there are mainly small rural settlements without schools, commuting pupils to distant schools is difficult, time-consuming and dangerous. This may be the reason for the departure of young families with children from rural peripheries (Kubeš, J. and Podlešáková, N. 2021).

Insufficient qualifications and insufficient language skills of *representatives and employees of public administration* in the region is one of the reasons for the still weak cross-border cooperation with neighbouring Bavaria and Saxony and within the cross-border Euregio Egrensis. According to Welter, F. *et al.* (2007), and Stoffelen, A. *et al.* (2017) the development of cooperation is hindered by the lack of initiative and impulsiveness of the Czech partners, insufficient language skills of partners on both sides of the border, reminiscences of residents on both sides of the problematic stages of the development of Czech-German relations in the 20th century, and persistent socioeconomic differences. Lipovská, Z. *et al.* (2012) recommend expanding and intensifying cooperation between schools (including regional universities) on both sides of the border in education and getting to know each other. Daily or weekly commuting of Czech workers to neighbouring German regions for work is not the form of interstate cooperation.

The Karlovy Vary Region is struggling with a *shortage of medical doctors* in its hospitals and polyclinics, and in the peripheral countryside. Many doctors have aged or left for better-paid work in Germany (Mareckova, M. 2004), and young doctors do not want to go to this peripheral region. State, regional and municipal financial and other incentives for doctors and medical students are already being implemented.

World-famous spas are concentrated in the region – in Karlovy Vary, Mariánské Lázně, Františkovy Lázně, Jáchymov. Around 650,000 guests use them annually, of which 70 percent are foreign (Vystoupil, J. *et al.* 2017). Balneology, accommodation, catering and other services come together in this spa industry (Speier, A.R. 2011). These spas have many employees, but they often lack the necessary education (including language skills) (Bolelоucka, E. and Wright, A. 2020). It is therefore necessary to establish a spa tertiary education system in the region and strengthen the relevant secondary education system as well as a balneological research institute.

After 1989, especially near the highway near Cheb, Sokolov and Karlovy Vary, large *halls of logistics and assembly plants*, mostly owned by foreigners, were created. They mainly employ cheap and poorly qualified Czech workers here. Now the leadership of the region and the state should rather support the development of modern and high-tech industry associated with a qualified workforce (Žítek, V. 2010). It is also important to preserve the production of original, internationally recognized glass and porcelain products, musical instruments and some food products requiring special craftsmanship. If a regional innovation centre were to be established in the region, it could support these higher production activities more, support start-ups, overall technical development and, thus, improve the human capital of the workforce.

In the Sokolov sub-region, surface mining of brown coal took place and to a lesser extent is still taking place, which is provided by workers living mainly in local towns and townships. The management of the *Sokolovská uhelná company* (regional brown-coal company), representatives of the towns and the Karlovy Vary Region, and local labour authorities come up with a series of measures related to the gradual reduction of brown coal mining and related energy and with a plan to end mining by 2035 (see Lipovská, Z. *et al.* 2012). The Sokolovská uhelná company wants to focus on new carbon-free energy, other new technologies and on the reclamation and revitalization of the landscape destroyed by surface mining (Frantál, B. *et al.* 2024). This will require a skilled, partly new workforce. Laid-off workers from brown-coal mining and processing

should undergo retraining, which will also contribute to the growth of human capital in the region. Similar problems are faced by the Most brown-coal area (Ústí region, Czechia) and brown-coal areas in Hungary (Salgótarján – Horváth, G. and Csüllög, G. 2012) and in eastern Germany (Lusatia – Matern, A. *et al*. 2023).

Conclusions

Favourable demographic capital and the growth of human capital are key factors for the further development of the Karlovy Vary Region as a whole, sub-regions of the region and individual municipalities located both in the peripheral, semi-peripheral and core areas of the region. The paper uses a settlement-geographical approach – first, the higher and lower settlement centres of the region are defined, and based on the time distance from micro-regional towns, the semi-peripheries and remote peripheries of the region are delimitated. Using the indicators, the paper then evaluates and compares the demographic and human capital of the types of municipalities and sub-regions of the Karlovy Vary Region, as well as this region and other regions of Czechia and neighbouring regions in Germany.

The meso-regional city of Karlovy Vary has a weaker demographic capital influenced by the aging of the local population and the departure of suburbanites to suburbs. Its human capital is favourable. Meso- and micro-regional towns are losing residents primarily as a result of suburbanization, which enriches their nearby suburban hinterland in terms of population and human capital. The municipalities in the semi-peripheral and peripheral rural areas of the region are diverse as a whole. If they have quality management and a good location, their capital values can be favourable.

In the case of the Karlovy Vary Region, located in the west of Czechia, on the border with developed Germany, the east-west gradient of human capital development within Czechia has not been confirmed. The Karlovy Vary Region is not doing well in comparison with other regions. It is in last place among Czech regions and lags even further behind neighbouring regions in Bavaria. The reason is primarily the specific development of the region after World War II, its peripheral position within Czechia, and the problematic post-socialist transformation of its economy until recently based mainly on brown coal.

The paper also includes strategies and measures to increase human capital in the Karlovy Vary Region and its municipalities. The key is the retention of university graduates and the establishment of a university or polytechnic college in the region. The development of upper secondary education, including dual training in companies, is also important.

Another significant benefit to the human capital of the region should be high-quality and affordable retraining of laid-off workers from the ceasing brown coal mining and from other declining industries, and the support of industrial enterprises with higher added value and high-tech production. The qualification development of workers in the region's world-famous spas is also important. Intensifying real (not paper) Czech-German cross-border cooperation would bring development incentives, improved language skills, and mutually beneficial economic and cultural cooperation to the region, its public administration, associations, schools, and businesses.

REFERENCES

Adsera, A. 2004. Changing fertility rates in developed countries. The impact of labor market institutions. *Journal of Population Economics* 17. 17–43. https://doi.org/10.1007/s00148-003-0166-x

Agarwal, S., Rahman, S. and Errington, A. 2009. Measuring the determinants of relative economic performance of rural areas. *Journal of Rural Studies* 25. (3): 309–321. https://doi.org/10.1016/j.jrurstud.2009.02.003

Becker, G. 1964. *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education*. Chicago, The University of Chicago Press.

Bernard, J. and Šimon, M. 2017. Vnitřní periferie v Česku: Multidimenzionalita sociálního vyloučení ve venkovských oblastech (Inner peripheries in

Czechia: The multidimensional nature of social exclusion in rural areas). *Sociologický časopis / Czech Sociological Review* 53. (1): 3–28. https://doi.org/10.13060/00380288.2017.53.1.299

Blažek, J. and Csank, P. 2005. The West-East gradient and regional development: The case of the Czech Republic. *AUC Geographica* 40. (1–2): 89–108.

Blundell, R., Dearden, L., Meghir, C. and Sianesi, B. 1999. Human capital investment: The returns from education and training to the individual, the firm and the economy. *Fiscal Studies* 20. (1): 1–23. https://doi.org/10.1111/j.1475-5890.1999.tb00001.x

Boleloucka, E. and Wright, A. 2020. Spa destinations in the Czech Republic: An empirical evaluation. *International Journal of Spa and Wellness* 3. (2–3): 117–144. https://doi.org/10.1080/24721735.2021.1880741

Bontis, N. and Serenko, A. 2007. The moderating role of human capital management practices on employee capabilities. *Journal of Knowledge Management* 11. (3): 31–51. https://doi.org/10.1108/13673270710752090

Brixy, U., Brunow, S. and Ochsen, C. 2022. On the peripheral-urban wage gap in Germany. *Applied Geography* 139. 102647. https://doi.org/10.1016/j.apgeog.2022.102647

Chytil, M.K. 1982. A centralized biomedical research data-processing unit and the stages of its development. *Medical Informatics* 7. (1): 39–48. https://doi.org/10.3109/14639238209020641

Coleman, J.S. 1988. Social capital in the creation of human capital. *American Journal of Sociology* 94. 95–120. https://doi.org/10.1086/228943

Downes, R. 1996. Economic transformation in Central and Eastern Europe: The role of regional development. *European Planning Studies* 4. (2): 217–224. https://doi.org/10.1080/09654319608720341

Elhorst, J.P. 1998. The non-utilization of human capital in regional labor markets across Europe. *Environment and Planning A,* 30. (5): 901–920. https://doi.org/10.1068/a300901

Frantál, B., Pasqualetti, M.J. and Brisudová, L. 2024. Challenges, dilemmas and success criteria of recycling coal mining landscapes. *Moravian Geographical Reports* 32. (4): 216–232. https://doi.org/10.2478/mgr-2024-0018

Gál, Z. and Páger B. 2017. The changing role of universities and the innovation performance of regions in Central and Eastern Europe. In *Routledge Handbook to Regional Development in Central and Eastern Europe.* Ed.: Lux, G., London, Routledge, 225–239. https://doi.org/10.4324/9781315586137-14

Hampl, M. 2003. Diferenciace a zvraty regionálního vývoje Karlovarska: Unikátní případ nebo obecný vzor? (Differentiation and turns in regional development of Karlovy Vary region: A unique case or a general regional pattern?). *Geografie – Sborník CGS* 108. (3): 173–190. https://doi.org/10.37040/geografie2003108030173

Hampl, M. and Marada, M. 2015. Sociogeografická regionalizace Česka (Sociogeographical regionalization of Czechia). *Geografie* 120. (3): 397–421. https://doi.org/10.37040/geografie2015120030397

Hamplová, E., Bal-Domańska, B. and Provazníková, K. 2021. Business activity and its concentration in the Czech Republic and Poland in the years 2018–2020. In *Hradec Economic Days 2021.* Eds.: Maci, J., Maresova, P., Firlej, K. and Soukal, I., Hradec Králové, University of Hradec Králové, 217–224. https://doi.org/10.36689/uhk/hed/2021-01-021

Hendrick, R.M. 2011. *Managing the Fiscal Metropolis: The Financial Policies, Practices, and Health of Suburban Municipalities.* Washington, Georgetown University Press. https://doi.org/10.1353/book11341

Horváth, G. and Csüllög, G. 2012. Salgótarján (Hungary) – the rise and fall of a mining and industrial region. In *Post-Mining Regions in Central Europe – Problems, Potentials, Possibilities.* Eds.: Fischer, W., Wirth, P. and Cernic-Mali, B., München, Oekom Verlag, 40–52.

Krugman, P.R. 1991. *Geography and Trade*. Cambridge, MIT Press.

Kubeš, J. and Podlešáková, N. 2021. Lidský a demografický kapitál v periferiích Plzeňského kraje (Human and demographic capital in the peripheries of the Pilsen Region). *Geografie* 126. (1): 97–122. https://doi.org/10.37040/geografie2021126010097

Leimgruber, W. 2004. *Between Global and Local. Marginality and Marginal Regions in the Context of Globalization and Deregulation*. Aldershot, Ashgate.

Lipovská, Z., Vaishar, A. and Šťastná, M. 2012. Sokolov-východ (Czech Republic) – From open cast pits to new landscapes. In *Post-Mining Regions in Central Europe – Problems, Potentials, Possibilities.* Eds.: Fischer, W., Wirth, P. and Cernic-Mali, B., München, Oekom Verlag, 63–78.

Lutz, W. 2006. Fertility rates and future population trends: Will Europe's birth rate recover or continue to decline? *International Journal of Andrology* 29. (1): 25–33. https://doi.org/10.1111/j.1365-2605.2005.00639.x

Mareckova, M. 2004. Exodus of Czech doctors leaves gaps in health care. *The Lancet* 363. (9419): 1443–1446. https://doi.org/10.1016/S0140-6736(04)16137-0

Matern, A., Špaček, M., Theuner, J., Knippschild, R. and Janáček, J. 2023. Strategies for energy transition and regional development in European post-coal mining regions: Ústí Region, Czechia, and Lusatia, Germany. *Territory, Politics, Governance* 1–22. Taylor & Francis online. https://doi.org/10.1080/21622671.2023.2231972

Matlovič, R., Klamár, R., Kozoň, J., Ivanová, M. and Michalko, M. 2018. Spatial polarity and spatial polarization in the context of supranational and national scales: Regions of Visegrad countries after their accession to the EU. *Bulletin of Geography. Socio-Economic Series* 41. 59–78. https://doi.org/10.2478/bog-2018-0026

Minařík, B. and Borůvková, J. 2014. Chosen aspects of human capital development in regions of the CR. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis* 59. (4): 159–165. https://doi.org/10.11118/actaun201159040159

Mincer, J. 1984. Human capital and economic growth. *Economics of Education Review* 3. (3): 195–205. https://doi.org/10.1016/0272-7757(84)90032-3

Musil, J. and Müller, J. 2008. Vnitřní periferie v České republice jako mechanismus sociální exkluze (Inner periphery in the Czech Republic as a mechanism of social exclusion). *Sociologický časopis / Czech Sociological Review* 44. (2): 321–348. https://doi.org/10.13060/00380288.2008.44.2.05

Novotná, M., Preis, J., Kopp, J. and Bartoš, M. 2013. Changes in migration to rural regions in the Czech Republic: Position and perspectives. *Moravian Geographical Reports* 21. (3): 37–54. https://doi.org/10.2478/mgr-2013-0015

Ployhart, R.E., Nyberg, A.J., Reilly, G. and Maltarich, M.A. 2014. Human capital is dead; long live human capital resources! *Journal of Management* 40. (2): 371–398. https://doi.org/10.1177/0149206313512152

PRKK 2021. *Program rozvoje Karlovarského kraje na období 2021–2027* (Development program of the Karlovy Vary region for the period 2021–2027). Karlovy Vary, Regional Authority of Karlovy Vary Region.

Sagan, I. and Masik, G. 2014. Economic resilience. The case study of Pomorskie region. *Raumforschung und Raumordnung* 72. (2): 153–164. https://doi.org/10.1007/s13147-013-0266-3

Šimon, M. and Bernard, J. 2016. Rural idyll without rural sociology? Changing features, functions and research of the Czech countryside. *Eastern European Countryside* 22. (1): 53–68. https://doi.org/10.1515/eec-2016-0003

Sleebos, J. 2003. *Low Fertility Rates in OECD Countries: Facts and Policy Responses.* OECD Social, Employment and Migration Working Papers. Paris, OECD. https://doi.org/10.1787/568477207883

Speier, A.R. 2011. Health tourism in a Czech health spa. *Anthropology & Medicine* 18. (1): 55–66. https://doi.org/10.1080/13648470.2010.525879

Steinführer, A., Osterhage, F., Tippel, C., Kreis, J. and Moldovan, A. 2024. Urban–rural migration in Germany: A decision in favour of 'the rural' or against 'the urban'? *Journal of Rural Studies* 111.103431. https://doi.org/10.1016/j.jrurstud.2024.103431

Stoffelen, A., Ioannides, D. and Vanneste, D. 2017. Obstacles to achieving cross-border tourism governance: A multi-scalar approach focusing on the German-Czech borderlands. *Annals of Tourism Research* 64. 126–138. https://doi.org/10.1016/j.annals.2017.03.003

Svendsen, G. and Sørensen, J.F. 2006. The socioeconomic power of social capital. *International Journal of Sociology and Social Policy* 26. (9–10): 411–429. https://doi.org/10.1108/01443330610690550

Teufel, N., Maier, J. and Doevenspeck, M. 2022. Cross-border cooperation areas in north Bavaria and west Bohemia – Analysis and evaluation. In *Cross-Border Spatial Development in Bavaria*, No. 34. Eds.: Chilla, T. and Sielker, F., Hannover, Academy for Territorial Development in the Leibniz Association, 88–109. https://nbn-resolving.org/urn:nbn:de:0156-41580587

Vaishar, A., Lipovská, Z. and Šťastná, M. 2012. Small towns in post-mining regions. In *Post-Mining Regions in Central Europe – Problems, Potentials, Possibilities.* Eds.: Fischer, W., Wirth, P. and Cernic-Mali, B., München, Oekom Verlag, 153–167.

Vystoupil, J., Šauer, M. and Bobková, M. 2017. Spa, spa tourism and wellness tourism in the Czech Republic. *Czech Journal of Tourism* 6. (1): 5–26. https://doi.org/10.1515/cjot-2017-0001

Weaver, R.D. and Habibov, N. 2012. Social capital, human capital, and economic well-being in the knowledge economy: Results from Canada's General Social Survey. *Journal of Sociology & Social Welfare* 39. (2): 31–53. https://doi.org/10.15453/0191-5096.3665

Welter, F., Althoff, K., Haack, F.S. and Veleva, N. 2007. *Institutional and Enterprise Cross-Border Activities within a Euregio: Case Study of "Hochfranken", Germany.* Siegen, Universität Siegen.

Wieczerzak, J. 2018. Demographic, human and social capital as factors of regional development. *Ekonomia Społeczna / Social Economy* 1. 68–79. https://doi.org/10.15678/ES.2018.1.06

Wielechowski, M., Cherevyk, D., Czech, K., Kotyza, P., Grzęda, Ł. and Smutka, L. 2021. Interdependence between human capital determinants and economic development: K-means regional clustering approach for Czechia and Poland. *Entrepreneurial Business and Economics Review* 9 (4): 173–194. https://doi.org/10.15678/EBER.2021.090411

Žítek, V. 2010. Innovation performance of the Czech regions. *Review of Economic Perspectives* 10. (4): 151–173. https://doi.org/10.2478/v10135-011-0003-1

Žítek, V. and Klímová, V. 2016. Research activity in the Czech and Slovak regions. *Entrenova* 2. (1): 425–432. https://hrcak.srce.hr/file/365244