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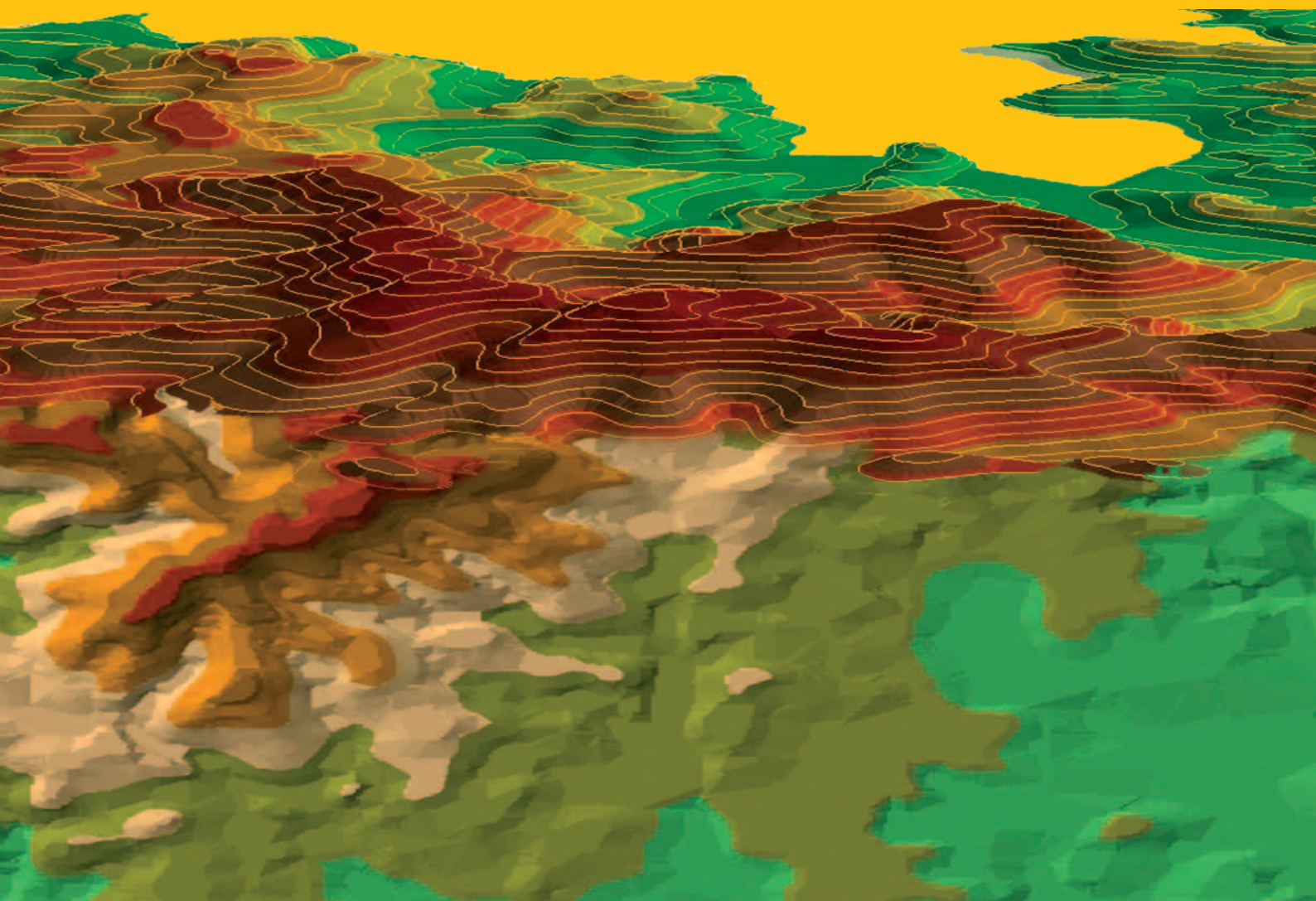

Fig. 1: Plant associations of forest edges with Melampyrum nemorosum maintained at places without any strong influence of eutrophication from the surrounding agricultural land (Photo P. Halas)

Fig. 2: Edges of forest fragments were traditionally used to put away stones from the surrounding agricultural land (Photo P. Halas)

Illustration related to the paper by J. Lacina, P. Halas and P. Švec

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Articles:

BIOGEOGRAPHICAL RELATIONSHIPS BETWEEN LANDSCAPE PATTERNS, SOME LOCAL ABIOTIC FACTORS AND VEGETATION OF FOREST EDGES (CZECH REPUBLIC)

Jan LACINA, Petr HALAS, Pavel ŠVEC

Abstract

Forest edges consist of specific ecotone plant associations. Their species composition reflects conditions within the local environment and the character of the surrounding landscape, as well as the history of the given area. This article aims to ascertain the importance of local conditions and the characteristics of the surrounding landscape on the species composition. The results show that the species composition of forest edges is adversely influenced by agricultural use of the surrounding landscape and differs according to the north-south gradient of aspect. In terms of their species composition, forest edges represent important refuges of certain plant species that have already disappeared from the surrounding landscape.

Shrnutí

Biogeografické vztahy mezi charakterem zemědělské krajiny, lokálními abiotickými podmínkami a vegetací lesních okrajů (Česká republika)

Lesní okraje představují specifická ekotonová společenstva rostlin. Jejich druhové složení odráží lokální podmínky prostředí, charakter okolní krajiny i historii daného území. V tomto příspěvku jsme se zabývali významem lokálních podmínek a charakteristik okolní krajiny na jejich druhové složení. Zjistili jsme, že druhové složení lesních okrajů je negativně ovlivňováno zemědělským využíváním okolí a liší se podle severojižního gradientu expozice. Lesní okraje svým druhovým složením představují významná refugia některých druhů rostlin, které z okolní krajiny již zmizely.

Keywords: *patch isolation, patch area, agricultural landscape, forest edges, plant diversity, land cover, Bohemian-Moravian Upland, Czech Republic*

1. Introduction

The species composition of isolated forest edge fragments is influenced by the size of the biotope, the degree of its isolation and the character of the surrounding environment, as well as by the characteristics of the species occurring in the given biotope. Fragmentation of natural biotopes due to human activity is considered the main cause of diminishing plant biodiversity worldwide (Eriksson, Ehrlén, 2001; Hobbs, Yates, 2003; Honnay et al., 2005; Cousins, 2009). The consequences of biotope fragmentation may severely affect ecosystems, populations, and individual species (Young et al,. 1996). Fragmentation involves interrelated processes of landscape change, such as shrinking biotopes leading to the physical reduction of population sizes (Endels et al., 2002a, 2002b; Leimu et al., 2006) and to the splitting-up of biotopes giving rise to size reduction of populations and exacerbating isolation (Saunders et al., 1991; Wiens, 1997; Dupré, Ehrlén, 2002). The increasing fragmentation makes patches draw apart, with lower probability of their re-colonisation as a result (Opdam, 1988). Splitting-up of the populations due to fragmentation leads to the formation of mutually isolated species-specific populations in the landscape; these populations communicate through migration and are characterised by local population extinction and colonisation of available free spaces (Hanski, Gilpin, 1997).

With the growing biotope fragmentation, the influence of the edge effect increases, a process related to the greater inhospitality of the biotope area, and manifests itself through the reduced fitness (reproductive success) of the surviving species, resulting from the penetration of adverse impacts from the landscape

matrix (Jules, 1998; Endels et al., 2002a, 2002b; Lienert, Fischer, 2003; Brys et al., 2004). In small woodland patches, the impacts of the edge effect are more profound (Forman, Godron, 1986; Pauchard, Alaback, 2004). The structure of the landscape and the environmental demands of the individual species also significantly influence the mobility of organisms (Hanski, Ovasakinen, 2000). The research reported here investigates which groups of forest edge species are more prone to limitation by the increasing fragmentation and how they are influenced by the structure of the surrounding landscape. Six species groups were categorised according to their modes of dissemination and pollination. These were individually analysed by canonical correspondence analysis (CCA) with special attention to detecting the importance of relevant local landform variables, size of the biotope, and landscape characteristics. Concrete plant species were identified in terms of their preference for northern or southern edges and their relation to the heterogeneity of the closest (100 m) surroundings. A significant relationship between species composition and land use was established; it is modified by landform conditions, position of the phytocoenological area and the size of the biotope.

2. Materials and methods

2.1 Study area

The study areas are situated on the south-western and eastern edge of the Bohemian-Moravian Upland in the Czech Republic (Fig. 1). The landscape is mostly a mosaic of farmland and forests. Deciduous forests represent 1.6%–72.0% (average 18.2%) of land cover. Forest margins surround small woodland edges with near-natural species composition. The species composition of the woodland patches corresponds approximately to the potential natural vegetation of the *Luzulo albidae-Quercetum*, *Dentario enneaphylli-Fagetum* and M*elampyro nemorosi-Carpinetum* (Neuhäuslová et al., 1997) associations. The most common trees are *Fagus sylvatica*, *Carpinus betulus*, while admixed species include *Acer campestre*, *A. platanoides*, *A. pseudoplatanus*, *Fraxinus excelsior*, *Sorbus aucuparia*, *Tilia cordata*, and *Abies alba*. Herbaceous undergrowth is often enriched by the presence of mesophilous woodland species such as *Convallaria majalis*, *Hepatica nobilis*, *Lathyrus vernus*, *Melampyrum nemorosum*, *Mercurialis perennis*, *Polygonatum odoratum*, *P. multiflorum*, *Pulmonaria obscura* and *P. officinalis*. Evergreen forests, consisting of spruce monocultures, take up 0.0%–52.0% (average 20.0%). The key component of the landscape structure is arable land (average 30.8%) and meadows (average 27.7%). The bedrock is granitic (south-western part) and metamorphic, such as gneiss and mica schist (eastern part). Elevations range from 470 to 658 m a.s.l. Average annual precipitation is 610.3 mm and average annual air temperature is 7.0 °C (Tolasz et al., 2007).

The total lengths of the forest edges studied ranged between 85.0 and 726.3 m (average 229.8 m).

2.2 Species data

The total number of woodland edges studied was 38. Two 2 m × 2 m phytosociological quadrats was laid in each forest edge, always on the southern and northern borders. The size of phytosociological quadrats based on the minimum width of forest edges. All species of higher vascular plants within them were recorded. The occurrence of vascular plant species was quantified by means of the nine-degree Braun-Blanquet abundance and dominance scale (Westhoff, van der Maarel, 1978). A total of 157 species were recorded in the quadrats, then categorised into groups by their mode of dissemination and pollination for separate analysis.

According to the Biolflor database (Klotz et al., 2003), the following categories of species were defined: endozoochoric species (e.g. *Actaea spicata*, *Convallaria majalis*, *Polygonatum multiflorum*, *Vaccinium myrtillus*), ectozoochoric species (e.g. *Ballota nigra*, *Galeopsis pubescens*, *Hieracium pillosela*, *Medicago falcata*), myrmecochoric + autochoric species (e.g. *Convallaria majalis*, *Corydalis intermedia*, *Genista tinctoria*, *Maianthemum bifolium*), anemochoric species (e.g. *Betula pendula*, *Hieracium murorum*, *Poa nemoralis*, *Silene nutans*), entomogamic species (e.g. *Securigera varia*, *Campanula persicifolia*, *C. rotundifolia*, *Thymus pulegioides*), and anemogamic species (e.g. *Betula pendula*, *Poa nemoralis*, *P. pratensis agg.*, *Rumex acetosa*). Nomenclature and taxonomic approaches are after Kubát et al. (2002). The number of species in each category was understood as a proportion

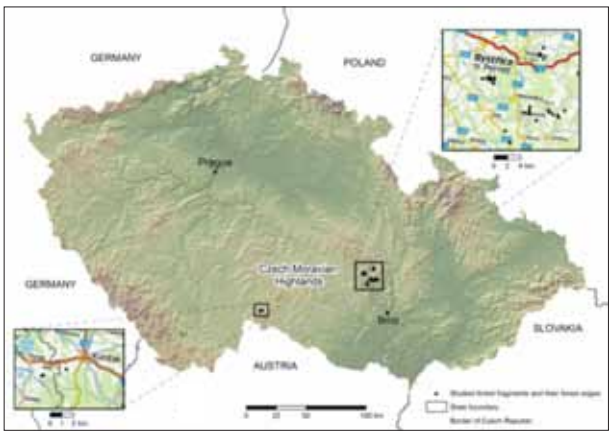


Fig. 1: Location of study areas within the Czech Republic

of their classification in the given category, i.e. a species belonging to two categories (e.g. anemochoric and ectozoochoric at the same time) was rated at 0.5.

2.3 Patch and land cover characteristics

All the woodland edges were vectorized, including 700 m of their surroundings, using ArcGIS 9.1. Seven types of land cover were differentiated: acidophilous grassland, deciduous woodland, coniferous woodland, wetland, arable land and ruderal vegetation, meadow, and settlement. Calculations were performed for all segments in terms of their share and length of boundaries in the buffer zones surrounding each of the forest edges at distances of 50 m, 100 m, 400 m, and 700 m.

2.4 Data analysis

Species data for multivariate analyses were adjusted by merging all the plants into a single vertical layer (merging of trees covering more than one vegetation layer) and the surface-cover ratio of the species was logarithmically transformed using Hill's scaling and underweighting of rare species significance. Due to the long gradient (over 3.0 SDU) detected upon detrended correspondence analysis (DCA) in most of the species groups, unimodal techniques (CCA canonical correspondence analyses) were used in accordance with the recommendations of ter Braak, Šmilauer (2005). Statistical significance was determined by means of the Monte Carlo permutation test (999 permutations). In several cases of the defined groups, species were missing in some quadrats; they were excluded from the analysis of the forest-edge quadrat pairs. The number of the quadrat pairs analysed is listed in Tab. 1.

Variables entered into gradient analyses included geographical (elevation, average annual precipitation, average annual air temperature), exchangeable soil pH, length of the forest edge, position of the quadrat (north/south) and selected landscape characteristics – shares and relative lengths of forest-free area boundaries (fields + meadows) within 50 m, 100 m, 400 m, and 700 m of the perimeter. The lengths of the boundaries were expressed as length per unit area (m^2/ ha). An explanation of some of the abbreviated variable terms and symbols used in the charts is presented in Tab. 2.

The shares and lengths of forest-free area boundaries within 100 m and 700 m of the perimeters were then selected along with the length of the forest edge and the position of the quadrat, which were analysed using partial canonical correspondence analysis (pCCA). Selected variables were analysed independently with the key variables (geographical, length of the forest edge and quadrat position) included as covariates.

Species group	Number of analysed relevé pairs
All species	38
Anemochores	38
Anemogam	38
Ectozoochores	38
Endozoochores	37
Entomogam	38
Autochores and Myrmecochores	35

Tab. 1: The number of quadrat pairs in the defined species groups processed by multivariate analyses

Temperature	average annual air temperature
Precipitation	average annual precipitation
Soil pH	exchangeable soil pH
MF (%) 50 m	shares of forest free areas within 50 m buffer zone
aMF (b) 50 m	absolute length of forest-free area boundaries within 50 m buffer zone
rMF (b) 50 m	relative length of forest-free area boundaries within 50 m buffer zone (m^3/ha)

Tab. 2: Expansion of abbreviated terms and symbols used for the variables

The relation of the actual plant species to selected environment variables (position of the quadrat and length of the forest-free boundaries within 100 m) was expressed through ranking the species by their score on the first canonical axis of the pCCA after selection of 20 species with the highest fit values. Only species with a frequency of at least six occurrences were shown. The presence-absence species data were used to express the relation of the actual species to the selected variable. Ellenberg´s indicator values (Ellenberg et al., 1992) calculated for each phytosociological quadrat in JUICE (Tichý, 2002) was also used to compare environmental factors on the northern and southern forest edges.

The normality of the data was analysed by STATISTICA 8.0 (Statsoft Inc., 2000), using the Shapiro-Wilks W test. In view of the abnormal distribution of some of the data, non-parametric methods were used. Numbers/shares of species in all of the relevés were used in correlation analyses.

3. Results

3.1 Influence of variables on species composition

The most important of the analysed variables are the geographical variables, especially elevation, some of the applied landscape characteristics, especially the share of forest-free areas within 700 m, the length of forest edge, and the position of the quadrat (Tab. 3).

	All species			Endozoochores			Ectozoochores			Autochores and Myrmecochores		
	var. (%)	F	P	var. (%)	F	P	var. (%)	F	P	var. (%)	F	P
All variables	26.6	1.581	≤ 0.001	26.9	1.495	≤ 0.001	24.8	1.350	≤ 0.001	27.0	1.450	≤ 0.001
Altitude	3.1	2.400	≤ 0.001	2.9	2.168	≤ 0.001	2.3	1.833	0.004	3.1	2.201	≤ 0.001
Temperature	1.8	1.476	0.012	-	-	n.s.	-	-	n.s.	2.2	1.651	0.007
Precipitation	2.3	1.857	0.002	-	-	n.s.	-	-	n.s.	-	-	n.s.
Soil pH	-	-	n.s.	-	-	n.s.	-	-	n.s.	-	-	n.s.
MF (%) 50 m	-	-	n.s.	-	-	n.s.	-	-	n.s.	-	-	n.s.
MF (%) 100 m	-	-	n.s.	-	-	n.s.	-	-	n.s.	-	-	n.s.
MF (%) 400 m	-	-	n.s.	-	-	n.s.	-	-	n.s.	-	-	n.s.
MF (%) 700 m	2.9	2.280	≤ 0.001	3.6	2.672	≤ 0.001	3.3	2.505	≤ 0.001	3.0	2.122	≤ 0.001
rMF (b) 50 m	-	-	n.s.	-	-	n.s.	-	-	n.s.	-	-	n.s.
rMF (b) 100 m	-	-	n.s.	2.4	1.807	0.008	-	-	n.s.	1.9	1.418	0.040
rMF (b) 400 m	1.9	1.545	0.006	-	-	n.s.	-	-	n.s.	2.4	1.780	≤ 0.001
rMF (b) 700 m	-	-	n.s.	-	-	n.s.	-	-	n.s.	-	-	n.s.
Length of forest edge	2.0	1.603	0.003	-	-	n.s.	2.8	2.163	0.005	-	-	n.s.
Phytosociological qadrat position	2.6	2.055	≤ 0.001	2.4	1.857	0.002	1.8	1.444	0.043	2.5	1.778	0.002
Sum of var. (%)	16.7	-	-	11.2	-	-	10.2	-	-	15.2	-	-

Tab. 3: Results of canonical correspondence analysis. Selected species groups as analysed by forward selection method Var. (%) – explained variability, F – test strength, p – statistical significance, n.s. – not significant

	Anemochores			Anemogames			Entomogames		
	var. (%)	F	P	var. (%)	F	P	var. (%)	F	P
All variables	36.9	1.656	≤ 0.001	29.8	1.851	≤ 0.001	23.7	1.350	≤ 0.001
Altitude	4.1	2.359	≤ 0.001	5.1	3.971	≤ 0.001	2.3	1.748	0.002
Temperature	-	-	n.s.	-	-	n.s.	-	-	n.s.
Precipitation	4.6	2.627	≤ 0.001	3.3	2.678	≤ 0.001	-	-	n.s.
Soil pH	-	-	n.s.	-	-	n.s.	-	-	n.s.
MF (%) 50 m	2.9	1.758	0.006	2.2	1.828	0.015	-	-	n.s.
MF (%) 100 m	4.0	2.389	≤ 0.001	2.0	1.727	0.024	-	-	n.s.
MF (%) 400 m	-	-	n.s.	-	-	n.s.	-	-	n.s.
MF (%) 700 m	-	-	n.s.	3.7	2.967	≤ 0.001	2.2	1.668	≤ 0.001
rMF (b) 50 m	-	-	n.s.	-	-	n.s.	-	-	n.s.
rMF (b) 100 m	-	-	n.s.	-	-	n.s.	2.0	1.569	0.003
rMF (b) 400 m	-	-	n.s.	-	-	n.s.	-	-	n.s.
rMF (b) 700 m	-	-	n.s.	-	-	n.s.	-	-	n.s.
Length of forest edge	2.6	1.579	0.029	2.1	1.742	0.029	1.9	1.450	0.037
Phytosociological qadrat position	3.4	2.056	≤ 0.001	2.3	1.933	0.010	2.4	1.802	≤ 0.001
Sum of var. (%)	21.5	-	-	20.6	-	-	10.7	-	-

Tab. 3 – Continuation

Partial canonical analyses also demonstrated a high significance for landscape variables in the variability of species composition (Tab. 4). In terms of landscape characteristics, the greatest part of species data variability was explained by the shares of forest-free areas within 700 m for most of the species groups defined. Heterogeneity of the forest edge surroundings expressed by the relative length of forest-free area boundaries had a significant and more prominent influence on the quadrat species composition within the nearer 100 m surroundings than within 700 m. The length of the forest edge significantly influenced the species variability in most of the species groups analysed, largely the anemochoric (2.8% $F = 1.655$, $p = 0.012$) and ectozoochoric species (2.7% $F = 2.147$, $p = 0.003$). The position of the quadrat explained most of the species data variability in the anemochoric species (3.3% $F = 1.992$, $p \leq 0.001$); on the other hand, it had no significant influence on the variability of ectozoochoric species.

3.2 Isolation and fragmentation

The results of the partial canonical analyses of the individual species groups (Tab. 4) show that the share of forest-free areas within 100 m or 700 m was among the most important of the environmental variables analysed in all the groups. Forest-free area shares explained the greatest part of the species data variability in those species groups with diasporas that disperse easily in open landscapes, i.e. the anemochoric and anemogamic species (Tab. 4).

Heterogeneity of the forest edge surroundings expressed by relative lengths of borders influenced the species composition of all species groups only within 100 m of perimeters. Further, the position of the quadrat (north/south) and the length of forest edge were important variables for the species composition variability in all the species groups (Tab. 4).

Tables 5–8 clearly show a marked difference between the correlations of numbers and shares of species with the length of the forest edge and lengths of forest-free borders within 100 m and 700 m, while the species diversity and species composition of the southern borders better reflect the use of the surrounding landscape and the size of the biotope than the northern quadrats.

	All species			**Endozoochores**			**Ectozoochores**			**Autochores and Myrmecochores**		
	var. (%)	F	P	var. (%)	F	P	var. (%)	F	P	var. (%)	F	P
MF (%) 100 m	2.6	2.133	≤ 0.001	2.7	2.111	≤ 0.001	3.1	2.476	≤ 0.001	2.3	1.656	0.008
MF (%) 700 m	2.8	2.229	≤ 0.001	3.1	2.383	≤ 0.001	2.6	2.090	0.003	2.7	1.984	≤ 0.001
rMF (b) 100 m	2.6	2.052	≤ 0.001	3.0	2.331	≤ 0.001	2.9	2.325	0.002	2.6	1.899	≤ 0.001
rMF (b) 700 m	1.7	1.350	0.040	-	-	n.s.	-	-	n.s.	-	-	n.s.
Length of forest edge	1.9	1.541	0.007	-	-	n.s.	2.7	2.147	0.003	1.8	1.289	0.143
Phytosociological qadrat position	2.6	1.087	≤ 0.001	2.3	1.760	0.006	-	-	n.s.	2.4	1.753	≤ 0.001

Tab. 4: Results of partial canonical correspondence analysis
Selected species groups were analysed by forward selection with the inclusion of selected variables as covariate. Var. (%) – explained variability, F – test strength, p – statistical significance, n.s. – not significant

	Anemochores			**Anemogames**			**Entomogames**		
	var. (%)	F	P	var. (%)	F	P	var. (%)	F	P
MF (%) 100 m	3.9	2.355	≤ 0.001	3.4	2.841	≤ 0.001	2.0	1.591	0.003
MF (%) 700 m	3.6	2.168	≤ 0.001	3.4	2.896	≤ 0.001	2.1	1.671	≤ 0.001
rMF (b) 100 m	3.3	1.985	0.003	3.0	2.548	0.002	2.2	1.711	≤ 0.001
rMF (b) 700 m	-	-	n.s.	-	-	n.s.	-	-	n.s.
Length of forest edge	2.8	1.655	0.012	2.0	1.623	0.037	1.8	1.413	0.041
Phytosociological qadrat position	3.3	1.992	≤ 0.001	2.3	1.921	0.009	2.4	1.841	≤ 0.001

Tab. 4 – Continuation

	Length of forest edge	MF (%) 100 m	MF (%) 700 m	aMF (b) 100 m	aMF (b) 700 m	rMF (b) 100 m	rMF (b) 700 m
All species	0.46**	−0.58***	−0.49**	0.47**	n.s.	n.s.	n.s.
Endozoochores	n.s.	−0.48**	−0.47**	n.s.	n.s.	n.s.	n.s.
Ectozoochores	0.72***	n.s.	−0.39*	0.46**	n.s.	n.s.	n.s.
Anemochores	0.52***	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Myrmecochores + autochores	n.s.	−0.61***	−0.46**	0.50**	n.s.	0.32*	n.s.
Anemogames	0.50**	n.s.	n.s.	0.44**	n.s.	n.s.	n.s.
Entomogames	0.37*	−0.56***	−0.48**	0.42**	n.s.	n.s.	n.s.

*Tab. 5: Spearman's correlation of environmental variables with the number of species within the defined groups in the quadrats from the **southern** parts of the forest edges*
*Significance levels: *p < 0.05, **p < 0.01, ***p < 0.001; n.s. – not significant*

	Length of forest edge	MF (%) 100 m	MF (%) 700 m	aMF (b) 100 m	aMF (b) 700 m	rMF (b) 100 m	rMF (b) 700 m
All species	0.42**	n.s.	−0.56***	n.s.	n.s.	n.s.	n.s.
Endozoochores	n.s.	n.s.	−0.51**	n.s.	n.s.	n.s.	n.s.
Ectozoochores	n.s.	n.s.	−0.36*	n.s.	n.s.	n.s.	n.s.
Anemochores	0.42**	n.s.	−0.47**	n.s.	n.s.	n.s.	n.s.
Myrmecochores + autochores	0.36*	n.s.	−0.43**	n.s.	n.s.	n.s.	n.s.
Anemogames	0.33*	−0.33*	−0.39*	n.s.	n.s.	n.s.	n.s.
Entomogames	0.40*	n.s.	−0.59***	n.s.	n.s.	n.s.	n.s.

*Tab. 6: Spearman's correlation of environmental variables with the number of species within the defined groups in the quadrats from the **northern** parts of the forest edges*
*Significance levels: *p < 0.05, **p < 0.01, ***p < 0.001; n.s. – not significant*

	Length of forest edge	MF (%) 100 m	MF (%) 700 m	aMF (b) 100 m	aMF (b) 700 m	rMF (b) 100 m	rMF (b) 700 m
Endozoochores	−0.43**	n.s.	n.s.	n.s.	−0.33*	n.s.	n.s.
Ectozoochores	0.39*	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Anemochores	n.s.	0.37*	0.33*	n.s.	n.s.	n.s.	n.s.
Myrmecochores + autochores	n.s.	−0.43**	n.s.	0.34*	n.s.	n.s.	n.s.
Anemogames	n.s.	0.33*	n.s.	n.s.	n.s.	n.s.	n.s.
Entomogames	n.s.	−0.33*	−0.37*	n.s.	n.s.	n.s.	n.s.

*Tab. 7: Spearman's correlation of environmental variables with the share of species within the defined groups in the quadrats from the **southern** parts of the forest edges*
*Significance levels: *p < 0.05, **p < 0.01, ***p < 0.001; n.s. – not significant*

	Length of forest edge	MF (%) 100 m	MF (%) 700 m	aMF (b) 100 m	aMF (b) 700 m	rMF (b) 100 m	rMF (b) 700 m
Endozoochores	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Ectozoochores	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Anemochores	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Myrmecochores + autochores	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Anemogames	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Entomogames	n.s.	n.s.	−0.39*	n.s.	n.s.	n.s.	n.s.

*Tab. 8: Spearman's correlation of environmental variables with the share of species within the defined groups in the quadrats from the **northern** parts of the forest edges*
*Significance levels: *p < 0.05, **p < 0.01, ***p < 0.001; n.s. – not significant*

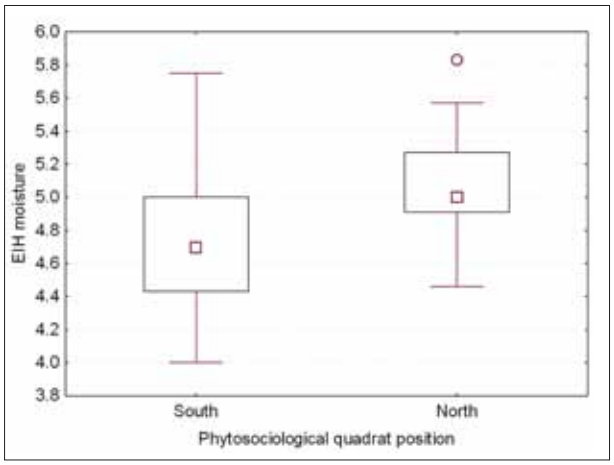
4. Discussion

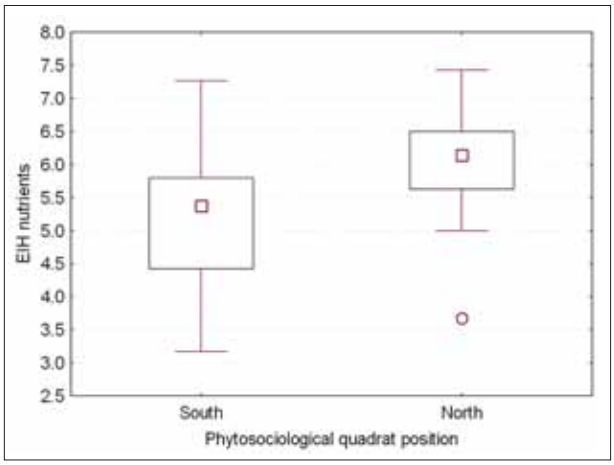
The results obtained were considered in the light of the of partial canonical correspondence analysis (pCCA), which was also used to analyse the relationships of individual plant species to the boundary length (heterogeneity) of the forest-free areas within 100 m of the perimeter and the position of the quadrat at the forest edge. The position of the quadrat, together with the use of presence-absence data, explained 3.1% ($F = 2.184$, $p \leq 0.001$) and length of boundaries within the 100 m surroundings explained 2.6% ($F = 1.813$, $p \leq 0.001$) of species data variability. The 20 plant species selected by their fit values constitute a relatively heterogeneous collection (see Tab. 9). This includes the typical forest species such as *Viola reichenbachiana*, *Fagus sylvatica*, *Quercus petraea agg.* and *Acer campestre* as well as the species of forest-free areas: *Genista tinctoria*, *Hypericum perforatum*, *Securigera varia*, and *Veronica chamaedrys*. The species bound to forest edges within the higher heterogeneity of the 100 m surroundings, in particular, include several species that do not disseminate easily – their dispersion is facilitated by the higher connectivity of suitable biotopes. These include V*iola reichenbachiana*, which is relatively closely bound to the forest environment; its seeds are spread by ants carrying them only over short distances (Grime et al., 1988; Oberdorfer, 1994; Hermy et al., 1999; Honnay et al., 2005; Digiovinazzo et al., 2009). Similar difficulties in spreading are faced by species with large seeds and autochoric means of dissemination – *Genista tinctoria* and *Securigera varia*, growing mainly in various types of grassland (Chytrý et al., 2001). In contrast, species more closely associated with forest edges with less heterogenic surroundings also included anemochoric plant species such as *Knautia arvensis agg.*, *Holcus mollis*, and *Elytrigia repens*.

The survival of various plant species in isolated forest edges is also influenced by the orientation of the edge in which they grow. Ellenberg's indicative values express significant differences in the species composition of northern and southern forest edges. Northern edges tend to be more humid (Fig. 2), thanks to which they offer better access to nutrients in comparable soil conditions (Fig. 3). Northern edges are favoured by ruderal species with high competition success rates, such as *Anthriscus sylvestris*, *Dactylis glomerata subsp. glomerata* and *Urtica dioica*, as well as some sciophilous forest species, e.g. *Asarum europaeum* or *Geranium robertianum* (Tab. 10).

Southern edges, in contrast, facilitate the survival of many types of grassland that are more light-demanding and less capable of competing with larger ruderal species. Grassland species growing in southern parts of the forest edges include e.g. *Achillea millefolium agg.*, *Genista tinctoria*, *Knautia arvensis agg.*, *Pimpinella saxifraga* and *Securigera varia* (Tab. 10).

Separately calculated correlations of the numbers and shares of species belonging to the defined groups from relevés laid in the northern and southern parts of the forest edges disclosed significantly different results. In most cases, the correlations with selected variables were more marked in the southern parts of the forest edges. The species composition in the southern quadrats thus better reflects the relation to the surrounding land cover and size of the biotope. The northern parts of the forest edges tend to be more





□ = *Median;* □ = *25–75% Inter-quartile Range;* ⌶ = *Whiskers;* ○ = *Outliers*

KW-H (1;76) = 15.28; P < 0.001
Fig. 2: Comparison of Ellenberg's indicative values for humidity between quadrats from southern and northern parts of forest edges

KW-H (1;76) = 14.43; P < 0.001
Fig. 3: Comparison of Ellenberg's indicative values for nutrients between quadrats from southern and northern parts of forest edges

Gradient	Plant species	Frequency	Score pCCA 1	Fit
↓	*Fagus sylvatica*	15	0.6218	0.0818
	Galium album	15	0.4517	0.0500
↓	*Knautia arvensis agg.*	6	0.4230	0.0178
	Galium aparine	23	0.4051	0.0565
Length of forest free area margins	*Prunus spinosa*	9	0.3765	0.0195
	Holcus mollis	18	0.3708	0.0394
	Elytrigia repens	39	0.3599	0.0965
	Quercus petraea agg.	13	0.2981	0.0190
	Hypericum perforatum	20	0.2544	0.0247
	Fragaria vesca	12	−0.2869	0.0221
	Veronica chamaedrys	14	−0.3113	0.0238
	Prunus avium	19	−0.3176	0.0322
	Geum urbanum	13	−0.3241	0.0249
	Taraxacum sect. Ruderalia	18	−0.3773	0.0528
	Acer campestre	12	−0.4222	0.0397
	Securigera varia	7	−0.4565	0.0259
	Dactylis glomerata subsp. glomerata	26	−0.4847	0.1385
↓	*Genista tinctoria*	9	−0.5413	0.0420
	Aegopodium podagraria	6	−0.6207	0.0426
↓	*Viola reichenbachiana*	6	−0.8722	0.0789

Tab. 9: Occurrence of species in forest edges on the gradient of relative forest-free area boundary length (heterogeneity of surroundings) up to a 100 m distance; the species are ranked according to their score on the 1st canonical axis of the pCCA; only the species occurring in more than six quadrats within the area are shown.

Phytosociological quadrat position	Plant species	Frequency	Score pCCA 1	Fit
North	*Asarum europaeum*	8	0.9500	0.1196
	Urtica dioica	15	0.6996	0.1198
	Campanula rapunculoides	7	0.4041	0.0198
	Geum urbanum	13	0.3777	0.0339
	Fraxinus excelsior	14	0.3642	0.0322
	Acer campestre	12	0.3580	0.0286
	Sorbus aucuparia subsp. aucuparia	10	0.3476	0.0180
	Geranium robertianum	29	0.3471	0.0673
	Dactylis glomerata subsp. glomerata	26	0.2829	0.0472
	Anthriscus sylvestris	28	0.1964	0.0290
South	*Prunus spinosa*	9	−0.3488	0.0168
	Rubus fruticosus agg.	18	−0.4586	0.0628
	Achillea millefolium agg.	15	−0.5990	0.0974
	Hypericum perforatum	20	−0.7014	0.1878
	Securigera varia	7	−0.7605	0.0720
	Genista tinctoria	9	−0.9909	0.1407
	Pimpinella saxifraga	6	−1.0084	0.1008
	Knautia arvensis agg.	6	−1.0212	0.1035
	Fallopia convolvulus	6	−1.0548	0.0698
	Corylus avellana	26	−1.1036	0.0228

Tab. 10: Occurrence of species in the forest edges according to their position within the forest edge; the species are ranked according to their score on the 1st canonical axis of the pCCA; only the species occurring in more than six quadrats within the area are shown

humid and nutritive. Such conditions attract highly competitive species such as eutrophic and ruderal species and the pCCA showed that this masks the significance of the variables analysed (Tab. 10). The key importance of competition in the more nutritive sites was confirmed also by the work of Foster et al. (2004). As the phytosociological data from the southern parts of the forest edges provide better evidence of species composition, only these results will be further commented upon here.

The species diversity of most of the defined species groups expanded with the increasing length of the forest edge, with the exception of endozoochoric and myrmecochoric + autochoric species (Tab. 5). The most marked relationship between the number of species and the size of the biotope (length of forest edge) was recorded for the ectozoochoric species. Forest edges (ecotones) are characterised by a relatively high ground cover factor of both herbaceous and shrub layers; in a fragmented landscape, they are important refuges and sources of food for wildlife (Fitzgibbon, 1997). That the most marked relationship between the species diversity and the length of the forest edge was recorded in the ectozoochoric species indirectly confirms the importance of the increasing length of the forest edge for the presence or frequency of wildlife occurrence. The attractiveness of the forest edge for wildlife lies mainly in its function as a refuge from predators and an environment containing sources of food (Fitzgibbon, 1997; Wolf, Batzli, 2002). The closest relationship between the species composition (Tab. 4) and diversity (Tab. 5) and the size of the biotope in ectozoochoric species may be explained by their relatively close relationship (in terms of available biotopes within farmland) with forest edges and similar habitats. Saunders et al. (1991) confirmed that diversity of specialist species tends to be most severely impacted by the reduction of biotope size. In farmland, forest edges represent space-restricted types of biotope in which both ectozoochoric and anemochoric species may thrive. For anemochoric species, forest edges may function as "nets" stretched across the landscape that capture their diasporas in numbers proportional to their extent. The greatest influence of forest edge length on the variability of species composition was recorded (again through pCCA) in ectozoochoric and anemochoric species.

On the other hand, endozoochoric species are limited by being spread by birds or mammals that have closer relationships to the particular biotopes, predominantly forests, in which they live, a situation similar to the myrmecochoric species disseminated by ants (van Dorp, 1987; van Dorp, Kalkhoven, 1998).

The myrmecochoric species (together with the autochoric) stood out because, of all the species groups, the increasing heterogeneity of the nearest surroundings (length of boundaries within 100 m) was of the highest importance for their higher abundance. However, an increasing isolation factor (share of forest-free areas within 100 m and 700 m) reduces the diversity of both myrmecochoric and anemochoric species (Tab. 5). Dzwonko and Loster (1992) and van Dorp (1987) also recorded higher sensitivity to isolation for myrmecochoric and autochoric species compared to the easily spreading anemochoric species. For example, Tremlová and Münzbergová (2007) categorise ectozoochoric and anemochoric species as space-dominating, with the highest dissemination capacity.

5. Conclusion

The share of forest-free areas had a significant influence on the diversity of some species groups in both the closer surroundings up to 100 m and over larger distances up to 700 m, but the closer surroundings had a more marked influence on the species diversity (Tab. 7). The structure of the surrounding landscape (absolute length of forest-free boundaries) influenced the species diversity only within the distance of up to 100 m, while relative boundary lengths were of practically no significance (Tab. 5). Diversity and species composition of forest edges are influenced by the parts of the landscape immediately surrounding the forest edges, but also by the relatively distant surroundings. Likewise, Rogers et al. (2002) demonstrated that the species composition of isolated forest fragments was most influenced by the impacts of landscape changes rather than by local variables.

The diversity and species composition of isolated forest edges are defined by the size of the biotope, by the degree of its isolation and by local environmental conditions, all of which substantially influence the competitive relations between plants. Land use in the proximity of forest edges significantly influences the degree of isolation that in turn affects the representation of various species types in terms of the dissemination of their diasporas. The results of this research report suggest the major importance of land-use approaches for the species composition and for the diversity of plant societies in small-scale, isolated fragments of vegetation.

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References:

BRYS, R., JACQUEMYN, H., ENDELS, P., VAN ROSSUM, F., HERMY, M., TRIEST, L., DE BRUYN, L., DE BLUST, G. (2004): Reduced reproductive success in small populations of the self-incompatible *Primula vulgaris*. Journal of Ecology, Vol. 92, p. 5–14.

COUSINS, S., OHLSON, H., ERIKSSON, O. (2006): Effects of historical and present fragmentation on plant species diversity in semi-natural grasslands in Swedish rural landscapes. Landscape Ecology, Vol. 22, p. 723–730.

DIGIOVINAZZO, P., FICETOLA, G. F., BOTTONI, L., ANDREIS, C.AND, PADOA-SCHIOPPA, E. (2010): Ecological thresholds in herb communities for the management of suburban fragmented forests. Forest Ecology and Management, Vol. 259, p. 343–349.

DUPRÉ, C., EHRLÉN, J. (2002): Habitat configuration, species traits and plant distributions. Journal of Ecology, Vol. 90, p. 796–805.

DZWONKO, Z., LOSTER, S. (1992): Species richness and seed dispersal to secondary woods in southern Poland. Journal of Biogeography, Vol. 19, p. 195–204.

ELLENBERG, H., WEBER, H. E., DÜLL, R., WIRTH, W., WERNER, W., PAULLIßEN, D. (1992): Zeigerwerte von Pflanzen in Mitteleuropa. Ed. 2. Scripta Geobotanica, Vol. 18, p. 1–258.

ENDELS, P., JACQUEMYN, H., BRYS, R., HERMY, M. (2002a): Changes in pin-thrum ratios in populations of the heterostyle *Primula vulgaris* Huds: does imbalance affect population persistence? Flora, Vol. 197, p. 326–331.

ENDELS, P., JACQUEMYN, H., BRYS, R., HERMY, M., DE BLUST, G. (2002b): Temporal changes (1986–1999) in populations of primrose (*Primula vulgaris* Huds.) in an agricultural landscape and implications for conservation. Biological Conservation, Vol. 105, p. 11–25.

ERIKSSON, O., EHRLÉN, J. (2001): Landscape fragmentation and the viability of plant populations. In: Silvertown, J., Antonovics, J. [eds.]: Integrating ecology and evolution in a spatial context. Blackwell Science, Oxford, UK, p. 157–175.

FITZGIBBON, C. D. (1997): Small mammals in farm forests: the effect of habitat, isolation and surrounding land-use patterns. Journal of Applied Ecology, Vol. 34, p. 530–539.

FORMAN, R. T. T., GODRON, M. (1986): Landscape ecology. John Wiley and, Sons, New York, 619 pp.

FOSTER, B. L., DICKSON, T. L., MURPHY C. A., KAREL I. S., SMITH V. H. (2004): Propagule pools mediate community assembly and diversity-ecosystem regulation along a grassland productivity gradient. Journal of Ecology, Vol. 92, p. 435–439.

GRIME, J. P., HODGSON, J. G., HUNT, R. (1988): Comparative Plant Ecology. A Functional Approach to Common British Species. Unwin Hyman, London, 748 pp.

HANSKI, I. A., GILPIN, M. E. [eds.] (1997): Metapopulation ecology—ecology, genetics and evolution. Academic Press, San Diego, 512 pp.

HANSKI, I., OVASKAINEN, O. (2000): The metapopulation capacity of a fragmented landscape. Nature, Vol. 404, p. 755–758.

HERMY, M., HONNAY, O., FIRBANK, L., GRASHOF-BOKDAM, C., LAWESSON, J. E. (1999): An ecological comparison between ancient and other forest plant species of Europe and the implications for forest conservation. Biological Conservation, Vol. 91, p. 9–22.

HOBBS, R. J., YATES, C. J. (2003): Impacts of ecosystem fragmentation on plant populations: generalising the idiosyncratic. Australian Journal of Botany, Vol. 51, p. 471–488.

HONNAY, O., JACQUEMYN, H., BOSSUYT, B., HERMY, M. (2005): Forest fragmentation effects on patch occupancy and population viability of herbaceous plant species. New Phytologist, Vol. 166, p. 723–736.

HONNAY, O., JACQUEMYN, H., BOSSUYT, B., HERMY, M. (2005): Forest fragmentation effects on patch occupancy and population viability of herbaceous plant species. New Phytologist, Vol. 166, p. 723–736.

CHYTRÝ, M., KUČERA, T., KOČÍ, M. [eds.] (2001): Katalog biotopů České republiky. Agentura ochrany přírody a krajiny ČR, Praha, 304 pp

JULES, E. S. (1998): Habitat fragmentation and demographic change for a common plant: Trillium in old-growth forest. Ecology, Vol. 79, p. 1645–1656.

KLOTZ, S., KÜHN, I., DURKA, W. (2002): BIOLFLOR – Eine Datenbank zu biologisch-ökologischen Merkmalen zur Flora von Deutschland. Schriftenreihe für Vegetationskunde, Vol. 38, p. 1–334.

LEIMU, R., MUTIKAINEN, P., KORICHEVA, J., FISCHER, M. (2006): How general are positive relationships between plant population size, fitness and genetic variation? Journal of Ecology, Vol. 94, p. 942–952.

LIENERT, J., FISCHER, M. (2003): Habitat fragmentation affects the common wetland specialist Primula farinosa in north-east Switzerland. Journal of Ecology, Vol. 91, p. 587–599.

NEUHÄUSLOVÁ, Z., MORAVEC, J., CHYTRÝ, M., SÁDLO, J., RYBNÍČEK, K., KOLBEK, J., JIRÁSEK, J. (1997): Mapa potenciální přirozené vegetace České republiky 1 : 500 000. Botanický ústav AV ČR, Průhonice.

OBERDORFER, E. (1994): Pflanzensoziologische Exkursionsflora. Eugen Ulmer, Stuttgart, 1050 pp.

OPDAM, P. (1988): Populations in fragmented landscape. In: Schreiber, K. F. [ed.]: Connectivity in landscape ecology. Proceedings of the 2nd international seminar of the 'International Association for Landscape Ecology',Münster. Geographische Arbeiten, Vol. 29, p. 75–77.

PAUCHARD, A., ALABACK, P. B. (2004): Influence of elevation, land use and landscape context on patterns of alien plant invasions along roadsides in protected areas of south-central Chile. Conservation Biology, Vol. 18, p. 1–11.

ROGERS, D. A., ROONEY, T. P., HAWBAKER, T. J., RADELOFF, V. C., WALLER, D. M. (2009): Paying the extinction debt in southern Wisconsin forest understories. In: Conservation Biology, Vol. 23, p. 1497–1506.

SAUNDERS, D. A., HOBBS, R. J., MARGULES, C. R. (1991): Biological consequences of ecosystem fragmentation: A review. Conservation Biology, Vol. 5, p. 18–32.

TER BRAAK, C. J. F., ŠMILAUER, P. (2005): CANOCO reference manual and CanoDraw for Windows user's guide. Software for Canonical Community Ordination (version 4.5). Biometris, Wageningen, České Budějovice, 500 pp.

TICHÝ, L. (2002): JUICE, software for vegetation classification. Journal of Vegetation Science, Vol. 13, p. 451–453.

TOLASZ, R. [ed.] (2007): Atlas podnebí Česka: Climate atlas of Czechia. 1. vyd. Praha, Český hydrometeorologický ústav, 255 pp.

TREMLOVÁ, K., MÜNZBERGOVÁ, Z. (2007): Importance of species traits for species distribution in fragmented landscape. Ecology, Vol. 88, p. 965–977.

VAN DORP, D., KALKHOVEN, J. T. R. (1988): Landscape structure as a determinant of interpatch seed dispersal in bird dispersed plants. VIIIth International Symposium on problems of Landscape Ecological Research, Bratislava. Vol. 2, p. 109–113.

VAN DORP, D. (1987): Verbreiding van besdragende planten in een Twents houtwallenlandschap; een vooronderzoek. Internal report IBN, Leersum, 23 pp.

WESTHOFF, V., VAN DER MAAREL, E. (1978): The Braun-Blanquet approach. In: Whittaker R. H. [ed.]: Classification of plant communities, W. Junk, The Hague, p. 289–399.

WIENS, J. A. (1997): Metapopulation dynamics and landscape ecology. In: Hanski, I. A., Gilpin, M. E., [eds.] (1997): Metapopulation ecology—ecology, genetics and evolution. Academic Press, San Diego, p. 43–62.

WOLF, M., BATZLI, G. O. (2002): Effects of forest edge on populations of whitefooted mice Peromyscus leucopus. Ecography, Vol. 25, p. 193–199.

YOUNG, A. G., BOYLE, T., BROWN, T. (1996): The population genetic consequences of habitat fragmentation for plants. Trends in Ecology and Evolution Vol. 11, p. 413–418.

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SUSTAINABLE INNER PERIPHERIES? A CASE STUDY OF THE OLEŠNICE MICRO-REGION (CZECH REPUBLIC)

Lenka JAKEŠOVÁ, Antonín VAISHAR

Abstract

The Olešnice micro-region represents municipalities situated at the boundary of the South Moravian Region. These come under the inner peripheries which do not develop economically, lose their population, get older and have a lower social and economic standard and a worse infrastructure. The authors work on a hypothesis that from the natural point of view the area has a strong recreational potential. The question is how local actors contribute to its development, what their relationships to the territory are and whether they are aware of the values of the area. The study is based on results of a questionnaire with local residents and also on a comparison with other peripheral rural areas in the region. The outcomes suggest that important requirements of sustainable development are not always included in the everyday lives of local people.

Shrnutí

Udržitelné vnitřní periferie? Příklad mikroregionu Olešnicko (Česká republika)

Mikroregion Olešnice reprezentuje obce, nacházející se na hranicích Jihomoravského kraje. Tyto obce tvoří tzv. vnitřní periferii, která je ekonomicky méně rozvinutá, ztrácí obyvatelstvo, stárne, má nižší sociální a ekonomické standardy a horší infrastrukturu. Autoři vycházejí z hypotézy, že z přírodního hlediska má mikroregion silný potenciál cestovního ruchu. Otázka je, jak místní subjekty přispívají k jeho rozvoji, jaký je jejich vztah k území a zda jsou si vědomi hodnot daného území. Studie je založena na výsledcích dotazníkového šetření mezi místními obyvateli, a také na srovnání s jinými periferními mikroregiony v kraji. Závěry ukazují, že významné požadavky udržitelného rozvoje nejsou vždy zahnuty do všedního života místních obyvatel.

Key words: *periphery; sustainability; countryside; recreation, Olešnice micro-region, Czech Republic*

1. Introduction

In the academic literature, a great deal of attention has been paid to the support and development of peripheral rural areas. Because of the rapid development of the society, the topic of today becomes not only the question of improvement of the situation in remote areas, but also how to use the potential of a given territory.

At present, the country has to face structural changes that significantly influence the living conditions of the local population. The loss of importance of agricultural production, unemployment, emigration of young people, and population ageing are the most significant of these changes. The remote micro-regions of the current inland, the so-called *internal peripheries*[1] (Musil, Müller, 2008), suffer from these and other aspects, primarily from the absence of full-valued local urban centres as well as from worse accessibility of regional centres. Another characteristic usually is a rugged relief that puts limitations on the development of agriculture (Vaishar, Zapletalová, 2010). Due to worsened conditions, a great number of small settlements located close to one another emerged in the landscape (Perlín, 1998). Other secondary features include location characteristics and transport accessibility discussed by Čermák (2005). However, one of the main characteristics of peripheral areas is their distance from the main centres (Ferrão, Lopes, 2004). Thus in Czechia, internal peripheries are usually

[1] Internal peripheries in contrast to borderland peripheries: in Czechia, borderland peripheries (except for the border with Slovakia) are impacted by postwar ethnically based population exchange which has substantially modified their social milieu.

found on the margins of metropolitan regions, and to a lesser extent on the boundaries of the spheres of influence of the neighbouring regional centres (Musil, Müller, 2008). The frontier periphery differs from the inner periphery in social consequences of the post-war population exchange on ethnical and social bases.

This paper considers an analysis of the sustainability of the peripheral areas and the possibilities of improving their social situation. The study proceeds from the assumption that despite their feeble development these remote, marginal micro-regions offer a space with well-preserved nature and a strong recreational potential (Fialová, 2001). This fact is also perceived by the inhabitants of the countryside themselves, who can see the development of rural areas mainly in the promotion of tourism, development of agro-tourism or rural tourism, and thus in the adequate diversification of activities. This brings about new ways of thinking and behaviour of the rural population.

The goals of this paper are as follows: to present a brief overview of the perception and character of the countryside and its sustainability in relation to the periphery based on the analysis of expert literature, to evaluate the current status of the rural periphery in the case study area, and to diagnose the perception of sustainable development from the viewpoint of their inhabitants in relation to their age, gender, education and occupation.

2. Theoretical background of the study

The countryside[2] starts to be an increasingly popular place of residence, a recreational environment, place of social contacts, a cultural and natural space, and a place of necessary relaxation (Šimková, 2008). Talking about the specificities and values of the countryside as such, we could therefore state that the sustainability of the countryside corresponds with the quality of its environment. Are we able to tell at all when the countryside is sustainable? How and by what shall we determine its sustainability? How does the sustainability manifest itself in the relation to peripheral areas?

The concept of sustainable development, on which the presented work is based, is especially significant for the development of rural areas. Development is designed as a process of positive changes. These are usually improvements of quantitative and qualitative characteristics of the given area, most often natural and socio-economic (Galvasová et al., 2007).

The academic and scientific sphere has worked with the "sustainability" concept since the 1st half of the 1980s, yet the general public has not come across with it at all. This is to confirm the fact that to determine what is sustainable and what is no longer sustainable is a very challenging task. In the conception of the G. Brundtland Commission (1987), sustainable development means: *"Such way of development that meets the needs of the present without compromising the ability of future generations to meet their own needs"*.

The principal idea is to ensure a balance among three basic pillars: social, economic, and environmental. Only a balanced development of the three pillars may lead to sustainable development (WCED, 1991). In other words, this is a multi-dimensional process, which endeavours to integrate economic, socio-cultural, and environmental goals in a sustainable manner (Kearney et al., 1994). In a global concept, the goal of the development of sustainable countryside is to attain sustainable economic growth and improvement of living conditions; this will ensure that rural regions will be attractive places for living, and will be able to provide a positive contribution to the national economy (Woods, 2011). In Czechia, the questions of sustainability in relation to marginal regions were studied e.g. by Cudlínová and Těšitel (2000).

According to Leimgruber (2004) …"*the definitions for marginal regions are vague and differ between academic disciplines. Marginal regions could however be characterized as regions lying off mainstream processes both in society and economy, but also in relation to the natural environment and geographical remoteness*"…. It is clear that such a characteristic has to be relative. On the other hand, periphery and peripheral regions relate more to the geographical distance and worse permeability of the landscape due to geomorphological or other natural conditions.

Responsible behaviour and attitude to the environment are determining for environmental sustainability (Šimková, 2008). Within environmental sustainability in the case of the countryside, it is possible to observe both a general degradation of its environment – i.e. the negative environmental dimension, and a positive environmental significance of rural areas in comparison to urban areas. Some examples are the construction of "ecological houses", the impact of renewable energy sources on the landscape, the development of "ecotourism", territorial systems of ecological stability realized at a high standard, protected landscape areas, the NATURA 2000 system, etc.

[2] Communes with less than 4,000 inhabitants are classified as rural in the South Moravia Region (with some exceptions) according to the Regional Branch of the Czech Statistical Office. Areas composed of rural communes form the South Moravia countryside.

Sustainable economic development connected with the increasing income of the population, i.e. a prosperous local economy, economic cohesion, and influence on other activities in the locality, availability and quality of workforce etc. are determining for economic sustainability (Šimková, 2008). According to Zeman (2002), the basic idea is to enhance the "framework of activities" beyond the traditional economic determination. The economic pillar is focused on increasing competitiveness as well as on ensuring sustainable growth of the governed locality (Stejskal, Kovárník, 2009). This is more easily measurable than the social sustainability as it can be defined quantitatively (Munro, 1995). According to Moldan and Braniš (2003), the economic dimension of sustainability grounds in the necessity to preserve the basic capital in all economic activities, and to utilise only the profit generated. It is often expected in the economic sphere of the post-socialist countryside that intensive agriculture will be replaced by the functions of tourism (e.g. Knappe, Benedek, Ilieva, 2011).

The peripheral rural areas, however, often lack the capital to start entrepreneurial activities. For this reason, a number of investors come from other regions, from cities, or even from abroad. In some cases, it may occur that new activities do not employ local workforce, do not cooperate with local entrepreneurs or do not purchase goods in local shops. In such cases, the benefit of business activities for the concrete rural areas is minimal, perhaps with the exception of the permanent property tax. On the other hand, the municipalities are responsible for the disposal of communal waste produced from such activities, or for the maintenance of local roads on which the transport to these activities takes place.

Social cohesion, health, education, social recognition, and quality of living are determining for social sustainability. Except from other things the quality of life includes housing, public transport, accessibility, and the level of public services (Šimková, 2008). The social dimension of sustainability applies to people as individuals on the one hand and to society on the other (Moldan, Braniš, 2003). It is important that the basic needs of all people are ensured, and that everyone has an opportunity to fulfil their desires for a better life (WCED, 1991).

Lay knowledge is of great importance for the development of a locality, especially in rural areas and small (remote) municipalities. According to Husák (2010), primarily all local actors, i.e. residents, non-residents, and old inhabitants have such knowledge. This means that the local population should have a decisive say in defining the sustainable development of the rural landscape. The problem of peripheral municipalities, however, is the population ageing as a result of natural development and emigration of young people. As described by Majerová (2005), owing to the decrease of traditional forms of everyday communication between villagers, the social integration of aged people will become increasingly difficult. In peripheral areas, we also observe the gradual disappearance of elements that used to strengthen social coherence. An example of changes deteriorating the situation of inhabitants in peripheries is the down-scaling of public transport services, postal services, shops, pubs, the closing of schools, sports clubs etc. Thus, a part of the population living in the peripheries suffers from social isolation (Musil, Müller, 2006).

We could also speak about demographic sustainability (see e.g. Copus and Crabtree, 1996) which is considered as an aspect of social sustainability (Camarinha-Matos and Afsarmanesh, 2010). The focus of sustainable development will be concentrated on the population. In the case of countryside, it is necessary to prevent it from depopulation. Demographic sustainability can be assessed very roughly on the basis of population migration. It is obvious that settlements showing a positive balance during the studied period are demographically sustainable. Apparently, certain settlements are approaching a certain critical boundary (the determination of which is not easy) and will not be demographically sustainable. The problem of countryside depopulation concerns a considerable part of rural micro-regions in Central and Eastern Europe (Bell et al., 2009; Fischer, 2009).

Under the conditions of globalization, the sustainability of the countryside may also be understood as maintaining its regional identity and specificities as a counterbalance to the general, levelling out patterns of production and consumption. Core areas are more developed within the globalization process, while in peripheral areas the development trends are not extended and problematic situation is deepened. Mainly the consequences of migration as a global problem are increasingly complex. It is the cause of process of decomposition of rural areas and globally uneven rural urbanization. While big cities are in favor of globalization, offering the diversity of activities and cultural life, small towns in peripheral areas are dominated by local customs and traditions that could be endangered by globalization.

Peripheral areas are valuable for their local identity (traditions, culture, and the environment), and it is primarily the specific distance that can be helpful for the survival of cultural diversity (Ferrão and

Lopes, 2004; Sedlacek et al., 2009). Due to this potential, the rural peripheral areas may boost the economic development by creating (micro) regional associations (Epps, 2002) to finance common projects and to collaborate in the fields of lobbying, advertising etc. For the development of these areas, however, cooperation among municipalities, economic organizations, and non-profit organizations, and increasing accountability of regional centres for their peripheral territories is of importance.

It can be stated that the perception of a location by local inhabitants determines to a certain extent the future possibilities of local development. The attachment to a place in natives, who have lived in a house/settlement/region for centuries, will have a different feeling of belonging from recent newcomers to the region (Stockmann, 2005). In this respect, for example, it is questionable whether a suburbanized countryside is sustainable as such, or whether it is a different type of settlement lacking a great part of rural characteristics. Additionally, Sumner (2005) puts the question whether the concept of sustainability is still suitable for analyzing the rural periphery.

A number of Czech authors occupy themselves with the research of peripheries and discuss the issues from many points of view. Havlíček, Chromý, Jančák, Marada (2005) attempted to summarize theoretical backgrounds of the research on peripheries. Another approach is the research of peripheral to marginal areas primarily at the micro-regional and local level (Vaishar et al., 2011). The development of peripheries may also be perceived in sociological terms as of areas with specific social characteristics, as in the case, e.g. with Musil, Müler (2008) or Jeřábek (2006).

In the Czech literature, inner and outer peripheries are strongly distinguished. The inner periphery can be found in inland, on the boundary of influence spheres of regional centres, whereas outer periphery is situated in the borderland with neighbouring countries (the Slovak part of the borderland is sometimes not included). Remoteness from important centres is a common characteristic of both the peripheries. The main difference consists in the fact that the population of the inner periphery is relatively stable (in terms of low level of immigrants). On the other side, the majority of population of the outer periphery (a part of which was a section on the iron curtain) was changed on the ethnical basis after the WWII. It preconditioned important differences between the two peripheries, which manifest themselves even at the present time. Differences between inner and outer periphery were documented by Havlíček et al. (2008). Czech inner periphery was delimited and characterized by Musil and Müller (2008).

In the academic literature, we find a new understanding of the periphery associated with the interconnection of information and communication technologies, mainly the Internet and mobile communications, which bring an opportunity for the sustainable development of rural or peripheral areas (Reinöhlová, 2005; Harvey, 1989). In many cases, peripheries are compared to the synonymous "underdeveloped regions", and the removal of peripheries is the main task of the government that tries to fight against regional disparities (Ferrão and Lopes, 2004). On the other hand, the peripheral countryside is often understood as a territory, which is capable of preserving greater biodiversity (O´Rourke, Kramm, 2009), thus contributing to ecological sustainability in general. Foreign authors studying the countryside, sustainable development, and marginality were, e.g. Woods (2011), Tryzna (1995), Bowler, Bryant and Cocklin (2002), Moseley (2003), Labrianidis (2004) and others. Jenkins (2000) points out that the sustainability of marginal rural regions relates to the integration of local traditions into imperatives of post-modern world.

We have to point that in geographical literature, periphery is a consequence of space polarization within the core–periphery concept (e.g. Borgatti, Everett, 2000). From it follows that under conditions of market economy, it is not possible to overcome the periphery; it is only possible to moderate its consequences. The periphery exists in a dichotomist relation to the core. It means that characteristics of the periphery are necessary to be looked for in a comparison to the core.

3. Characteristics of the Olešnice Micro-Region

3.1 General characteristics of the territory

According to the Strategy of Regional Development of the Czech Republic[3], in the territory of the South Moravia Region, some parts of the Bohemian-Moravian Uplands, and mainly a part of the northern border of the region opposite the Vysočina Region and the Pardubice Region in the Blansko district can be considered internal peripheries. A relatively large and rugged territory is not entirely integrated into the gravitation field of Boskovice, the closest sub-regional centre. On the other side, the local centres Olešnice, Kunštát, and Velké Opatovice are too weak to fulfil central functions

[3] Strategie regionálního rozvoje České republiky (2006) /Regional Development Strategy of the Czech Republic/

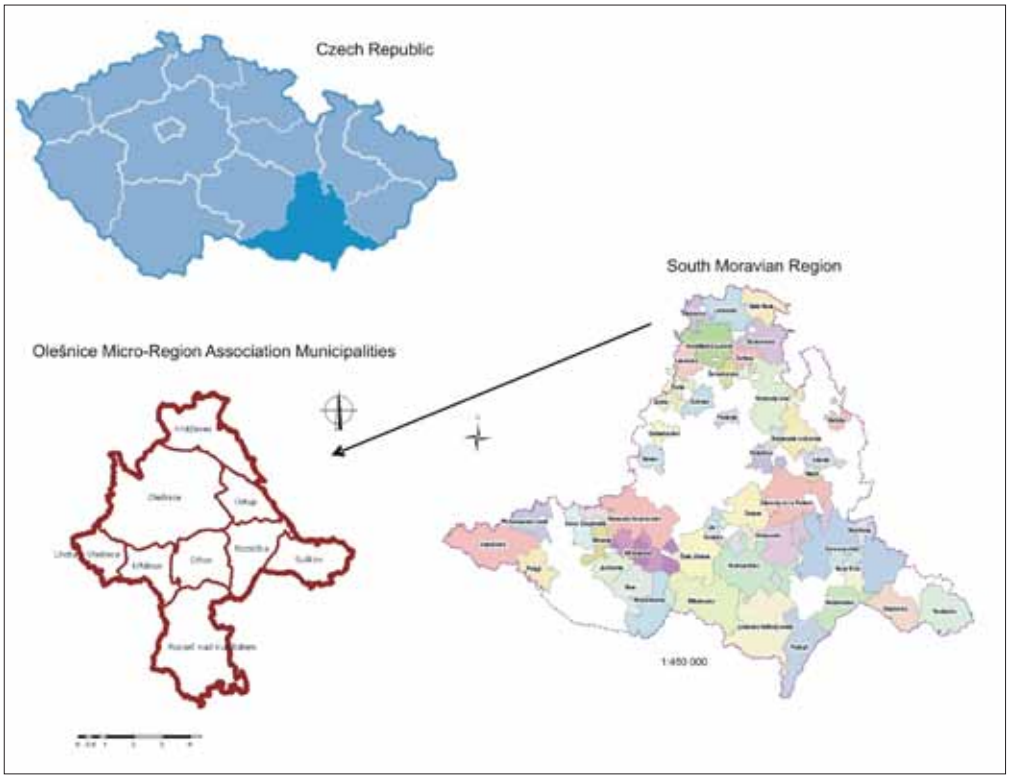

Fig. 1: Olešnice Micro-Region Association of Municipalities. Source: http://www.uur.cz/default.asp?ID=3779 (Mikroregiony Jihomoravského kraje. Ústav územního rozvoje Brno, květen 2003)

adequately. Important centres are not available either on the other side of the regional boundary, in the regions of Pardubice and Vysočina (Fig. 1).

Association of Municipalities is a voluntary alliance of communes, which was established to meet individual and common interests of its members. It includes the communes of Crhov, Kněževes (with local parts of Jobova Lhota and Veselka), Křtěnov, Louka, Lhota u Olešnice, Olešnice, Rozsíčka, and Ústup on an area of 4,540 ha. Olešnice is a natural centre of the area. The territory is situated in the Nedvědická vrchovina Upland, at the boundary of three districts (Blansko, Žďár nad Sázavou, and Svitavy) of three regions (South Moravia, Pardubice, and Vysočina), and the historic lands of Moravia and Bohemia. The town of Olešnice (Fig. 2. – see cover p. 4) is at a distance of 23 km from Boskovice, the superior sub-regional centre. The nearest sub-regional centres of neighbouring regions are at a distance of 21 km (Bystřice nad Pernštejnem) and 23 km (Polička). In all mentioned directions, it is necessary to pass over rugged terrains (Peša, 2005).

As of 1 January 2010, the micro-region had totally 2,814 inhabitants, of whom 62% lived in the town of Olešnice, the micro-region's centre. The settlement structure of the micro-region is fragmented, three communes have less than 100 inhabitants, and the population of other three communes is 100–200 inhabitants. Approximately 26% of the population lives in these communes. This settlement structure corresponds with the relief ruggedness. The population density in the micro-region amounts roughly to 65 inhabitants per km^2, which is just a one half of the national average.

3.2 Economy

Although the Olešnice area is not very productive, local people have been living on agriculture since time immemorial (Peša, 2000). AGROSPOL Ltd. agricultural enterprise that also farms the agricultural land in Kněževes and Ústup is the most prominent company in Olešnice. Other agricultural enterprises are CORPO Louka Ltd., Agricultural cooperative Mír (Peace), and the farm AGRON Sulíkov s.r.o. in Rozsíčka. There are about 10 family farms in the territory, cultivating only a very small part of the land.

Food processing followed by metalworking remain the main industries in the Olešnice area. Currently, Mlékárna RMD Olešnice (agrarian dairy cooperative – Fig. 3 – see cover p. 4) with approx. 160 employees is the most important industrial enterprise (Fig. 2). It is one of the largest milk processing factories in Moravia. MORAVIAFLOR with 100 employees, a traditional producer of artificial flowers, today for decorative purposes, is the second biggest enterprise. The Agroplast metal-working company employs 60 people. Other job opportunities can be found in smaller companies and with some individual tradesmen.

Results of the 2001 census show that the Olešnice micro-region has a great number of commuters as 60% of the workforce travel for work out of the micro-region. Most job opportunities for the population exist in Olešnice from where only 47% of the working population commutes to work while the remaining part finds local employmentd. The most frequent destinations for commuters are the towns of Boskovice and Letovice (Peša, 2005).

3.3 Attributes of Olešnice peripherality

Theoretically speaking, the Olešnice area is a rural micro-region with limited outlooks for prosperity. The surroundings are only attractive for their natural beauty; there are no architectural places of interest in the area. The micro-region faces problems both in the economic and social respect. It is very difficult to find work nearby. The existing jobs are usually very poorly paid, which results in a greater share of population commuting for work. There are neither adequate economic opportunities nor a social life to fulfil the needs of today's generation. For these reasons, the area becomes depopulated and young qualified people leave for towns and cities.

The micro-region's remoteness concerning transport is another characteristic. The territory is not far from the second largest city of the Czech Republic (Brno) but in spite of that, it is not very attractive for recreation. The problem is a missing railway link, which makes the area less attractive for the development of tourism. Another disadvantage hampering the development of tourism is the small number of accommodation facilities, which would make a so-called "weekend tourism" possible (Moseley, 2003). Second homes are the main form of recreation in this area. In a number of rural municipalities, cottages owned primarily by Brno inhabitants account for a major part of the building stock.

Nevertheless, "inner distinction" that is largely favourable for the development of rural tourism and local traditions could be an advantage of the peripheral areas. In the municipalities of the micro-region, a relatively rich traditional social life prevails. Some traditional cultural and social events have been successfully preserved; other traditions have been rediscovered by the locals and are being developed. The Olešnice micro-region is very valuable from the perspective of natural and aesthetic values. The entire area belongs to the Svratecká hornatina Hilly Land nature park (Peša, 2005). This fact can be built upon, and the development strategy of the Olešnice micro-region periphery should be directed from the traditional forms of farming (agriculture) to the promotion of rural tourism and the promotion of local cultural events (Woods, 2011; Strategie rozvoje Jihomoravského kraje).

4. Questionnaire survey: methodological considerations

The aim of the paper is to assess the sustainability of peripheral countryside in the Olešnice micro-region in terms of natural resources, social capital and economic efficiency. The first step was a choice of the regional level for research. The Olešnice micro-region is integrated by functions of its central place – the small town Olešnice (Fig. 3). Thus it can be regarded as a representative peripheral countryside area and is a suitable object for the research on local inhabitants perceptions.

The study is based on the results of a questionnaire survey with local inhabitants, which was focused on the investigation of public perception of the geographical position (i.e. peripheral position within the South Moravia Region), development potential of the area (including tourism potential and local business environment) and their residential satisfaction and attachment to the place.

The sample of respondents included inhabitants of the Olešnice municipality. Collaboration with local grammar schools was established to address a sufficient number of respondents. The questionnaire was distributed to families by school pupils. The process of responding the questions was voluntary and confidential. The biggest disadvantage of the adopted method was that the questionnaire concerned only the population recruited of parents or grandparents of pupils in the schools. It means that not all the age and family status categories were included in the sample and the research was not representative. On the other hand, the inhabitants with children of school age form a very expressive social group in the town, which is relatively stabilized there and mostly interested in the future.

We presuppose that sustainability is perceived differently and is preconditioned by the system of values differing in specific population groups (according to age, gender, education, profession, etc.). That is why not only the complete set of respondents was evaluated but also individual age, gender, education and professional groups. The data were elaborated by basic statistical analysis and correlation analysis. The data analysis process commences with the calculation of basic descriptive characteristics (tables of frequencies, calculations of mean value, median, mode, spreads, variances, normality of distribution etc.). For the sake of clearness, the results were translated into a graphic format.

Altogether 137 questionnaires were distributed. Of them, 110 were completed by parents of school pupils, 20 by the local administration and seven were

completed on site. Of them, 104 forms were returned completed, which represents a 76% return. The questionnaire consisted of 7 identification questions (e.g. age, gender, profession, education etc.). Other questions were directed to business and tourism potentials, ecological life style demand and social background of the population in the territory under investigation.

The answers were evaluated according to a 4-point scale. In our case, point 1 means "fully agreed", point 4 means "fully disagreed". We avoided the neutral decision (so-called semantic zero), which is not a part of even point scales. The results were statistically elaborated by means of codes which were allocated to individual answers. Further we worked only with the set of codes. The data were digitalized in MS Excel and transformed into the Statistica Base 10 software. The level of significance was in all tests of parametrical statistics defined always as max. $P \leq 0.05$. Incomplete answers were not included in the analyses.

The research premise was as follows: The perception of geographical position within the South Moravia region, recreational activities in the area, satisfaction with the environmental situation, suitability of territory for business, sufficiency of cultural life is different with respect, to gender, age, education and profession of the population.

The research questions were defined as follows:

- Question 1: How do local people perceive their geographical position (peripheriality) within a region?
- Question 2: How strong is their relationship to the territory? (measured as a rate of satisfaction and social cohesion of residents)
- Question 3: How do local people evaluate the quality of life and the development potential of the area? (measured as a rate of satisfaction with living environment, interpersonal relations, tourism potential, conditions for business and enterprising, etc.)

5. Analysis of the perception of sustainable development and social relations of inhabitants living in the inner periphery of the Olešnice micro-region

Females (72%) were the prevailing group of respondents who returned the completed questionnaires. The age category of 36–50 years was the most numerous group (38%). People with the vocational education without the school-leaving examination (38%) dominated the category of education and as to occupation, a greater part of respondents fell in the category "other" (29%).

The majority of respondents were satisfied with the locality of their residence (57%). They live a long time in the territory or even were born there. The respondents were connected with the area through contacts with their family members, the house of their dwelling and social relations (friends, neighbours). Besides of these social reasons, the respondents considered for important quiet milieu and healthy environment. Profession, customs and tradition followed. Sport activities were less important as to relation to the territory.

The perception of geographical position was the next question. Most respondents considered the position on the regional border rather disadvantageous and next 22% greatly inconvenient. Mostly young mobile people with university education did not think that the position of the micro-region is unfavourable. They probably purposely stay in the area combining the living in rural milieu with employment in urban businesses. Poor technical a transport infrastructure, insufficient services, health care of lower quality and cultural opportunities were criticized more. Also higher prices of food and other basic goods (evoked by lower competition in the rural space) represent a certain problem. It showed once again that people prefer rural milieu but ask for urban quality of services.

The territory of the Olešnice micro-region was evaluated by almost 80% of respondents as strongly attractive for tourism. Mostly the respondents employed in services held this opinion. In fact, the tourism potential is not better than in the neighbouring regions. Additionally, the tourist infrastructure (e.g. accommodation services) is insufficient. The micro-region is sought mostly as a place of second living and by undemanding tourist (hikers, bikers, family holiday).

Satisfaction with the condition of the environment was expressed by 3/4 of respondents, mainly by people aged 36–50 years (higher working age) employed in public administration and services. Only a scant share of people found some problems in this field. This finding corresponds also with the situation in other peripheral territories, e.g. in the borderland territory of Sušice micro-region (Chromý, Skála, 2010).

About 75% of the population did not agree with the verdict that the commune has favourable conditions for business. People with stable families and economic position employed in services, transport and industry formed the rest.

Interpersonal relations were investigated too. The respondents selected mostly the answer mildly satisfied with the relations (57%) or mildly unsatisfied (32%). It shows that the rural idyll is more a matter

of the past. Though the people are not fully satisfied with interpersonal relations, they feel safe and keep contacts with their neighbours.

Seeking answers to the hypothesis, we tested the following independent variables (Sustainable Rural Development): gender, age, education and profession. Statistical tests of independence chi-squared test for the contingency table were used to test the hypothesis. The hypothesis could be answered by the selected test corresponding to the variable of gender. The variables of age, education and profession did not comply with the conditions for being used in the test and the hypothesis could not be answered.

The results of the summary table (shown in Tab. 1.) show that there are no statistically significant differences between males and females in the perception of positional location along the South Moravia Region border (critical value of test criterion for the level of significance is 0.05, where P = 0.960893). It is clear that the calculated value of test criterion is greater than the critical value, i.e. males and females valuate the positional location of the community similarly. It turned out that there are no statistically significant differences between males and females in perceptions of recreational attractions, satisfaction with the state of the environment, suitability of areas for business development, abundance of cultural activities in the community, i.e. males and females are similarly satisfied.

The results of the subjective evaluation show some disturbance of sustainable development equilibrium in the peripheral Olešnice micro-region. The geographical position was evaluated as disadvantageous. The ecological pillar reached the highest value. The territory has a well-preserved landscape with small-scale nature protection. Low business activities are the most problematic. It means that the economic pillar is the weakest segment of sustainability. The perception of periphery as a territory with natural capital but low economic development is strongly rooted among the people. Interpersonal contacts (social pillar) are not bad but they could improve.

6. Comparison of demographic and social indicators with other types of rural areas

In the analysis of the Olešnice micro-region, we departed from a general presumption that it is a territory with a disadvantaged social structure of the population. However, our comparison of selected social indicators of the Olešnice micro-region as an internal periphery with other micro-regions of the South Moravia Region (representing a sub-urbanized countryside, a well accessible inland countryside, and borderland micro-regions on the border with Slovakia, Austria, and on the highly permeable transit border) shows that the Olešnice micro-region appears as an area with the highest natural increase of inhabitants

Sex	q1 (1)	q1 (2)	q1 (3)	q1 (4)	Total
1	6.41	**11.99**	8.92	1.67	29.00
2	**16.59**	**31.01**	**23.08**	4.33	75.00
Total	23.00	43.00	32.00	6.00	104.00

Tab. l: Summary Table: Expected frequency (Olešnice micro-region)
Frequency of labeled cells > 10; Pearson's chi-squared: 0.295, df = 3, p = 0.96; 1 – male; 2 – female

(albeit with high emigration). The micro-region exhibits the second lowest unemployment, the second most favourable educational structure of inhabitants, and the second youngest population (all this after the sub-urbanized countryside). This is entirely contrary to the expectations suggested in the introduction of this paper.

For the analysis, we used the following indicators: Natural increase and migration balance were calculated from the population balances (Czech Statistical Office; further CSO) for the five-year period 2006–2010. The index of age, i.e. the ratio of people aged 0–14 to people aged 65 and older was taken from urban and municipal statistics (CSO) as at the end of 2010. The ratio of people with post-GCE education (i.e. the ratio of people with advanced vocational training and university education to the number of inhabitants older than 15) was calculated from the results of the 2001 census, as the results of the 2011 census were not available yet. Therefore, the absolute figures for education are already out of date but we still believe the ratios between the individual types of micro-regions are more or less stable. The unemployment data used in this paper were borrowed from the server of the Ministry of Labour and Social Affairs of the Czech Republic for July 2011.

The sub-urbanized rural areas were represented by the Ponávka micro-region (Association of municipalities), the well accessible fertile countryside was represented by the micro-region of Nový Dvůr, the internal periphery was represented by the Olešnice micro-region, and the borderlands were represented by the area of Horňácko (situated on the

Micro-region	Natural increase	Migration balance	Index of age	Education	Unemployment
Ponávka	+4.0 ‰	+158.9	1.05	18.3	7.2
Nový Dvůr	−0.1 ‰	+9.2	0.97	5.6	13.9
Olešnice	+5.2 ‰	−7.6	1.01	7.5	8.9
Podluží	−6.1 ‰	+18.7	0.92	6.7	12.8
Horňácko	−16.2 ‰	−9.3	0.81	7.1	13.1
Vranov n.D.	−10.6 ‰	−13.6	0.87	5.2	12.8

Tab. 2: Demographic and socio-economic characteristics of the selected micro-regions of the South Moravia Region from 2006 to 2010

Czech-Slovak border), by the micro-region of Vranov nad Dyjí (situated on the Czech-Austrian border), and by the Podluží micro-region (well-accessible triangle borderland). A comparison of the micro-regions is presented in the Tab. 2.

It is a question why the social characteristics of this South Moravia inner periphery are markedly better that e.g. those of the highly permeable, traditionally rich and fertile countryside of the Nový Dvůr micro-region. In our opinion, the reasons have to be sought in the population, its stability, motivation, and relation to their micro-region. If we carry this thought further, the support of the inner periphery makes sense, as there is probably an inner potential capable of maintaining the started activities even after the end of subsidies provided by the government or by the European Union. Obviously this is only a hypothesis that would require corroboration by further research. Nevertheless, it seems that the sustainability of rural areas is not only a question of "objective" indicators but also a subject of motivation of the local population (Jančák et al., 2010).

7. Development potential

The natural conditions of the micro-region represent a potential for a healthy lifestyle and sports. The scenic landscape with far and wide views but mild slopes is suitable for less demanding kinds of tourism such as biking, hiking, and winter sports, especially cross-country skiing. The slowly developing rural tourism would also have some opportunities there, unlike agro-tourism for which there are no favourable conditions in the area. Other products of the tourist industry with a potential for development are folklore and gastronomic events. Tourism is seen as being of considerable economic and social benefit to rural areas through the income and infrastructural developments it may bring to marginal and less developed regions (Hall, 2005).

In this micro-region, an obstacle to the development of commercial tourism can be seen mainly in the missing accommodation and other infrastructure. The number of family boarding houses and guesthouses is minimal as well as hotel-type accommodation facilities that could cater for tourists with modest requirements.

At the same time, the perspective for Olešnice is associated with the traditional industrial production in small and medium-sized businesses. This production should be supplemented with services in centres (including services for seniors), and possibly also with tourism and agro-tourism. Creating concrete conditions for entrepreneurs only comes after that; it may be an initiative to build the deficient services, an offer of non-residential premises or land for business activities, assistance in dealing with authorities etc. In the conditions of rural areas, the support of small and medium-sized businesses is an important route to the improvement of the situation on the labour market, as the conditions of the location are not favourable for acquiring large investments.

However, it is necessary to take into account the difference between Olešnice itself and the surrounding small villages that usually rely on their centre both in the sphere of job opportunities and services including the lowest hierarchic level.

8. Conclusion

The scientific study of the sustainable development conditions in an area is a basic prerequisite for better knowledge about the possible development of marginalized rural areas. These areas have many functions and many meanings. Since the beginning of time, they have been sources of food, material, and energy. They are places of relaxation, tranquillity and are sought for sports activities. Rural areas are valued because of their scenic landscape and natural environment (Woods, 2011). However, will the countryside, as we know it, be sustainable in the future? The answer to the question when the three pillars of sustainability are in equilibrium is rather complex.

In geography, the question of the relation between common and special is always in the play. Of course, all villages, their inhabitants and activities are specific.

But it is evident that the Olešnice micro-region does not have any substantial peculiarity in terms of natural, economic or social features. It means that the results could serve as a comparative basis also for other micro-regions on the inner periphery.

This paper presents an example of a survey in the peripheral area at the northern margin of the South Moravia Region. With the exception of the comparison with other micro-regions, no hard data were used in the study but we purposely focused ourselves on the differentiation of the subjective perception of some aspects of the local life. The focus of interest is set on the examination of sustainability, on studying the character of the Olešnice micro-region inner periphery, and the potential for the development of tourism in the territory. The difference of the marginal area is tested from the perspective of three pillars of the sustainable development, i.e. environmental, economic, and social. We believe that sustainability can only be achieved if the three pillars are in balance. Markedly worse state of one of the pillars is dangerous regardless of the quality of the other two. We are also interested in the perception of the typical characteristics of peripheral areas by local people.

In their statements, the respondents confirmed the characteristics of the periphery. In the evaluation of their perception of the location, 63% of the respondents agreed that the situation of the municipality near the boundary of the South Moravia Region is handicapped (geographical relations) as it is distant from the main centres and has a bad transport and technical infrastructure. The responses also suggested the fact that the area faces problems both in the economic and social sphere. Its disadvantage is a low level of entrepreneurial activities (economic relations). Most of the respondents feel safe in the area, maintain friendly relations with their neighbours, but the interpersonal relations could be generally better (social relations).

The question aimed at identifying what is often specific and sought in the periphery (nature conservation and quiet environment) reflected positive answers. It proves that a healthy environment largely contributes to stabilize the local population, as it is one of the dominant factors to tie the inhabitants to the territory. For this reason, many inhabitants prefer living in the remote corners of Moravia.

According to the respondents, the Olešnice micro-region is often sought for recreation. The area is an outstanding example of how the recreational potential of peripheries can be utilized. A winter ski-area was constructed in Olešnice, and in 2007, an integrated transport system was introduced to enable a more frequent connection with larger cities on the main route. Transport between the main municipalities and Olešnice is still poor. A disadvantage is a missing connection of the area by railway, which makes it less attractive for other potential visitors. It is also appropriate to take into account the problem of rural tourism sustainability.

Nevertheless, Dávid (2010) points out that …*"a sustainable and responsible tourism is not imaginable without an application of ecological thinking. Sustainability of tourism is a double task: it is necessary to implement a long-term protection, and at the same time to guarantee economic return of the invested means. Sustainable tourism must be economically efficient on a long-term basis and at the same time socially and ethically equitable in relation to local people"*.[4] Apart from other things, this means that tourist attractions should neither damage or destroy natural, architectural riches of the micro-region in question, nor the profits from tourism in such areas should flow away into distant cities or even abroad. Sharpley (2005) documents on the example of foot and mouth disease in Great Britain that rural tourism is relatively fragile and could be easily impacted by unexpected events (not speaking about the fashion).

The model territory is lacking a sufficient amount of accommodation facilities. For the sustainable development of the municipality it is necessary to resolve the situation in the sphere of housing and in finding such forms of development, which will support the development of low-impact tourism with the related cultural life and improved infrastructure – all this to such an extent that the significant values, both natural and cultural, are preserved for the future generations.

The focus on the support of sustainability is another important aspect of the development and quality of life in the peripheral micro-regions without prerequisites for development. This sustainability has to be based on a diversified economy, usually maintained by the primary production, basic processing of primary products, communal economy and services for local inhabitants without ambitions for growth. However, it is logical that, given the character of the periphery, with respect to the ageing population such a development is somewhat difficult. Therefore, it is a rather challenging task, which needs a supply of "energy" from elsewhere.

[4] Translated by Lenka Jakešová

It may be assumed with a high probability (almost certainty) that some rural micro-regions do not have prerequisites for the development in the quantitative sense – if there is no continuous supply of incentives from outside. This status is a logical outcome of economic and social differentiation under the conditions of the market economy. Thus, it is obvious that the development in the quantitative sense meets a number of obstacles, i.e. the lack of objective prerequisites, the negative perception of development on the part of the local population, insufficient actual benefits for the micro-region in question, or the protection of nature concerns. In such cases, the concentration on the conditions of sustainability is a logical focus of the activity of municipal and regional authorities. However, to be able to assess the sustainability of the development of the territory it is important to be aware of the interests advocated not only by the representatives of the local administration, but also by the inhabitants themselves. Active support and mutual cooperation by the local community count among the basic prerequisites of the transformation of the society towards sustainability.

In foreign literature (McGranahan, Wojan, Lambert, 2011) we may encounter observations that the rural periphery may attract creative inhabitants involved in the knowledge economy provided that it could offer distinctive natural attractions. Can a prerequisite like this be related to the Olešnice micro-region? There are also findings that the area of available open landscape decreases with the development of urbanization (including sub-urbanization) (Walter, Schläpfer, 2010). Can this be a strong card for micro-regions like Olešnice? Can a rural periphery become a destination for amenity migrants (Bartoš, Kušová, Těšitel, 2009)?

In conclusion, we may just state that actual stimulation of the Olešnice micro-region depends primarily on its inhabitants, their activity and their entrepreneurial spirit, on the abilities and enthusiasm of municipal authorities and their representatives, on the common effort of all entities in this rural area. In other words, it depends on citizens, on the non-profit sector, entrepreneurs, municipal authorities and regionalists cooperating with the municipal authorities in the area development. A similar finding presents the work dealing with the opinions of experts in the development of rural areas (Binek et al., 2011). It is necessary to support small and medium-sized businesses in the municipality with a possible increase of job opportunities as well as the improvement of necessary services and municipal amenities in both cultural and technical respect. A municipality can hardly be developed from outside if it cannot start to develop itself by mobilizing internal resources and utilising external support. Despite all disadvantages, the Olešnice micro-region is the area of great vitality and deep inner strength that will help to overcome the challenging period. It is the territory that will keep its rural character, the main resource of which is the local population.

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References:

BELL, S., MONTARZINO, A., ASPINALL, P., PENEZE, Z., NIKODEMUS, O. (2009): Rural society, social inclusion and landscape change in Central and Eastern Europe: A case study of Latvia. Sociologia Ruralis, Vol. 49, No. 3, p. 295–326.

BINEK, J. et al. (2011): Synergie ve venkovském prostoru – Paradoxy rozvoje venkova. Brno, GaREP, 64 pp.

BARTOŠ, M., KUŠOVÁ, D., TĚŠITEL, J. (2009): Motivation and life style of the Czech amenity migrants (case study). European Countryside, Vol. 1, No. 3, p. 164–179.

BORGATTI, S. P., EVERETT, M. G. (2000): Models of core/periphery structures. Social Network, Vol. 21, No. 4, p. 376–395.

CAMARINHA-MATOS, L. M., AFSARMANESH, H. (2010): Active ageing road map - a collaborative networks contribution to demographic sustainability. IFIP Advances in Information and Communication Technology, Vol. 336, p. 46–59.

ČERMÁK, L. (2005): Hodnoceni vztahu dopravní dostupnosti a exponovanosti území. In: Novotná, M. [ed.]: Problémy periferních oblastí. Praha, Karlova univerzita, p. 44–53.

CHROMÝ, P., SKÁLA, J. (2010): Kulturně-geografické aspekty rozvoje příhraničních periférií: Analýza vybraných složek územní identity obyvatelstva Sušicka. Geografie, Vol. 115, No. 2, p. 223–246.

COPUS, A. K., CRABTREE, J. R. (1996): Indicators of socio-economic sustainability. An application to remote rural Scotland. Journal of Rural Studies, Vol. 12, No. 1, p. 41–54.

CUDLÍNOVÁ, E., TĚŠITEL, J. (2000): Marginální oblasti - indikátor trvale udržitelného rozvoje. Životné prostredie, Vol. 34, No. 1, p. 10–14.

DÁVID, L. (2010): A turizmus ökológiai szempontú fejlesztésé nek lehetoségei és területei. Tájökológiai Lapok, Vol. 8, No. 1, p. 47–56.

EPPS, R. (2002): Sustainable rural communities and rural development In: Bowler, I. R. et al. [eds.]: The Sustainability of Rural Systems. Dordrecht, Kluwer, p. 225–246.

FERRÃO, J., LOPES, R. (2004): Understanding Peripheral Rural Areas as Contexts for Economic Development. In: Labrianidis L. [ed.]: Future of Europe´s Rural Peripheries. Farnham, Ashgate, p. 31–61.

FIALOVÁ, D. (2001): Druhé bydlení a jeho vztah k periferním oblastem. Geografie, Vol. 106, No. 1, p. 36–47.

FISCHER, T. (2009): Aging in rural areas in Austria. On the interrelations of spatial aspects and the quality of life of today´s older generation. European Countryside, Vol. 1, No. 3, p. 153–163.

GALVASOVÁ, I. et al. (2007): Spolupráce obcí jako faktor rozvoje. Brno, Georgetown, 140 pp.

HARVEY, D. (1989): The condition of postmodernity. Oxford, Blackwell, 392 pp.

HAVLÍČEK, T., CHROMÝ, P., JANČÁK, V., MARADA, M. (2005): Vybrané teoreticko-metodologické aspekty a trendy geografického výzkumu periferních oblastí. In: Novotná, M., [ed.]: Problémy periferních oblastí. Praha, Karlova univerzita, p. 6–25.

HAVLÍČEK, T., CHROMÝ, P., JANČÁK, V., MARADA, M. (2005): Innere und äußere Peripherie am Beispiel Tschechiens. Mitteilungen der Österreichischen geographischen Gesellschaft, Vol. 150, p. 299–316.

HALL, D. (2005): Sustainable Rural Tourism and Rural Change. In: Schmied D. [ed.]: Winning and Losing. The Changing Geography of Europe´s Rural Areas. Farnham, Ashgate, p. 72–89.

HUSÁK, J. (2010): Znalosti a jejich aplikace při realizaci trvale udržitelného rozvoje venkovských oblastí. In: Regióny – vidiek – životné prostredie. Nitra, Slovenská Poľnohospodárska Univerzita, p. 160–164.

JAKEŠOVÁ, L. (2011): Udržitelný rozvoj venkova v Jihomoravském kraji [Ph.D. thesis]. Mendelova univerzita in Brno, 272 pp.

JANČÁK, V., CHROMÝ, P., MARADA, M, HAVLÍČEK, T., VONDRÁČKOVÁ, P. (2010): Sociální kapitál jako faktor rozvoje periferních oblastí: analýza vybraných složek sociálního kapitálu v typově odlišných periferiích Česka. Geografie, Vol. 115, No. 2, p. 207–222.

JENKINS, T. N. (2000): Putting postmodernity into practice: endogenous development and the role of traditional cultures in the rural development of marginal regions. Ecological Economics Vol. 34, No. 3, p. 301–313.

JEŘÁBEK, M. (2006): Reserch into peripheral areas in the Czech Republic – changes in the landscape and land use in the model regions. Europa XXI, Vol. 15, No. 171–184.

KEARNEY, B., BOYLE, G., WALSH, J. A. (1994): EU LEADER Initiative in Ireland: Evaluation and recommendations. Dublin, Stationery Office, 137 pp.

KNAPPE, E., BENEDEK, J., ILIEVA, M. (2011): Periphere Regionen in Südosteuropa und ihr Potenzial. Geographische Rundschau, Vol. 63, No. 4, p. 28–33.

LABRIANIDIS, L. (2004): Future of Europe´s Rural Peripheries. Farnham, Ashgate, 312 pp.

LEIMGRUBER, W. (2004): Between global and local. Marginality and marginal regions in the context of globalization a deregulation. Aldershot, Ashgate, 331 pp.

MAJEROVÁ, V. et al. (2005): Český venkov 2005. Rozvoj venkovské společnosti. Praha, Czech University of Life Sciences, 163 pp.

McGRANAHAN, D. A., WOJAN, T. R., LAMBERT, D. M. (2011): The rural growth trifecta: Outdoor amenities, creative class and entrepreneurial context. Journal of Economic Geography Vol. 11, No. 3, p. 529–557.

MOLDAN, B., BRANIŠ, M. (2003): Globální problémy životního prostředí. In: Metrický, V. et al. [eds.]: Globalizace. Praha, Portál, p. 31–69.

MOSELEY, M. J. (2003): Rural Development. Principles and Practice. Sage, London, 227 pp.

MUNRO, D. A. (1995): Sustainability: Rhetoric or Reality? In: Tryzna T. C. [ed.]: A Sustainable World: Defining and measuring sustainable development. Sacramento, International Centre for the Environment and Public Policy, p. 27–35.

MUSIL, J., MÜLLER, J. (2006): Vnitřní periférie České republiky, sociální soudržnost a sociální vyloučení. Praha, Karlova univerzita, 52 pp.

MUSIL, J., MÜLLER, J. (2008): Vnitřní periferie v České republice jako mechanismus sociální exkluze. Sociologický časopis, Vol. 44, No. 2, p. 321–348.

PERLÍN, R. (1998): Venkov, typologie venkovského prostoru. Praha, Ministerstvo vnitra České republiky, 21 pp.

PEŠA, Z. (2000): Čitanka vlastivědy Olešnicka. MU Olešnice. 43 pp.

PEŠA Z. (2005): Mikroregion Olešnicko. Olešnice: Dobrovolný svazek obcí Olešnicko. 73 pp.

Regional Development Strategy. South Moravan Region. Concise Version for General Public (2007). Brno, The Authorioty of South Moravian Region, 62 pp.

REINÖHLOVÁ, E. (2005): Informační a komunikační technologie pro rozvoj periferních oblastí – zkušenosti ze zahraničí. In: Novotná, M. [ed.]: Problémy periferních oblastí. Praha, Karlova univerzita, p. 36–44.

O´ROURKE, E., KRAMM, N. (2009): Changes in the management of Irish uplands: a case study from the Iveragh peninsula. European Countryside, Vol. 1, No. 1, p. 53–66.

SEDLACEK, S., KURKA, B., MAIER, G. (2009): Regional identity: a key to overcome structural weaknesses in peripheral rural regions? European Countryside, Vol. 1, No. 4, p. 180–201.

SHARPLEY, R. (2005): Rural tourism and sustainability – a critique. In: Hall, D., Roberts, L., Mitchell, M. [eds.]: New directions of rural tourism, 2nd ed. Ashgate, Aldershot, p. 38–53.

STEJSKAL, J., KOVÁRNÍK, J. (2009): Regionální politika a její nástroje. Praha, Portál, 216 pp.

STOCKMANN, J. (2005): Moravské Kopanice: identita na periferii. In: Novotná, M. [ed.]: Problémy periferních oblastí. Praha, Karlova univerzita, p. 161–167.

Strategie regionálního rozvoje České republiky (2006). Praha, Ministerstvo pro místní rozvoj ČR, 109 pp.

SUMNER, J. (2005): Value wars in the new periphery. Sustainability, rural communities and agriculture. Agriculture and Human Values, Vol. 22, No. 3, p. 303–312.

ŠIMKOVÁ, E. (2008): Udržitelný rozvoj venkova a role venkovské turistiky. Ekonomie a Management, No. 1, p. 26–32.

TRYZNA, T.C. [ed.] (1995): A Sustainable World: Defining and measuring sustainable development. Sacramento, International Centre for the Environment and Public Policy, 272 pp.

VAISHAR, A., ZAPLETALOVÁ, J. (2010): Sustainable development of the Moravian countryside. Revija za geografijo, Vol. 5, No. 1, p. 43–54.

VASHAR, A., DVOŘÁK, P., HUBAČÍKOVÁ, V., NOSKOVÁ, H., NOVÁKOVÁ, E., ZAPLETALOVÁ, J. (2011): Regiony v pohraničí. Brno, Ústav geoniky Akademie věd ČR, 133 pp.

WALTER, F., SCHLÄPFER, F. (2010): Landscape amenities and local development: A review of migration, regional economic and hedonic pricing studies. Ecological Economics, Vol. 70, No. 2, p. 141–152.

WOODS, M. (2011): Rural. London/New York, Routledge, 336 pp.

World Commission on Environment and Development (1991): Naše společná budoucnost [Translated by P. Korčák]. Praha, Academia, 297 pp.

ZEMAN, J. (2002): Ekonomické základy trvale udržitelného rozvoje. Olomouc,: Univerzita Palackého, 171 pp.

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A COMPARISON OF POPULATION AGEING IN THE CZECH REPUBLIC AND THE SLOVAK REPUBLIC BASED ON GENERATION SUPPORT AND EXCHANGE

Marcela KÁČEROVÁ, Jana ONDAČKOVÁ, Jozef MLÁDEK

Abstract

The object of study is the population of the Czech Republic and Slovak Republic, and the aim was to identify the process of population ageing using two approaches: temporal and spatial. In the analysis of population ageing sophisticated instruments of cognition were used. Indicators are based on the comparison of selected generation groups. The comparison shows a high degree of similarity. In the development of ageing processes, we can observe however also certain differences between the CR and SR. The population ageing in the Czech Republic starts earlier than in Slovakia, and the process is more intense.

Shrnutí

Komparace stárnutí populace České a Slovenské republiky na základě generační podpory a výměny

Předmětem studie je obyvatelstvo České a Slovenské republiky, cílem pak identifikace procesu stárnutí populace při zohlednění dvou aspektů: časového a prostorového. Při analýze stárnutí obyvatel byly použity sofistikované nástroje poznání. Indikátory jsou založeny na srovnání vybraných generačních skupin. Komparace ukazuje vysokou míru podobnosti. Ve vývoji procesů stárnutí pozorujeme mezi ČR a SR určité odlišnosti. Stárnutí obyvatelstva v ČR začíná dříve než na Slovensku a probíhá intenzivněji.

***Key words**: population ageing, index of potential economic support, social support index, coefficients of inflow, outflow and exchange, dynamic index of economic ageing, Slovak Republic, Czech Republic*

1. Introduction

Age structure can be considered one of the most important attributes of a population. This is because every age structure develops over a long time period. The actual age structure is a result of many population processes over the past one hundred years. Although the characteristics of an age structure are instantaneous, cross-sectional variables, they reflect the basic demographic processes – fertility, mortality and migration. At the same time, the current age structure will affect population development in the next one hundred years.

Age structure is indispensable in the construction of indicators for the evaluation of many demographic phenomena and processes – because individual age groups affect these indicators to varying degrees (reproduction, marriage rate, migration, etc.). In addition to theoretical and methodological applications, the population age structure also represents a wide range of social and practical consequences. It is essential that its characteristics are taken into account when assessing the potential labour force, in creating educational systems, health care, and social security (particularly inactive population groups).

These are just a few of the reasons for the great interest in the evaluation of population age structures, both their typologies and transformation. One of the most important changes is the ageing of population structures (the process of population rejuvenation is less common). From the demographic point of view, such changes increase the number or proportion of higher age categories within the population (top-down ageing). The changes also involve the reduction of the number and proportion of children in the population (bottom-up ageing). A seemingly straightforward evaluation of the young and older age categories of the population is complicated by their mutual interrelations, as well as by the relations to other age categories of the population under assessment. Such changes of age structure are considered as general patterns of population development in most countries.

Sauvy (1948) commented on population ageing as a phenomenon that is the least debatable, easily measurable, and the most stable. He believed that age structure is subject to gradual changes, even in the case of unforeseen disasters. Today it is apparent that in the 1950s, the seriousness of the process of population ageing was not sufficiently foreseen. Currently the stage of population development of most developed countries is the rapid – and for most observers alarming, level of population ageing. On the other hand, the positive aspect of population ageing is considered to be the continuous increase of the quality of life, manifested specifically in increased life expectancy. In Slovakia, life expectancy in 1950 was 59 years for males and 63 years for females. In the Czech Republic it was 62 years and 67 years respectively. By 2009, these indicators had increased in Slovakia to 71.3 years (and to 74.2 in the CR) for males and 78.7 years (and 80.1 in the CR) for females. Also during the 20th century, in Slovakia the population category of 65 and over increased 4.2-fold (while the total population increased only 1.8-fold) and its proportion increased from 5.3% to 12.3%. In the Czech Republic between 1920 and 2009, the total population increased 1.1-fold, and the 65 and over population increased 2.5 times, while the proportion of this population group increased from 6.2% to 15.0%.

The object of this research is to compare the changes in the age structures of the population of the Czech Republic and Slovak Republic, The aim was to identify the process of population ageing in Slovakia and the Czech Republic using two approaches: temporal and spatial. The time period for the temporal analysis was selected based on the availability and comparability of data from 1920 to 2025[1]. The spatial analysis at the country level deals with the ageing process and changes between 1996 and 2009. Both populations under observation were part of a single common state for an extended time (except for the period 1939–1945). The population of these countries was thus affected by a uniform population policy, "which sought to increase or at least maintain an adequate level of fertility and establish conditions to enable the reduction of mortality" (Kučera, 1968). Despite the common approach of both countries, certain differences in their population development can be observed. During the entire period, the population of the Czech Republic responded to external reproduction stimuli (economic, psychological, etc.) faster than the population of Slovakia (Andrle, Srb, 1983). Our analysis will demonstrate the degree to which this difference was reflected in the population ageing processes.

2. Theoretical backgrounds

There is a wide range of methods available in Slovak as well as wider literature to measure the parameters of population ageing, or to measure the changes in the age structure of the population. Our method was based on the traditional measurement of the population ageing process through the proportion of selected age, the ageing index, Billeter index[2] and similar measures (Pavlík et al., 1986; Mládek et al., 2006; Pavlíková, Mládek, 1999; Káčerová, 2009; Ondačková, 2011; Mládek, Káčerová, 2008; Mládek, 2004; Verešík, 1974; Michálek, 1995). The application of very frequently used indicators of ageing – the ageing index and Billeter index – enables a preliminary assessment of ageing in both populations over the course of the century (Fig. 1). In particular, characteristic features appear such as the similarity between the population ageing process in the Czech Republic and the Slovak Republic (almost parallel curves). Along with the obvious similarity, there is also the advance of the Czech Republic in the development of the indicator that was accentuated in the 1930s. Until the beginning of World War II, the Czech Republic was closer to the western type of family behaviour as described by Hajnal line (Rabušic, 2001), while the Slovak Republic was closer to the eastern model. Since the age of marriage in the western type of family behaviour was high and sexual intercourse before marriage was strongly discouraged, the age at first birth was also high as a consequence. In the Czech society between the wars, the preference was for only one child (Roubiček, 1997), while in Slovakia, a family model with two or more children was preferred.

The analysis of the age structure of the population and its ageing using sophisticated instruments is a crucial part of this study. The indicators are based on a comparison or substitution of the selected population groups, most often generation groups – generations associated with certain major demographic, economic and social processes and functions. These may be generations with a major reproduction function, generations of the economically active population, generations with the function of education and social support (Długosz, Kurek, 2009; Hrubý, 1996; Lutz, 2006; Qiao, 1988).

The evaluation of the process of population ageing, or the level achieved by using these tools, requires more detailed data on age structures, and the interpretation of the acquired information is sometimes quite difficult.

[1] For both populations it applies that 1920–2009 are the real age structure, while for the SR 1921–1930 are from the census records. For 2010–2025 we used a population forecast.

[2] Billeter index = [(Population (0–14) – Population (50+)) / Population (15–49)] × 100

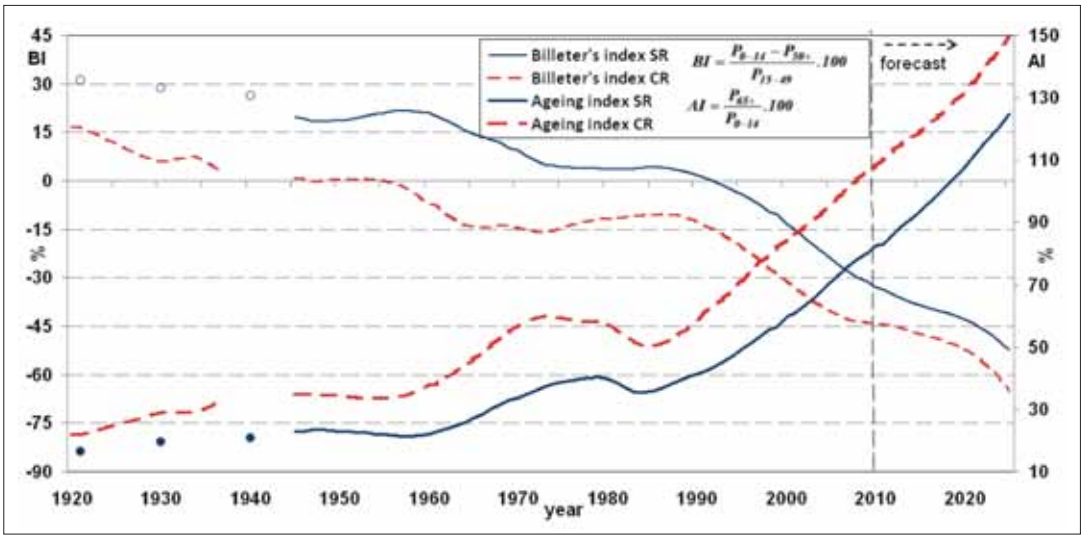

Fig. 1: Development of population ageing indices in CR and SR (1920–2025)
Source: Statistical Office of SR (1946–2010, 2006), Czech Statistical Office (2009, 2010a), Bleha, Vaňo (2007)

From the economic aspect, the quantitative relation between the age categories of productive and post-productive population is very important. This is expressed by the *Index of potential economic support* – I_{pes}.

$$I_{1pes} = \frac{P_{15-64}}{P_{65+}} \times c \qquad I_{2pes} = \frac{P_{20-64}}{P_{65+}} \times c$$

If we substitute 100 for c, then the index represents the number of people in the productive age, per 100 people in the post-productive age. The index can be defined and used in two modifications. In the first case I_{1pes} is used on the basis of statistical data for the productive population aged 20–64 and in the second case – I_{2pes} is based on data for 15 to 64 year olds. Both indicators have a similar trend. If we use the number of economically active individuals as the numerator and the number of pensioners as the denominator, the index would represent the number of working individuals per 100 nactive individuals (pensioners).

The category of the productive population is generally considered very important socio-economically, which is why we need to assess its changes as younger generations enter the category of productive population, and older generations leave it (Hrubý, 1996; Káčerová, 2009).

$$C_i = \frac{P_{10-14}}{P_{15-64}} \times c \qquad C_o = \frac{P_{60-64}}{P_{15-64}} \times c \qquad C_e = \frac{P_{10-14}}{P_{60-64}} \times c$$

C_i – coefficient of inflow, C_o – coefficient of outflow, C_e – coefficient of exchange

Very often the emphasis is put on the substitution of certain important social age groups. Długosz, Kurek (2009) consider the 85+ age category to be one of such important social groups. Usually this age category is associated with the need for special care, social or family support. With respect to certain demographic trends and life expectancy of the Slovak and Czech population we have reduced this age limit to 80 years. With such a modification, the *index of potential social support* (parents) looks as follows:

$$I_{ss1} = \frac{P_{80+}}{P_{50-64}} \times c \qquad I_{ss2} = \frac{P_{85+}}{P_{50-64}} \times c$$

Index (I_{ss1}) represents the number of individuals in the 80+ age group per 100 individuals aged 50–64. This ratio can be viewed as a relationship between the generation of parents and their children and as a potential possibility of direct inter-generation assistance.

Dynamic population ageing metrics attempt to compare the size of the age groups that enter or leave the important age categories of the population at a certain time. The dynamic index of economic ageing of the productive population is used to compare the population entering with the population leaving the category of productive population (Długosz, Kurek, 2009).

$$I_{ead} = \left[P_{(0-14)t} - P_{(0-14)t+n}\right] + \left[P_{(65+)t+n} - P_{(65+)t}\right]$$

I_{ead} – dynamic economic ageing index, $P_{(0-14)t}$ – share of population aged 0–14 at the beginning of the study period, $P_{(0-14)t+n}$ – share of population aged 0–14 at the end of the study period, $P_{(65+)t+n}$ – share of population aged 65+ at the end of the study period, $P_{(65+)t}$ – share of population aged 65+ at the beginning of the study period

I_{ead} represents the speed of the population ageing process. If the index assumes positive values, it means that the population is growing older (an unequivocal

sign is the positive difference between both age categories, demonstrating that each subsequent generation of 0 to 14 years is smaller than the previous one and at the same time each subsequent generation of 65 and over is larger than the previous one). The larger the value of I_{ead}, the faster is the process of ageing. If the index assumes negative values, this indicates that the population is rejuvenating.

If we were to assess the changes of the population age structure with respect to reproduction, we should use the modified indicator – *dynamic reproduction ageing index*.

$$I_{rad} = \left[P_{(0–14)t} - P_{(0–14)t+n}\right] + \left[P_{(15–49)t+n} - P_{(15–49)t}\right]$$

I_{rad} – dynamic reproduction ageing index, $P_{(0\text{-}14)t}$ – share of population aged 0–14 at the beginning of the study period, $P_{(0\text{-}14)t+n}$ – share of population aged 0–14 at the end of the study period, $P_{(15\text{-}49)t+n}$ – share of population aged 15–49 at the end of the study period, $P_{(15\text{-}49)t}$ –share of population aged 15–49 at the beginning of the study period.

3. Temporal aspect

The development of all *indices of potential economic support* I_{pes} shows a decline, demonstrating the ageing of the population in both countries. Worth noting are the almost parallel curves, indicating the similarity of population development in both countries. In the early 1920s, the ratio of the post-productive to productive population was one to 8.9 and 11.6 respectively (Fig. 2). During the first half of the 20th century, there was a slow decline in these indicators to 7.5 and 10. By 1990, the values of these indicators had decreased to 5 and 6, and then stabilized over the next 20 years. The forecast of future development shows that the declining trend will be resumed, reaching the value of 2.6 to 3.5 in 2025. The only period of rejuvenation of both populations in terms of this indicator was the period 1980–85, when the smaller population born during World War I was entering the post-productive age. The graphical interpretation of the development of I_{pes} values clearly demonstrates that in all of these periods the Czech population was ageing markedly faster than the Slovak population. At the same time, both populations are converging in terms of the ageing rate (the index interval in 1950 was 1.6 and 1.2, and in 2025 the values are expected to reach 0.7 and 0.6 respectively).

The *coefficient of inflow* represents the number of individuals in the age category 10–14 entering productive ages. Overall, the inflow coefficient in both populations is declining, which means a decrease in the inflow of young population to the productive age category (Fig. 3). In 1920, there were 17–19 persons aged 10–14 years per 100 of the working population. A significant decline in this indicator can be observed in the early 1930s, when the age group 10–14 included the smaller populations from the period of the First World War. But even discounting this negative deviation, a declining trend in the inflow coefficient can be observed, reaching 10–16 in the 1950s. This was followed by a short-term increase as a result of increased fertility after 1938, due to the closure of universities, the abolition of military service, as well as the fact that pregnancy and early motherhood was a protection of sorts against total deployment in Germany (Fialová, 1991). Moreover, the mothers of young children were protected from deployment as labour, and last but not least, young families had a better food supply (Srb, 2004). The declining trend was more recently interrupted only in the 1980s, thanks to successful pronatal measures in the 1970s, which resulted in the growth of the pre-productive age category of the population. By 2009, the inflow coefficient was reduced to 6–7 (of 10–14-year olds per 100 of the working population). At the same time, we can observe the convergence of the Slovak and Czech populations as a result of low fertility in both countries in the 1990s, which resulted in very low values of this indicator (coefficient of inflow) by the end of this period. Throughout the entire reporting period, the inflow coefficient was higher in Slovakia – reflecting the higher birth rate of the Slovak population. According to the population forecasts, the situation will change after 2015.

The *coefficient of outflow* represents the movement out of 60 to 64-year olds from the productive age category to the post-productive population. The curves demonstrate the growing trend in both populations, but there is a significant reduction in 1976–81 when the less numerous generations born during the First World War (Fig. 3) were entering the 65 and over age category. The higher value of the coefficient for the Czech population demonstrates the faster ageing of the Czech population – except for the forecast period after 2010.

The *coefficient of exchange* expresses the changes in the proportion of "incoming" to and "leaving" from the productive population. During the period of interest, the situatión changed dramatically. At the beginning of the century the exchange coefficient reached 300 to 359%. Since the coefficient of outflow in this period was stabilized, the development was in line with the trends of the inflow coefficient. In the 1950s, the ratio of "incoming" to "outgoing" population was 1.5–3. The decline was interrupted only at the end of the 1970s when the generations born during

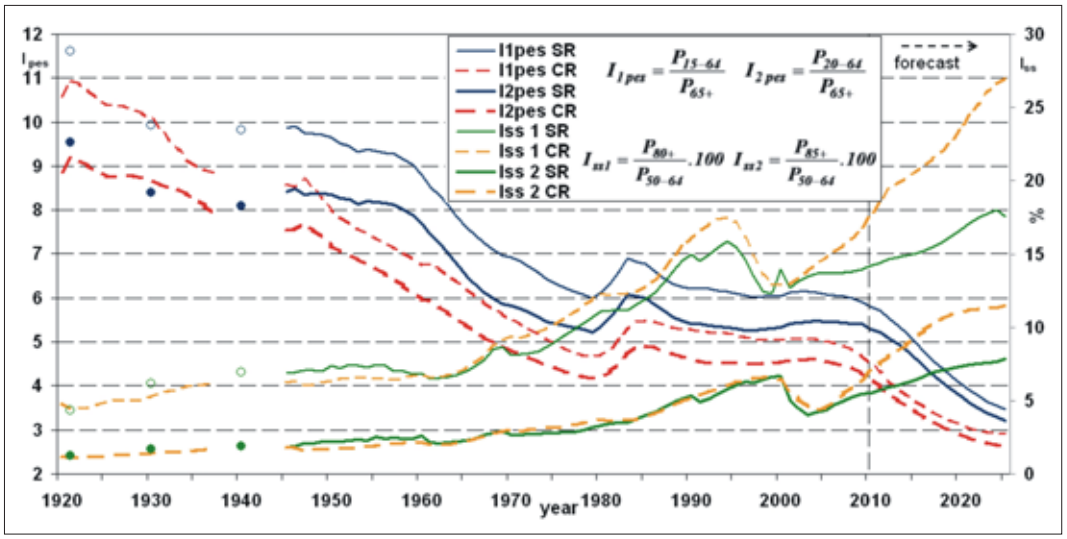

Fig. 2: Index of potential economic support and potencial social support in CR and SR (1920–2025)
Source: Statistical Office of SR (1946–2010, 2006), Czech Statistical Office (2009, 2010a), Bleha, Vaňo (2007)

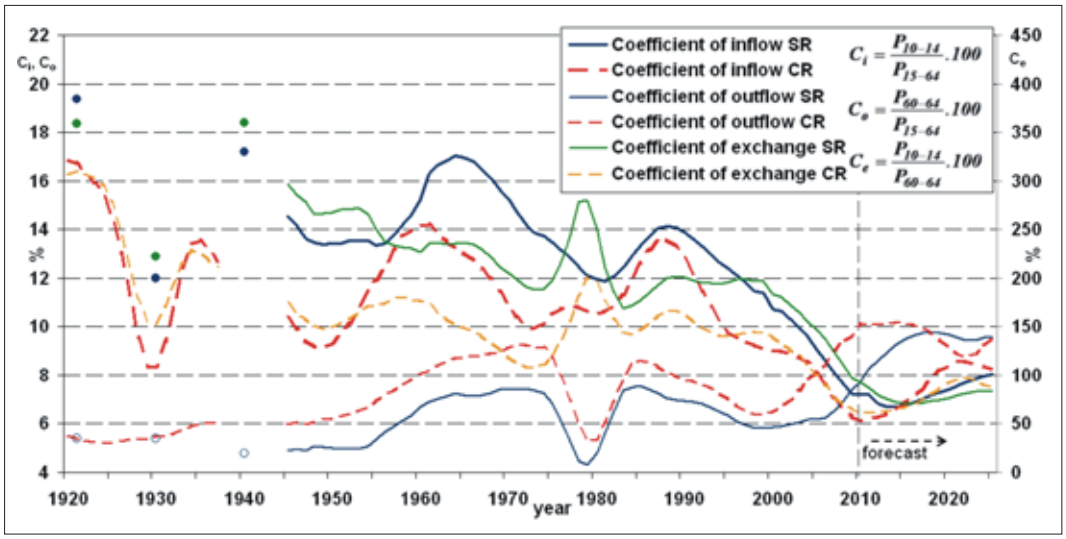

Fig. 3: Coefficient of inflow, outflow and exchange in CR and SR (1920–2025)
Source: Statistical Office of SR (1946–2010, 2006), Czech Statistical Office (2009, 2010a), Bleha, Vaňo (2007)

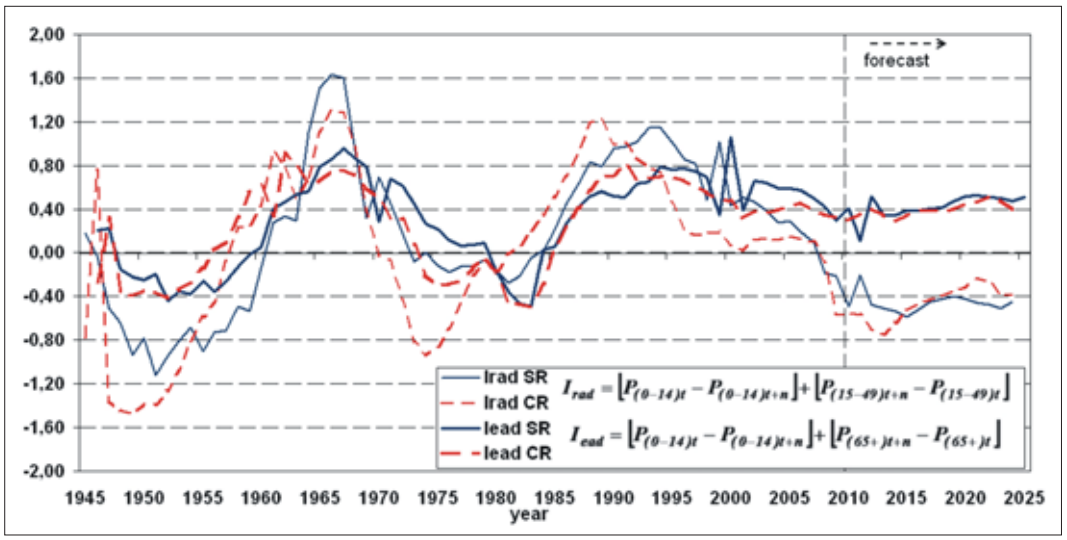

Fig. 4: Dynamic economic ageing index and dynamic reproduction ageing index in CR and SR (1945–2025)
Source: Statistical Office of SR (1946–2010, 2006), Czech Statistical Office (2009, 2010a), Bleha, Vaňo (2007)

the First World War were leaving the productive ages, and the first generations born during the years of increased birth rate began to enter the workforce. At present the inflow of the young population groups does not compensate for the outflow (94% for the Slovak and 65% for the Czech population), with a slightly increasing trend (Fig. 3).

Development in the ratio of the generation of "parents" (80+) to the generation of their "children" (50–64 years) confirms the ageing of the population in Slovakia and the Czech Republic through the *social support index*. At the beginning of the subject period, this indicator was at the level of 4–5 with a slight upward trend, and thus in the 1950s for 100 individuals in the generation of children there were only 7 parents. By 1980, the index had risen to 11, and in 1993, it was 17–18 (Fig. 2). The most significant factor was reduced mortality associated with so-called premature deaths (before the age of 65), which was disproportionately high in the Czech Republic in comparison with developed countries (Dzúrová, 2001). The reduction of the social support index since 1994 (to the level of 12–13) is associated with the transition of the smaller generations born during the First World War into the 80+ age category. In recent years, the value of this index has increased to 14%, and according to demographic forecasts, it should reach 18% in Slovakia and increase to almost 28% in the Czech Republic by 2025.

Dynamic economic ageing indices of the Slovak and Czech population reflect the characteristic changes in both age categories (0–14 year olds, 65 and older), and alternating periods of population ageing and rejuvenation (Fig. 4). Periods of population rejuvenation can be observed in the 1950s and 1970s, where the main factor was mainly increased fertility. Accelerated population ageing was observed in the 1960s and from the end of the 1980s. More recently, the ageing process has been affected especially by reduced fertility (bottom-up ageing), resulting from strong individualism, and the mass spread of (hormonal) contraception. Moreover, the situation was intensified by social insecurity, growing unemployment and an unfavourable economic situation, particularly in the area of independent housing (Mládek et al., 2006). In 1980, the proportion of the population in the 0–14 age category (children) was 26.1% in Slovakia (in the Czech Republic 23.3%), and the proportion of 65+ age category was 10.4% (CR 13.5%). By 2009, the proportion of children category in Slovakia was reduced to 15.3% (14.2% in the CR), and the proportion of 65 and over increased to 12.3% (15.0% in the CR). The positive values of I_{rad} indicate the faster reproductive ageing of the population. There is a decline in the proportion of children (potential for reproductive category) and the reproductive age category. In the case of negative values I_{rad}, the reproductive rejuvenation of the population occurs.

The development of reproductive ageing in both countries is of a cyclical nature (Fig. 4), reflecting the development cycles of fertility and the subsequent rise or fall of the proportions of the reproductive category. The first is during the 1950s with the rejuvenation of the population mainly as a result of high fertility. In the 1960s it was replaced by the ageing of the population, resulting from declining fertility which was a consequence of both the global economic crisis and the passing of a more liberal abortion law. During this period, the Czech Republic had even seen a decline in total fertility, gross and net reproduction rates below replacement level. Another period of population rejuvenation was observed in the 1970s and the first half of the 1980s, reflecting the increase in fertility, and the influx of the more numerous generations from the 1950s into the reproductive age category. A new ageing period is observed in the late 1980s and 1990s, mainly due to a sharp decline in fertility. More remarkable is the reduction of the rate of ageing in recent years with even the hint of rejuvenation in both populations. Apart from a slight recovery in fertility, these changes have to be attributed to the numerically large generations born in the 1970s, representing increased reproductive potential. The reduction of this indicator is also strongly affected by the transfer of post-war baby-boomers to the post-reproductive age group.

4. Spatial aspects of population ageing

The transformation of the population age structure towards ageing over time is characterised by significant regional differences. The significant differences in ageing at the global level, especially the differences between the population of the developed and less developed countries are well known. Socially developed countries experienced faster processes of ageing, which result in particular economic and social issues. There are also considerable regional differences in ageing among developed European countries (Pavlíková, Mládek, 2001; Káčerová, Bleha, 2007).

Potential economic support of the population was assessed at district level in the period between 1996 and 2009. In the observed years, the index remained unchanged on average, and certain similarities can be observed in regional distribution. The trend is affected especially by a higher fertility rate in recent years, and the resultant growth of the population of working age. Historically, the most youthful districts (north-western districts of the Czech Republic and the north-eastern districts of the

Slovak Republic) had the highest values of the index of economic support, and districts with advanced ageing had the lowest support index. There is a significant influence of the young Roma population age structures in the north-eastern and some southern districts of the Slovak Republic (Pukačová, Mládek, 2012). However, there are certain exceptions. One of these is the Praha-západ District, which in 1996 was among districts with very low values, while in 2009 it had the most favourable figures, especially thanks to the extension of the Praha region (Fig. 5, Tab. 1). In both populations, low values are also characteristic of regions with high unemployment and for regions less attractive to the economically active population – peripheral Czech inland districts and the districts of southern Slovakia.

The index of potential social support also demonstrates the process of ageing and its varying regional manifestations (Fig. 6, Tab. 2). The comparison of spatial differentiation in 1996 and 2009 points to only slight changes, and in many districts the index of potential support of "parents" and their "children" remains very similar. However, while in the Czech Republic there was a further increase in the index of potential social support, Slovakia saw a slight decline. In the Czech Republic the lowest values were observed especially in those districts with a lower life expectancy – the northwest border regions. This negative state is attributed by Andrle and Srb (1983) to the adverse ecological conditions in these districts. Lower life expectancy is a result of higher unemployment and lower education levels. A low proportion can also be observed in the Moravian-Silesian region with a similar physical and social environment. The highest values were recorded in the districts of large cities (Praha, Brno, Hradec Králové), probably due to the concentration of educated people who care for their health and where health care is more available. The districts of Slovakia where historically there is the highest proportion of elderly people (regions Trenčín and Nitra) unsurprisingly also have the highest level of the potential social support index.

Regional differences in ageing impact individual districts in the Czech Republic and Slovakia quite considerably. The rate of ageing was evaluated using the dynamic economic ageing index in the period 1996-2009. Although the Czech population began the subject period with a significantly older age structure, in general, the Slovak population was ageing faster. At the same time, while in the case of the Slovak Republic the population ageing was evident in all districts, in the Czech Republic, there was a rejuvenation of the population in two districts (Praha-západ and Praha-východ). Lower values are characteristic of the entire region of Praha and Central Bohemia. This region is marked by the emigration of the post-productive population (freeing their residences for their descendants), as well as the immigration of the productive population seeking job opportunities. In contrast, the lack of jobs following the social and economic transformation in the Moravian-Silesian region has resulted in faster ageing. In Slovakia, the above average rate of ageing is observed in the western part of Slovakia, with the exception of the wider Bratislava region. The districts of northern and eastern Slovakia are the second significant geographical area. Different rate of ageing is reflected in the complex relations of the increase (decrease) of the young age group, and an increase (decrease) of older age groups (Fig. 7, Tab. 3).

Lowest Slovak Republic				**Lowest Czech Republic**			
District	**1996**	**District**	**2009**	**District**	**1996**	**District**	**2009**
Sobrance	3.4	Medzilaborce	3.6	Jičín	3.8	Brno-město	3.7
Medzilaborce	3.4	Sobrance	4.2	Praha	3.8	Pelhřimov	3.7
Krupina	3.9	Turčianské Teplice	4.2	Nymburk	3.9	Písek	3.7
Turčianské Teplice	4.0	Nové Mesto n. V.	4.3	Praha-západ	4.0	Hradec Králové	3.8
Poltár	4.1	Myjava	4.4	Kolín	4.0	Plzeň-město	3.8
Highest Slovak Republic				**Highest Czech Republic**			
Spišská Nová Ves	6.7	Stará Ľubovňa	6.3	Český Krumlov	6.1	Praha-západ	5.3
Poprad	6.7	Spišská Nová Ves	6.4	Česká Lípa	6.1	Český Krumlov	5.3
Námestovo	7.1	Tvrdošín	6.8	Chomutov	6.1	Chomutov	5.4
Tvrdošín	7.4	Kežmarok	7.2	Tachov	6.3	Tachov	5.4
Košice	7.4	Námestovo	7.7	Sokolov	7.0	Česká Lípa	5.4
average SR	**5.3**	**average SR**	**5.4**	**average CR**	**4.5**	**average CR**	**4.3**

Tab. 1: Extreme attributes of the potential economic support index
Source: Statistical Office of SR (1997, 2010), Czech Statistical Office (1997, 2010b)

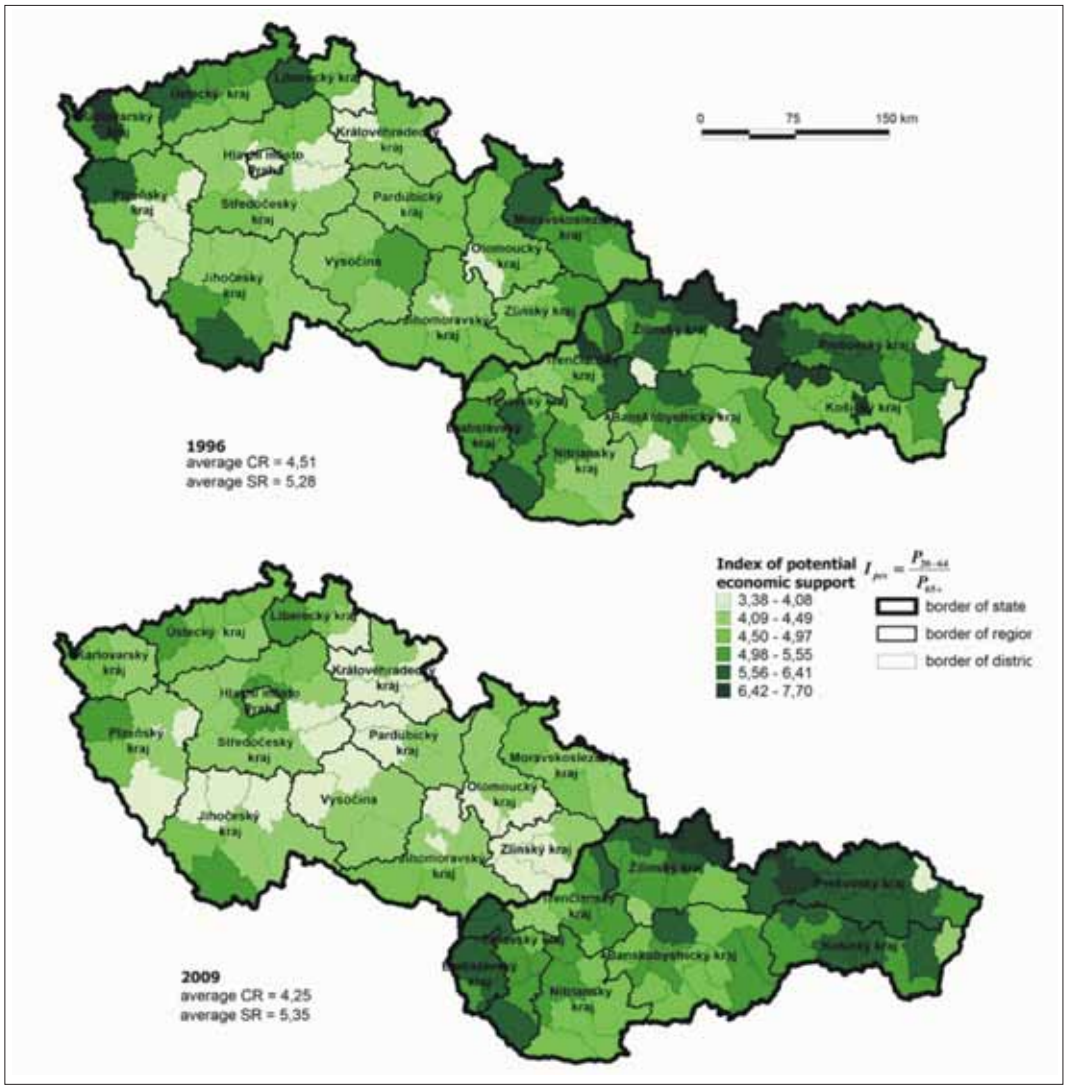

Fig. 5: Index of potential economic support in Czech Republic and Slovak Republic in years 1996 and 2009
Source: Statistical Office of SR (1997, 2010), Czech Statistical Office (1997, 2010b)

Lowest Slovak Republic				**Lowest Czech Republic**			
District	**1996**	**District**	**2009**	**District**	**1996**	**District**	**2009**
Košice	10.1	Tvrdošín	10.9	Sokolov	7.2	Tachov	11.0
Tvrdošín	10.3	Košice	11.0	Most	9.9	Sokolov	11.1
Ilava	10.4	Dunajská Streda	11.2	Tachov	10.2	Chomutov	11.6
Kysucké N. Mesto	11.0	Ilava	11.3	Karlovy Vary	10.5	Česká Lípa	12.1
Dunajská Streda	11.2	Spišská Nová Ves	11.3	Chomutov	10.8	Český Krumlov	12.1
Highest Slovak Republic				**Highest Czech Republic**			
Banská Štiavnica	18.8	Poltár	17.5	Nymburk	19.2	Prostějov	19.2
Poltár	19.2	Nové Mesto n. V.	17.6	Prostějov	19.4	Hradec Králové	19.5
Liptovský Mikuláš	19.2	Turčianske Teplice	18.5	Třebíč	19.9	Semily	19.5
Krupina	20.1	Sobrance	21.8	Vyškov	21.0	Praha	20.9
Turčianske Teplice	22.4	Medzilaborce	23.4	Jičín	21.6	Brno-město	21.8
average SR	**14.6**	**average SR**	**13.9**	**average CR**	**15.5**	**average CR**	**17.1**

Tab. 2: Extreme attributes of the potential social support index
Source: Statistical Office of SR (1997, 2010), Czech Statistical Office (1997, 2010b)

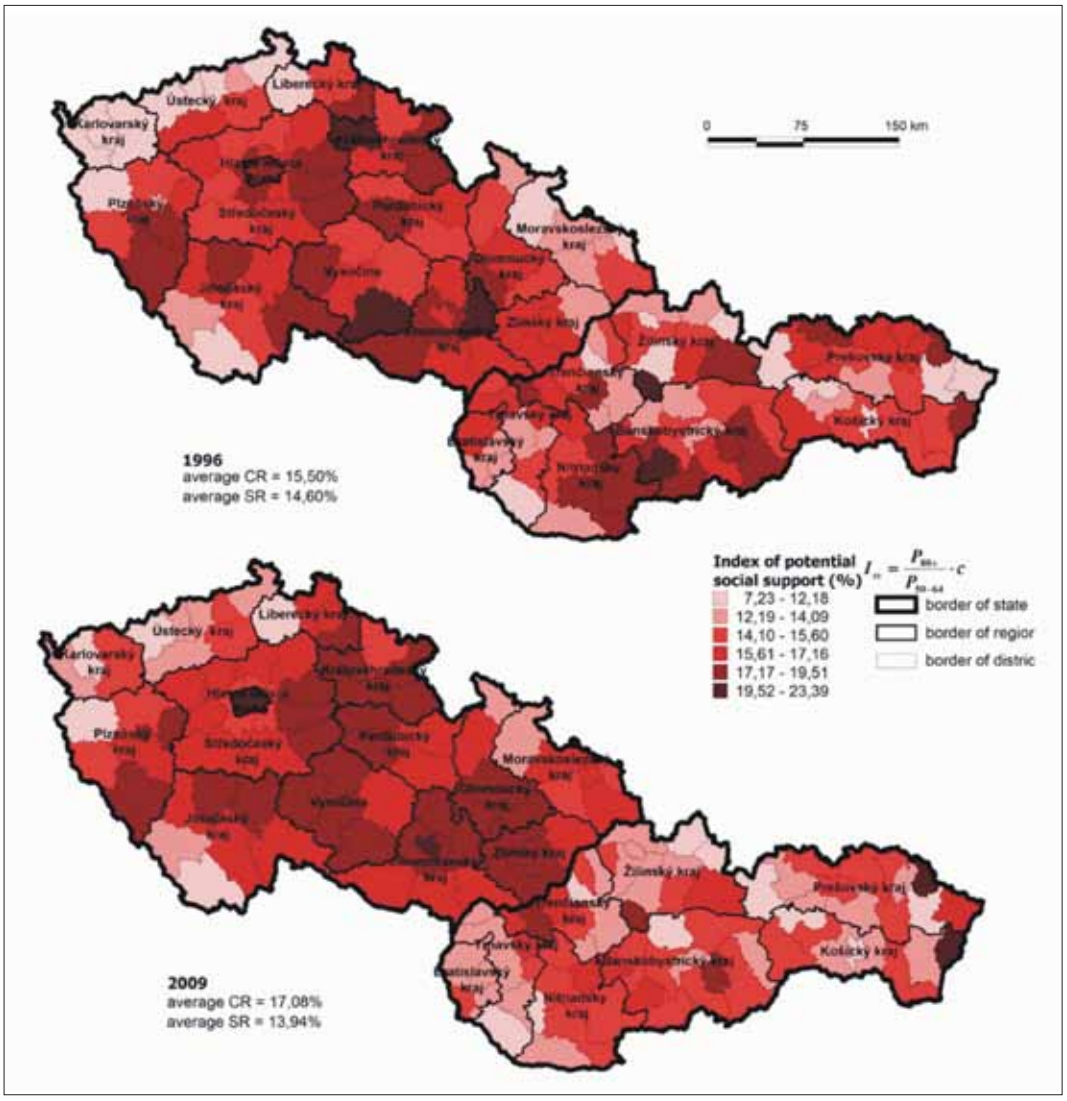

Fig. 6: Index of potential social support in Czech Republic and Slovak Republic in years 1996 and 2009
Source: Statistical Office of SR (1997, 2010), Czech Statistical Office (1997, 2010b)

Lowest Slovak Republic		**Lowest Czech Republic**	
District	**1996**	**District**	**1996**
Košice-okolie	3.1	Praha-západ	−4.3
Rimavská Sobota	3.2	Praha-východ	−2.6
Senec	3.4	Nymburk	0.8
Sobrance	3.4	Beroun	2.3
Krupina	4.0	Praha	2.6
Highest Slovak Republic		**Highest Czech Republic**	
Košice	10	Jeseník	8.1
Humenné	10.7	Bruntál	8.2
Prievidza	10.8	Žďár nad Sázavou	8.7
Považská Bystrica	11.3	Sokolov	9.3
Ilava	12.6	Karviná	9.4
average SR	**7.5**	**average CR**	**5.4**

Tab. 3: Extreme attributes of the dynamic economic ageing index
Source: Statistical Office of SR (1997, 2010), Czech Statistical Office (1997, 2010b)

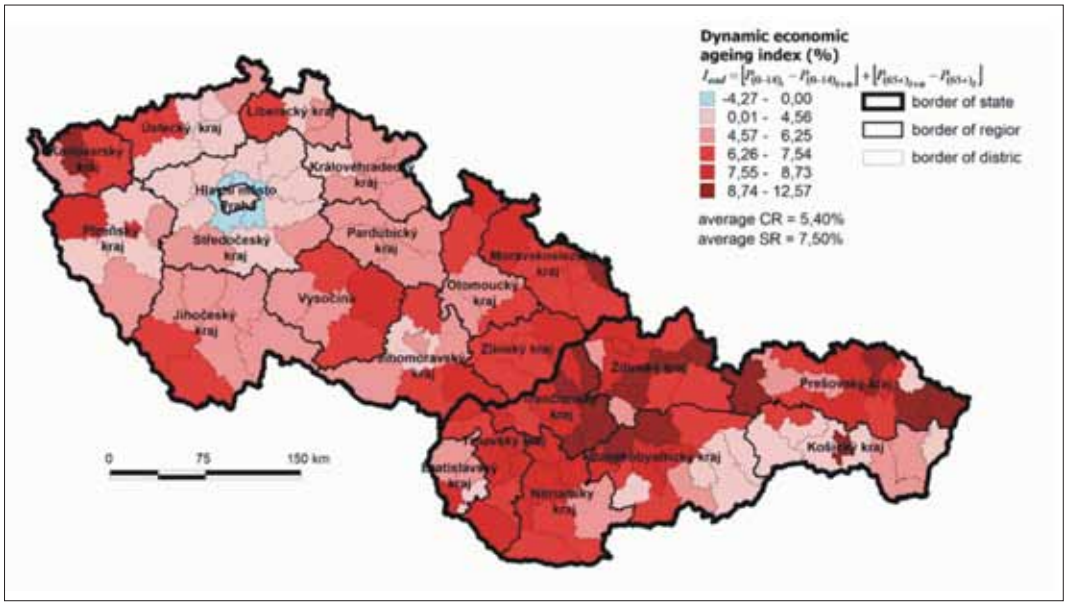

Fig. 7: Dynamic economic ageing index in Czech Republic and Slovak Republic in years 1996–2009
Source: Statistical Office of SR (1997, 2010), Czech Statistical Office (1997, 2010b)

In order to simplify the information on both populations at the regional level (Fig. 8), a simple combination of the index of ageing and the dynamic economic ageing index was chosen. Their respective values in the districts were compared with the average figures of both indicators, determined as the average of both populations (Czech Republic and Slovak Republic). This resulted in the identification of 6 types of regional populations (according to Długosz, Kurek, 2006).

In general, it can be stated that the Czech Republic has more districts with older populations, while in Slovakia, there is a larger number of more youthful age districts. A population ageing index with a below-average index of ageing can be observed in the Czech Republic in the north-western border, this is a result of past migration trends from Bohemia and Slovakia. The incoming immigrants had a higher fertility level, which was then maintained in subsequent generations (Bartoňová, 1999). Districts in the Czech Republic mainly age at a slower rate, while the Moravian and Silesian districts are characterized by higher values of the dynamic index of ageing. The positive impact of the capital city Praha means that the districts of Praha – both západ and východ – have a unique position with their younger age structure and a trend towards rejuvenation. A similar effect can be observed in the suburban area of Bratislava, where

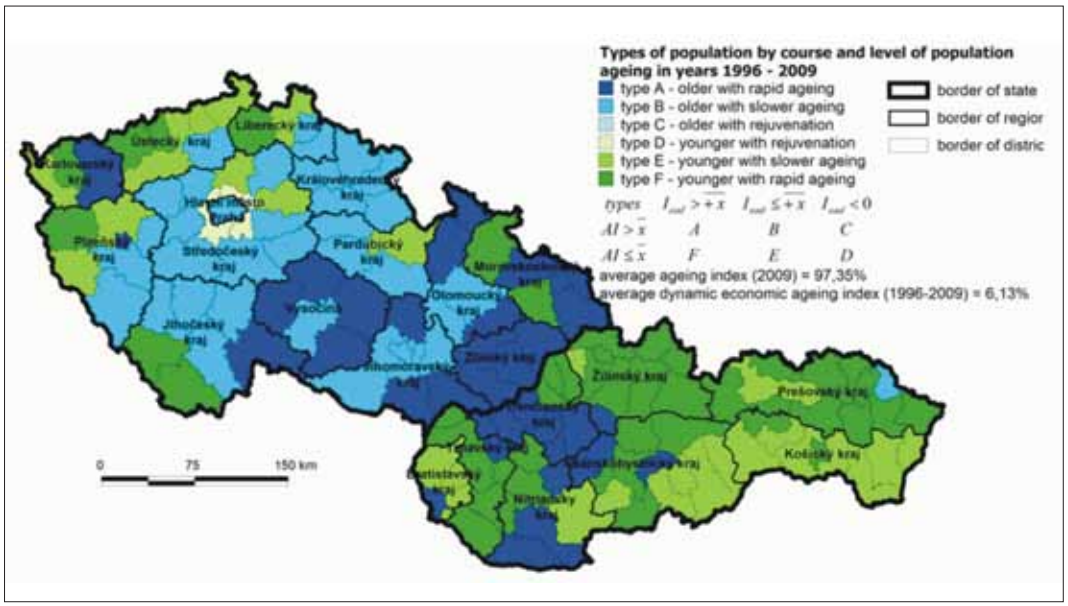

Fig. 8: Types of districts of Czech Republic and Slovak Republic according to population ageing in years 1996–2009
Source: Statistical Office of SR (1997, 2010), Czech Statistical Office (1997, 2010b)

the population is ageing as well, but at a slower rate. A lower dynamic ageing index is also characteristic of south-eastern districts of Slovakia. In contrast, most districts of the Slovak Republic demonstrate higher values of the dynamic ageing index. The exceptions are districts in the Trenčín region with an above-average index of ageing.

5. Conclusion

In order to explore the processes involved in the population ageing intensively, a number of methods and techniques have been used. The new ones include an attempt to compare the number and proportion of major age categories. Some of them compare the pre-reproductive and post-reproductive categories of population and thus provide the knowledge about the development of the reproduction environment with respect to the exchange of generations. A set of indicators compares the productive population groups and provides information about the growing category of young age groups, as well as changes in the numbers of older age groups (retired persons). Mutual relations of these population ages introduce irreplaceable knowledge for the whole economic sphere. The quantitative relationship of "parents" and their "children" is important for the social welfare (security). Especially for the older age population groups such comparisons provide some idea of intergenerational support or care.

The comparison of ageing indicators in the CR and SR shows an exceptionally high degree of similarity. If the processes of population ageing such as changes of age structure are to be assessed comprehensively, then their similarity has to be sought in similar population and social processes in the CR and SR. The historical development of the reproductive population, in particular, showed the significant effects of the First World War, the economic crisis in the 1930s, and the effects of the Second World War (mainly post-war increase in fertility). A uniform population and family policy in the former Czechoslovakia (prenatal measures in the 1970s, social transformation in the early 1990s) influenced demographic behaviour too. Surprising may be also the similarity of population development forecasts, which reflect a certain inertia of future developmental trends.

In addition to the similarity of development processes of ageing we can also observe certain differences between the CR and SR. Each population has its own individual demographic behaviour, which reflects their distinctive historical, cultural and political conditions. The ageing of the population in the CR started earlier than in Slovakia, and the process is more intense. This can be observed on the basis of the development of the ageing index and the development of the Billeter´s indexes (Fig. 1).

The same results are demonstrated by the used indicators of generation substitutions, too. The indexes of potential economic support show the same geographical differences. In 1996, the level of this indicator was comparable in both countries, about 13 ears later there were significant differences. The level of potential economic support in the CR has clearly decreased, while in many districts of Slovakia it has slightly increased.

Regional differences in population ageing are also the result of long-term migration trends, especially the young population's migration to urban areas (urbanization). It is mainly caused by the concentration of employment opportunities at places of many economic activities. However, the opposite directions of migration occur as well, especially the population of large cities often moves into rural villages (suburbanisation).

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References:

ANDRLE, A., SRB, V. (1983): Současné procesy populačního vývoje ČSSR a jejich význam pro geografii. Geografický časopis, Vol. 35, No. 1, p. 32–47.

BARTOŇOVÁ, D. (1999): Vývoj regionální diferenciace věkové struktury se zřetelem k územním rozdílům ve vývoji reprodukce v České republice. Geografie-Sborník ČGS. Vol. 104, No. 1, p. 13–23.

BILLETER, E. P. (1954): Eine Masszahl zur Beurteilung der Altersverteilung einer Bevölkerung. Schweizerische Zeitschrift für Volkswirtschaft und Statistik, No. 90, p. 496–505.

BLEHA, B., VAŇO, B. (2007): Prognóza vývoja obyvateľstva SR do roku 2025 (aktualizácia). Infostat, Bratislava, 57 pp.

ČSÚ [CZECH STATISTICAL OFFICE] (2009): Projekce obyvatelstva České republiky do roku 2025. Praha.

ČSÚ [CZECH STATISTICAL OFFICE] (1997): Věkové složení obyvatelstva v roce 1996. Praha.

ČSÚ [CZECH STATISTICAL OFFICE] (2010a): Demografická příručka 2009. Praha.

ČSÚ [CZECH STATISTICAL OFFICE] (2010b): Věkové složení obyvatelstva v roce 2009. Praha.

DŁUGOSZ, Z., KUREK, S. (2006): Demographic ageing in European union countries. In: Komornicki, T., Czapiewski, K. Ł. [eds.]: Europe XXI – Regional Periphery in Central and Eastern Europe. IGiPZ PAN, Warszawa, p. 185–197.

DŁUGOSZ, Z., KUREK, S. (2009): Population ageing and its predictions for 2030 in the Małopolskie voivodship compared to Poland and Europe. Moravian Geographical Reports, Vol. 17, No. 1., p. 2–18.

DZÚROVÁ, D. (2001): Demografické starnutí v Českej republice. In: Hampl M. et al.: Regionální vývoj: specifika české transformace, evropská integrace a obecná teorie. Karlova Univerzita, Praha, p. 75–86.

FIALOVÁ, L. (1991): Obyvatelstvo podle věku a rodinného stavu v Československu po roce 1945. Demografie, Vol. 33, No. 2, p. 114–119.

HRUBÝ, J. (1996): Základy demografie. Acta operativo-economica, Nitra, 103 pp.

KÁČEROVÁ, M. (2009): Časový a priestorový aspekt poznávania procesu populačného starnutia obyvateľstva Slovenska. Dizertačná práca. Archív Prírodovedeckej fakulty UK v Bratislave.

KÁČEROVÁ, M., BLEHA, B. (2007): Teoretické východiská populačného starnutia a retrospektívny pohľad na starnutie Európy. Slovenská statistika a demografia, Vol. 17, No. 3, p. 43–61.

KUČERA, M. (1968): Populační politika Československa. Demografie, Vol. 10, No. 4, p. 307–317.

LUTZ, W. (2006): Population ageing and future human capital: Europe and Asia in comparative perspective. Conference: The impact of ageing: A common Challenge for Europe and Asia, 26 pp.

MICHÁLEK, A. (1995): Zmeny vekovej štruktúry obyvateľstva na mezoregionálnej a mikroregionálnej úrovni. Slovenská štatistika a demografia, Vol. 5, No. 3, p. 17–27.

MLÁDEK, J., KUSENDOVÁ, D., MARENČÁKOVÁ, J., PODOLÁK, P., VAŇO, B. (2006): Demogeografická analýza Slovenska. Univerzita Komenského, Bratislava, 222 pp.

MLÁDEK, J. (2004): Časové a priestorové aspekty procesu starnutia obyvateľstva Slovenska. In: Rolková, N. [ed.]: Desaťročie Slovenskej republiky. Matica slovenská, Martin, p. 311–322.

MLÁDEK, J., KÁČEROVÁ, M. (2008): Analysis of Population Ageing in Slovakia: Time and Regional Dimensions. Geografický časopis, Vol. 60, No. 2, p. 179–197.

ONDAČKOVÁ, J. (2011): Populačné starnutie obyvateľstva Českej republiky: diplomová práca. Univerzita Komenského, Bratislava. 93 p.

PAVLÍK, Z., RYCHTAŘÍKOVÁ, J., ŠUBRTOVÁ, A. (1986): Základy demografie. Československé akademie věd, Praha, 736 pp.

PAVLÍKOVÁ, S., MLÁDEK, J. (1999): Aplikácia vybraných metód štúdia starnutia obyvateľstva Slovenska. In: Demografické, zdravotné a sociálno-ekonomické aspekty úmrtnosti. 7. demografická konferencia. Slovenská štatistická a demografická spoločnosť, Bratislava, p. 114–125.

PAVLÍKOVÁ, S., MLÁDEK, J. (2001): Starnutie obyvateľstva Európy. In: Geografické aspekty středoevreopského prostoru. Předpoklady vstupu ČR a SR do Evropské unie. Geografie 22, Masarykova univerzita, Brno, p. 148–151.

PUKAČOVÁ, J., MLÁDEK, J. (2012): Mladé vekové štruktúry Rómov na Slovensku. Acta Geographica Universitatis Comenianae Bratislava, Vol. 56, No. 1. (in print).

QIAO, X. (1988): Population ageing model and its explanation. Population Research, Vol. 5, No. 2, p. 10–17.

RABUŠIC, L. (2001): Kde ty všechny děti jsou? Porodnost v sociologické perspektivě. Sociologické nakladatelství, Praha.

ROUBÍČEK, V. (1997): Úvod do demografie. Codex Bohemia, Praha, 348 pp.

SAUVY, A. (1948): Social and Economic Consequences of the Ageing of Western European Population. Population Studies, Vol. 2, No. 1. [cit. 05.02.2008]. Avaible at URL: <http://links.jstor.org/sici?sici=00324728%28194806%292%3A1%3C115%3ASAECOT%3E2.0.CO%3B2-X>.

SRB, V. (2004): 1 000 let obyvatelstva českých zemí. Karolinum, Praha.

ŠTATISTICKÝ ÚRAD SR [Statistical Office of SR] (1946–2010): Vekové zloženie obyvateľstva Slovenskej republiky 1945–2009]. Bratislava.

ŠTATISTICKÝ ÚRAD SR [Statistical Office of SR] (1997): Vekové zloženie obyvateľstva SR 1996. Bratislava.

ŠTATISTICKÝ ÚRAD SR [Statistical Office of SR] (2006): Vekové zloženie obyvateľstva SR 1921–1980. Bratislava.

ŠTATISTICKÝ ÚRAD SR [Statistical Office of SR] (2010): Vekové zloženie obyvateľstva SR 2009. Bratislava.

VEREŠÍK, J. (1974): Štruktúra obyvateľstva. In: Slovensko – Ľud I. Obzor, Bratislava, p. 372–382.

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SPATIAL PATTERNS OF DAILY AND NON-DAILY COMMUTING FOR RETAIL SHOPPING: THE CASE OF THE BRNO CITY, CZECH REPUBLIC

Josef KUNC, Bohumil FRANTÁL, Petr TONEV, Zdeněk SZCZYRBA

Abstract

Retailing has become a significant driver of changes in the urban environment and one of the key setters of consumption rhythms in the Czech Republic after 1989. Commuting for retail shopping represents a significant part of daily mobility of inhabitants within the city. Weekend and irregular (specialized) shopping in shopping centers at the city periphery has grown in importance recently. The inner city is not a primary destination when buying foodstuffs anymore and it has been losing its position even in shopping for other than foodstuffs goods. A survey implemented within the inner Brno City has provided a view into the spatial patterns of urban shopping behavior and analyzed shopping places of local inhabitants. The paper presents and discusses selected results of the survey.

Shrnutí

Prostorové modely denní a nedenní dojížďky za maloobchodem: příklad města Brna

Maloobchod se po roce 1989 stal v České republice významným hybatelem změn v urbánním prostředí a jedním z klíčových rytmizátorů spotřeby. Dojížďka za maloobchodem tvoří významnou součást denních pohybů obyvatel v rámci města. V posledních letech ovšem získávají stále silnější postavení víkendové a nepravidelné (specializované) nákupy v nákupních centrech na městské periferii. Centrum města již není primárním cílem při nákupu potravin a pozici ztrácí také pro nákupy nepotravinářského zboží. Šetření v rámci vnitřního Brna umožnilo nahlédnout do nákupních zvyklostí a konfrontovat místa realizace nákupů místních obyvatel. Příspěvek přináší vybrané výsledky šetření a diskusní komentáře.

Key words: *commuting for retail shopping, retail gravitation, shopping centers, Brno, Czech Republic*

1. Introduction

The Czech society, which had demonstrated signs of cultural and economic isolation before 1989, has been cast into the globalization context and has started to cope with its consequences (Mlčoch et al., 2000; Frič, Potůček, 2004 and others). Before 1989, the shopping behavior of the Czech population had been determined by directives of the centrally controlled socialist economy in the field of internal commerce, which obligatorily specified the locations of consumption including the spectrum of goods to be sold.

The socialist retail trade showed many contradictions (concerning the assortment of goods, spatial distribution etc.) in comparison to the Western European retail trade model (Drtina, Krásný, 1989). The lack of space for shopping, in comparison with market economies in Western Europe, was a prominent issue in the previous Czech (Czechoslovak respectively) Republic, according to Krásný (1990).

The Czech society very quickly adapted to innovations in the field of retail trade and decisively changed its shopping habits. The first large-area stores of foreign retail chains started to appear in the country with a huge wave of privatization and liberalization of the economic environment in the first half of the 1990s (Szczyrba, 2005; Kunc et al., 2012). This *first initial phase* of the consumer behavior transformation was based on the development of new supermarket networks that were built both on the green-fields at locations with the absent retail supply and on the premises of the former socialist food stores according to their own operating requirements. The *initial stage* of the foreign retail chain penetration into these markets was rather wary and the growing expansion and related transformation of shopping customs can be observed only later (Dicken, 2003). In this context, the *second stage* (the second half of the 1990s) of the retail shopping transformation was characterized by even more intensive development of additional

large-scale store formats, first in the form of discount stores and later by the "hypermarket boom". This was followed by a quick increase in the popularity of shopping in these modern large-scale stores. Retail trade is not as sophisticated a field as manufacturing and research (especially in terms of requirements put on the labour force), which resulted in a relatively rapid opening of new stores all over the residential system (Viturka et al., 1998).

It is quite apparent that contemporary shopping is a much more complicated and multidimensional phenomenon than in the previous period (in comparison to former models of shopping behavior assuming that the direction of commuting is determined just by two dominant factors: distance and price), and especially when related to the Czech environment (concerning the extent of shopping areas and a supply of goods and related services), where any changes were performed much more forcefully than in the market-economy countries. The spectrum of changes is relatively wide (see below), for example the frequency of shopping, which, besides other things, determines the basic rhythm of the daily urban system (e.g. Berry, 1967; Bezák, 2000).

It is the aim of this paper, which is based on the results of a wide questionnaire survey with inhabitants of the Brno City, to analyze spatial shopping mobility (retail gravitation) and evaluate selected characteristics of behavior among the inhabitants of this regional metropolis. We focus on both the daily and non-daily (irregular) commuting for retail shopping while comparing the shopping for daily needs and irregular visits especially to shopping centers both at the edge of the city and in the inner city.

2. Theoretical background

The shopping behavior and the related spatial mobility are functions of both the personal characteristics of shoppers (decision-makers) and conditions of the surrounding environment (decision-making environment) (Lentnek et al., 1976). People living in a same environment may behave differently within the environment for many reasons. These can be individual needs and motivations, different information about the conditions of the environment (supply range and quality) or factors consisting in so-called spatio-temporal constraints – mostly financial possibilities and spatial mobility (Lloyd, Jennings, 1978).

For many decades before 1989, the shopping behavior of the Czech population was determined by directives of the centrally controlled socialist economy in the field of internal commerce, which, besides other things, obligatorily specified the locations of consumption including a spectrum of goods to be sold. The localization of retail shops did not reflect the distribution of demand with the purchasing power, which resulted in the overloading of most inner cities while the building of new shopping centers in the newly constructed housing developments was rather inadequate (Szczyrba, 2005).

Their locations in cities were economically irrelevant and therefore even the cities lacked any incentives for investments in shopping center constructions (Musil, 2001). No significant change was brought about even by the increased intensity of building new department stores during the 1970s and 1980s, which was aimed at eliminating the growing dissatisfaction of the population with the range and quality of the commercial supply. This rather joyless state of affairs was often in a sharp contrast with sometimes rather unreasonable construction of retail shopping capacities in rural areas while maintaining generally below-average investment levels in the development of retail shopping as compared with the West European countries. Stressing of these social principles reached in the then Czechoslovakia the highest level from the Central European group of socialist countries (Krásný, 1990).

Globalization trends of retail shopping belong among the most visible features of the socioeconomic transformation of the Czech society after 1989 (Cimler, 2001; Szczyrba et al., 2006; Starzycná, 2010). The new dimension of large shops and shopping centers of multinational chains not only pushed the former traditional forms of retail shopping out of the shoppers' attention but it also significantly altered the cultural customs and patterns of shopping-related behavior in several generations (for similar topics see also Szczyrba, 2005; Starzycná, et al., 2010; Kunc et al., 2012a; Spilková, 2012). A visit to a shopping center has become an attraction, entertainment and a form of leisure time activity for young people but also for seniors. The environment of shopping malls provides people not only with opportunities for satisfying their shopping needs but it also gives them a space for satisfying their aesthetic (visual) and social needs (to be in the center of events, meet other people, show their social status or just stroll around and watch life passing by – see Bauman, 1996).

A new concept of shopping has appeared in the course of time, characterized by a combination of basic shopping functions and shopping place attributes ranging from non-commercial to recreational; this situation has become similar to the situation in other countries (Butler, 1991; Dallen, 2005; Bäckström, 2006). Also Guy (1998) emphasizes, within his classification of

consumer behavior, the so-called leisure shopping as a significant form of the currently widely understood process of shopping. Shopping centers, especially when located in inner cities (inner-city-developments) increase their recreational potential and establish a new dimension of city tourism industry in the post-industrial stage of city development (Clark et al., 2003; Kowalczyk, 2005).

In the context of the above-stated facts it is quite apparent that irregular and weekend activities of various population groups in shopping centers and hypermarkets increasingly grow in importance and, in contrast to the daily commuting for shopping, the purchasing of goods is often not a primary purpose to visit a shopping center (especially during weekends) (Mitríková, 2008). We are witnesses of an increasing share of non-daily commuting for retail shopping or services in general, which is caused by the operation of shopping centers and other large retail stores at city peripheries (so-called out-of-town centers). The fact increasingly participates in the decentralization of retail functions within the urban structure and in the origination of a polycentric arrangement of cities (Heineberg, 2006; Knox, Pinch, 2009). Retail shopping has become a significant driver of changes within urban structures at the time of globalization and it is one of the key setters of consumption rhythms in the cities (Mulíček et al., 2010).

Cities have always played a role of natural centers for the shopping tourism industry due to their commercial function; yet until recently, this role was exclusively based on central locations offering their customer-tourists a wide spectrum of specialized retail shops. The post-industrial stage of urban development has witnessed their spatial-functional transformation and origination of new inner cities, though (Matlovič, 2000; Sýkora, 2001; Węcławowicz, 2003). It is necessary to note that shopping centers were one of the causes of this transformation since they changed the previous concept of mono-centric functional arrangement of cities (Brown, 1992; Guy, 1994; England, 2000; Dallen, 2005; Bäckström, 2006 and many others).

Shopping in retail shops is one of basic repeated spatio-temporal human activities and therefore it is a popular study object for Time Geography (e.g. Miller, O´Kelly, 1983; Scott, He, 2012). It can be understood as a frequent commuting for retail shopping where you study movements of people into shopping places that stimulate the demand of consumers for shopping and consuming of additional services. The extent and direction of commuting are ranked according to the type and location of retailing units within an urban structure, i.e. they depend on an arrangement of the retail-shop network in tiers, which correlates with the hierarchy of satisfying the population's needs for goods of daily, frequent and casual demand (Szczyrba, 2006).

Research works studying the retail gravity models (especially concerning shopping centers) are rather frequent research tasks. They focus on the reason of the functioning of shopping centers or availability of retail facilities in the inner city. The authors mostly strive to describe, at specific examples, a shopping behavior model for the given population with respect to the selection of locations for their shopping (Timmermans et al., 1982; Coshall, 1985; Bacon, 1995; Marjanen, 1995; Findlay et al., 2001; McEachern, Warnaby, 2006; Jackson et al., 2011). Several studies of German authors dealing with the detailed evaluation of retail gravity model and shopping behavior of consumers (Kulke, 1992) or analyzing the functioning of shopping centers in the regions of the former East Germany (Jürgens, 1994) are also interesting and rather pertaining to the Czech environment.

Czech geographers have focused on typical large-area retail markets and newly-built shopping centers with the aim of evaluating geographical and sociological aspects of the shopping centers' retail gravity, consumers' shopping behavior changes and their development in time (Smolová, Szczyrba, 2000; Spilková, 2003; Ordeltová and Szczyrba, 2006; Mulíček, 2007; Kunc et al., 2012a) and also the environmental impacts on the land (Koželouh, 2010). Szczyrba (2005) is the author of the first work containing a case study supported with a questionnaire survey focused on the development and transformation of the retailing network while taking into account the retail shopping behavior of the population. For information about the subsequent development both in Czech and foreign retailing networks with a focus on shopping centers see Spilková (2012a).

3. Research methodology

3.1 Data collection

An absolute majority of empirical studies quoted in the theoretical discussion are methodically based on questionnaire surveys as the most widespread quantitative research method (Flowerdew, Martin, 2005). The most common research strategy of acquiring data when studying retail gravity within large retail units is a method of interviewing respondents directly in hypermarkets and shopping centers or in their surroundings (usually at parking lots) where people are asked questions on retail gravitation issues, place preferences of shopping, shopping frequency, behavioral intentions and their motivations, etc.

It is also possible to use questionnaires filled with the respondents directly in their households or places of residence. This method is nevertheless time consuming and limited by small space coverage (this approach is used for surveys conducted in a single town or municipality). A different strategy was applied e.g. by Maryáš (1983) who, due to the large size of the studied territory (whole Czech Republic), used a method of questioning mayors of municipalities - their answers were supposed to substitute for the otherwise unavailable data from individuals living in the municipality.

Despite the time consumption, we selected the second above-described method for the purpose of our research, i.e. questioning at the places of residence. The questionnaire survey was performed by means of standardized structured interviews conducted by trained questioners (students of Masaryk University in Brno) during autumn 2011 and spring 2012.

3.2 Study area and the sample of respondents

The survey was realized in Brno, the second largest city in the Czech Republic (with approximately 379,000 inhabitants as of January 1, 2012). For the purpose of sampling of respondents and further analysis of data, the study area was subdivided into urban districts, which were grouped into relatively homogeneous units according to their morphogenetic similarities within the city structure (location within the city with respect to the historic center, type of development, etc. (cf. Mulíček, 2007) – see Fig. 1. These units can be identified with the cadastral districts of Brno, which can be further identified with the municipal districts for the sake of simplification. Relevant data analyses and interpretations were subsequently performed at this spatial level.

The sample included 1,600 respondents older than 15 years with permanent residence in Brno. The structure of the respondents sample is based on a two-stage quota sampling. At the first stage, we determined the numbers of respondents within the individual aggregated urban districts relative to their total populations; the number of respondents ranged from 15 to 100 according to the size of the urban district (the populations varied from 335 (minimum) to more than 25,000 (maximum), the average being 8,000). The second stage featured the selection of respondents

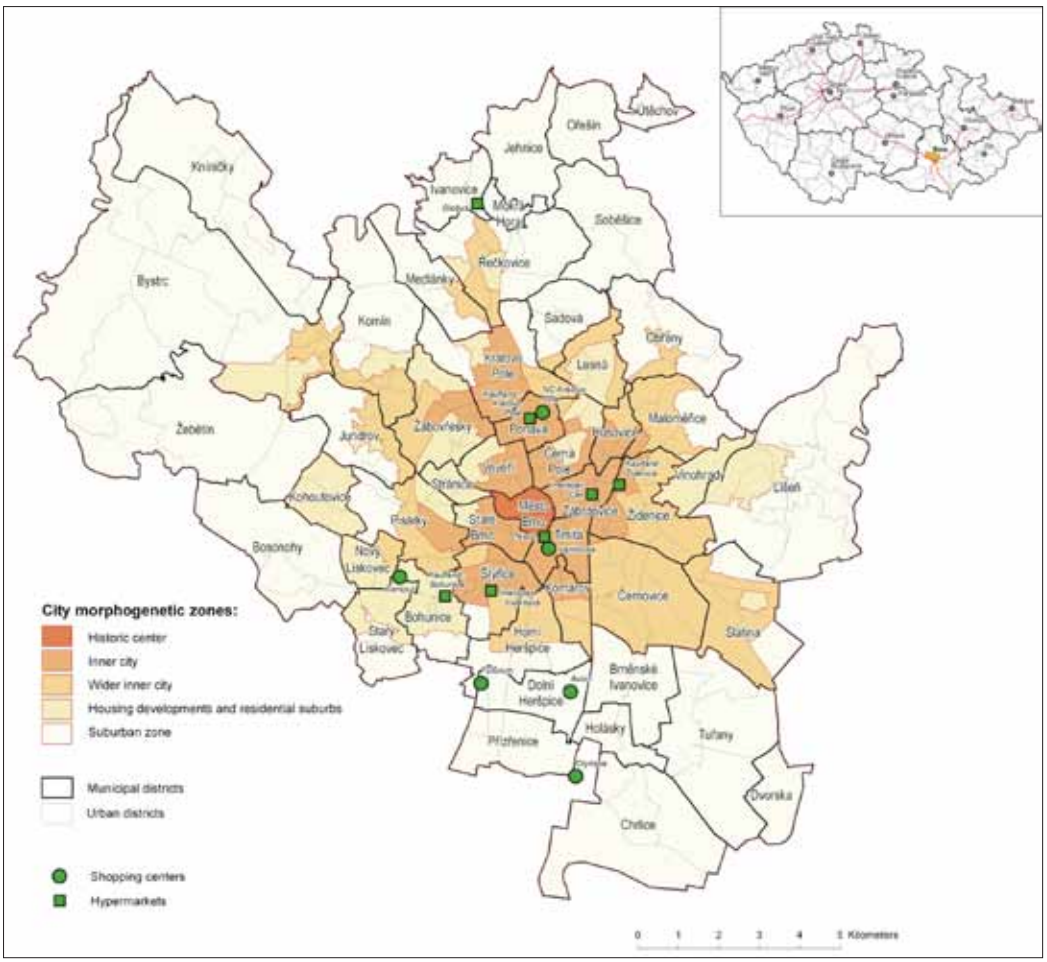

Fig. 1: Area under study: Brno City and its location within the Czech Republic, its internal structure and main shopping centers. Source: Authors

based on a quota sampling according to basic demographic characteristics (gender, age, education) to simulate a general structure of the Brno population. Intentionally, we reduced the representation of the youngest and the oldest age categories in the sample as compared to general population while the representation of the middle age categories with the biggest purchasing power in relation to shopping is relatively more frequent (Tab. 1).

3.3 Research questions and hypotheses

We used a questionnaire form similar to other research works conducted in this field of study (Kulke, 1992; Marjanen, 1995; Findlay et al., 2001; Szczyrba, 2002; Jackson et al., 2011, Kunc et al., 2012a and others). Basic questions of the questionnaire, relevant to this paper, were focused on the places of shopping and retail gravitation and they were divided into the categories of "daily shopping, weekend/weekly shopping and specialized/irregular shopping", means of transportation, time distance and shopping frequency.

We also asked the respondents whether they were missing any specific type of a shop in the city and about their perception of changes in the structure and supply of retail shopping within the past years. The last section of the questionnaire was focused on their visits to the shopping centers in Brno; here we asked about the motivational factors for shopping in the shopping centers, means of transport, average time spent in the inner city and average spending in the shopping centers. The mentioned issues were analyzed in relation to the respondents´ socio-demographic characteristics (gender, age, education, number of household members), their place of residence and place of work.

The hypotheses that drive this survey were defined as follows:

- Large shopping centers and hypermarkets significantly dominate over smaller retailing units from the viewpoint of a share in the realized shopping volume;
- Retail gravitation and shopping patterns of people are significantly influenced by their socio-demographic (age, education) and socioeconomic (economic activity, income) characteristics; and
- The expanding network of retail shops in the post-socialist cities (represented by the Brno City) and the development of supplies during the past few years are perceived by inhabitants as significantly positive.

Data obtained from the questionnaires were digitized and analyzed via the SPSS software using descriptive statistics and the correlation analysis. Selected data were subsequently spatially analyzed and visualized in the GIS environment. Selected results of the analyses are presented in the form of tables and cartographic outputs hereinafter.

With regard to the research methodology, we are aware of certain limits concerning the interpretation of the obtained results, which are burdened with a certain level of generalization (limited number of respondents in municipal districts with few inhabitants) and at the same time reflecting spatial and transportation specifics of the model territory, i.e. the City of Brno. This survey cannot be considered a representative image of the whole Czech population with regard to the sample selection, yet the obtained results have an important informative and predictive value and can be used to infer some general conclusions. The value of the results has to be considered also from the viewpoint of the acute lack of other "hard data" in this field of retail research.

Categories		Survey sample [%]	Brno population [%]
Gender	Male	42	48
	Female	58	52
Age	0–15	Not included	14
	15–19	2	4
	20–29	27	13
	30–49	45	30
	50–59	14	13
	60 and more	12	25
Education	Basic	5	18
	Secondary without GCE	20	30
	Secondary with GCE	45	34
	Tertiary	30	18

Tab. 1: Structure of the sample of respondents

4. Results

Shopping frequency can be simply divided into three basic types: daily shopping, weekly (weekend) shopping and irregular (specialized shopping). Food products and small-volume articles for individual needs prevail in regular daily shopping. Weekend or weekly shopping is focused on food and general merchandise (drugstore goods, household articles, etc.) in larger volumes. Irregular shopping includes a wide assortment of consumer goods mostly of non-food character, such as footgear, electronics, furniture, kitchen ware, toys, books, etc. This is just an introductory division, for more detailed description see below.

According to the three above-specified frequency types of shopping it is possible to divide the retail gravitation of the Brno inhabitants into five different spatial locations:

- In the place of residence and its surroundings (this area is delimited by the border of the specific municipal district);
- In the Brno inner city (includes the historic core and the area in the vicinity of the railway station where you can find the Tesco department store and the Galerie Vaňkovka shopping center);
- In the shopping centers at the edge of Brno (includes the following shopping centers: Globus, Olympia, Avion Shopping Park, Futurum and Campus Square);
- Somewhere else in Brno (areas with retailing units, except for the three above-mentioned locations); and
- Somewhere else outside Brno (areas beyond the administrative border of the city).

As shown in Figs. 2 and 3, daily shopping is done mostly (68%) at the place of residence and its surroundings as expected. Specifically in Brno, these are town districts with large numbers of inhabitants and good retailing facilities – Královo Pole, Veveří, Žabovřesky, Židenice, Pisárky and large housing development complexes such as Bystrc, Bohunice, Starý Lískovec, Nový Lískovec, Lesná, Líšeň and Slatina and also suburbs with small numbers of inhabitants, such as Tuřany, Chrlice and Žebětín, where local people prefer small shops and self-service shops. In the inner city of Brno, foodstuffs are mostly purchased by people living in the inner city itself and in the adjacent town districts: Trnitá, Komárov and Stránice but also by people from distant peripheries, such as Ivanovice and Dvorska. In these cases, the place of shopping is linked to the place of work. Shopping centers are preferred for daily shopping only by inhabitants of northern suburbs Mokrá Hora, Útěchov, Ořešín and Ivanovice (the influence of the Globus hypermarket, which can be considered a shopping mall due to its size and many small outlets in the shopping arcade under a single roof) and southern suburbs Dolní Heršpice, Horní Heršpice, Přízřenice and Holásky with a strong attraction of three shopping centers Futurum, Avion Shopping Park and Olympia. Inhabitants of the other municipal districts do their daily shopping in other municipal districts rather than in their places of residence. For the location of individual municipal districts, shopping centers and hypermarkets see Fig. 5.

Places of weekly (weekend) shopping within the area of inner Brno are much more balanced (Fig. 4). The most significant part of the inhabitants (37%) rather surprisingly do their shopping (similarly as their daily shopping) at places of their residence and their surroundings. The fact demonstrates that inhabitants of many municipal districts use the ever wider supply of various types of retailing concepts (self-service shops, supermarkets, hypermarkets, discount stores,

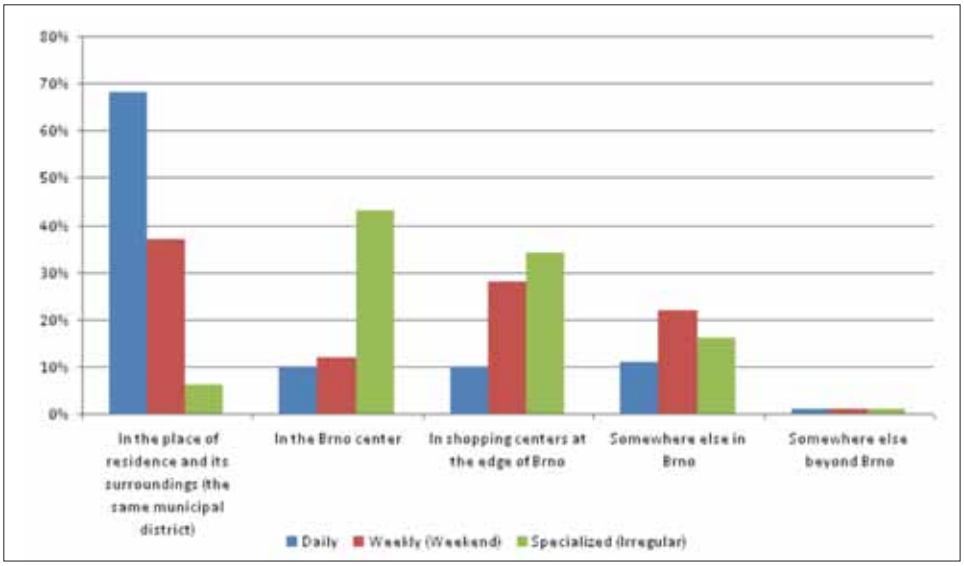

Fig. 2: Place of shopping according to the three basic frequency types of shopping. Source: Authors´ research

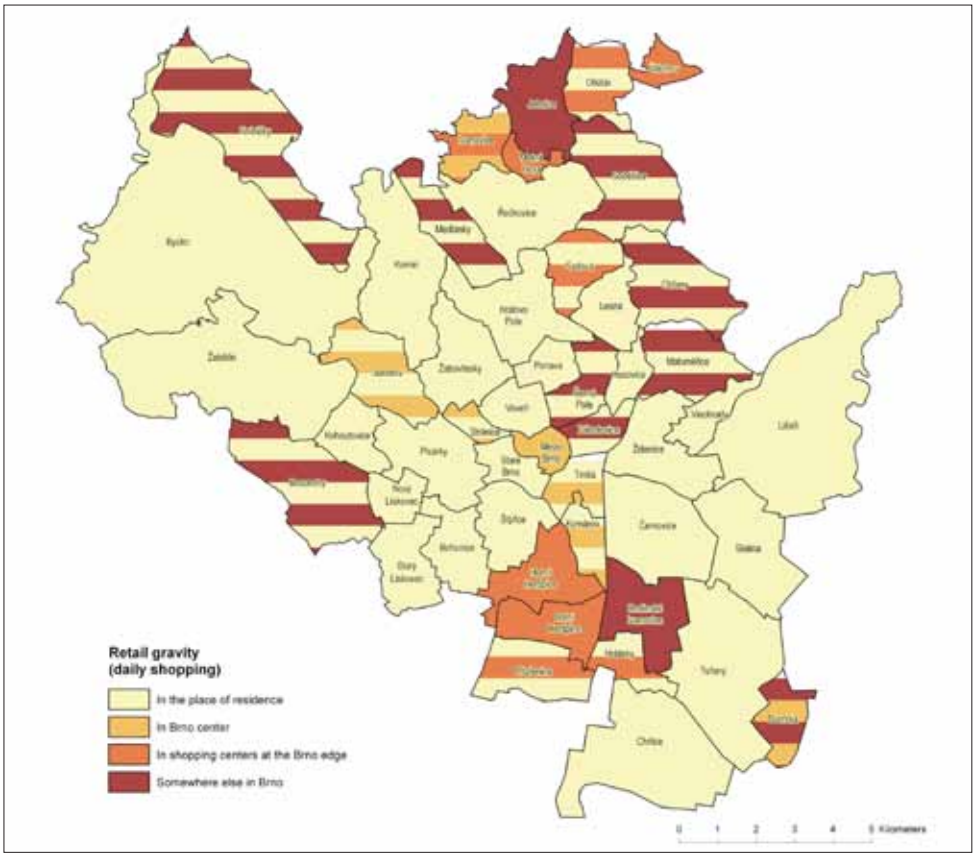

Fig. 3: Places of daily shopping in the individual town districts, related to the respondents' places of residence
Source: Authors´ research

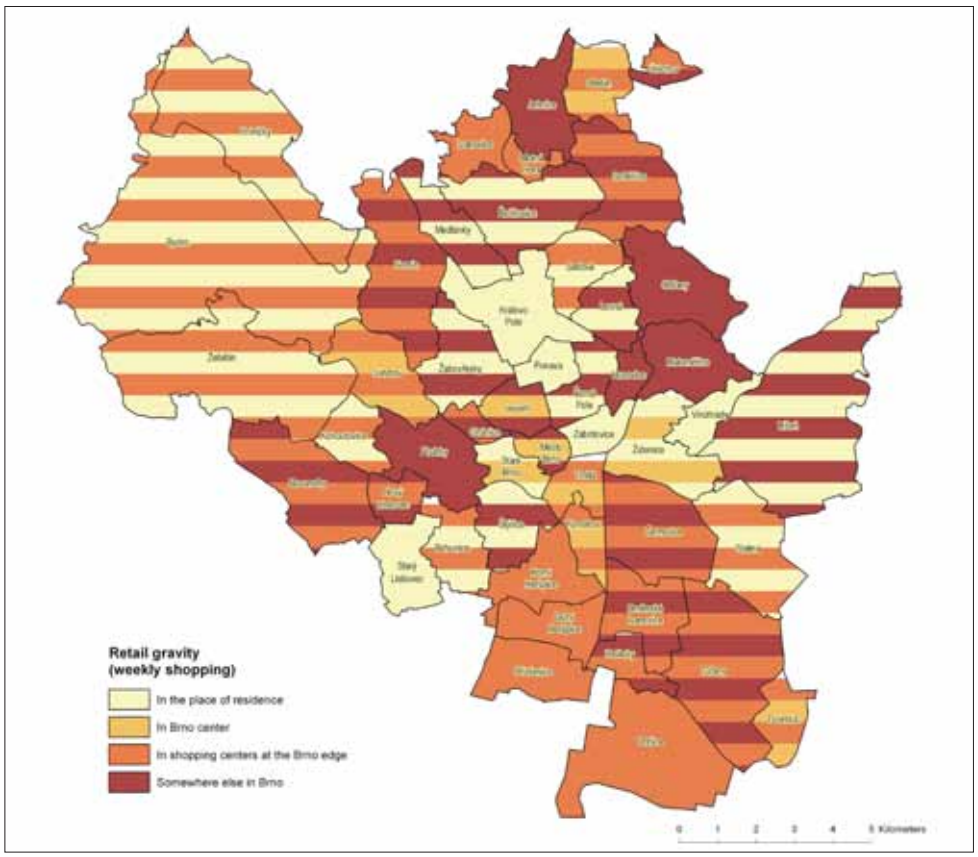

Fig. 4: Places of weekly shopping in the individual town districts, related to the respondents' places of residence
Source: Authors´ research

etc.) located close to their places of residence for larger and regular shopping. Yet here you can see the growing importance of the shopping centers at the edge of the city (28%).

Weekly shopping at the place of residence and its surroundings is preferred especially by the inhabitants of the municipal districts of Královo Pole, Ponava (here you can see also the impact of the Královo Pole shopping center in this municipal district), Zábrdovice (high-density housing development and very good retailing facilities), and housing developments in Starý Lískovec and Vinohrady (also a sufficient concentration of shops). Weekly shopping in shopping centers is typical of the northern (Ivanovice, Mokrá Hora) and southern suburbs (Horní Heršpice, Dolní Heršpice, Přízřenice and Chrlice), where the above-described shopping centers represent very attractive shopping islands (much more distinctive than in the case of daily shopping).

Weekly shopping outside their place of residence is a choice of inhabitants in municipal districts located especially in the eastern part of the city (Obřany, Maloměřice and Husovice) without any shopping centers or hypermarkets. With a slight overstatement we could speak about a retail-undersized eastern part of Brno. Similar replies were provided also by the respondents from the northern and rather sparsely populated suburb of Jehnice and central Pisárky, where no large-area markets exist either but these municipal districts have very good transport connections to the surrounding districts with better facilities. The inner city is not a preferred location for weekly shopping gravitation.

The inner city (43%) and shopping centers at the city outskirts (34%) are preferred locations for specialized and irregular shopping. Considering the popularity of shopping centers in recent years and their "ability" to wipe out small shops in the inner city, a reversed order might be expected in this specialized shopping. This could be the result of the attraction of the very popular shopping center Galerie Vaňkovka and the Tesco department store (Tesco hypermarket), which, owing to their locations and accessibility belong to the inner city.

For the gravitation of individual town districts, or rather inhabitants living in them, to the shopping centers and hypermarkets see Fig. 5. Similarly to the previous figures (daily and weekly shopping), it also depicts the most frequently represented shopping directions. The northern part of the city is governed by the Globus hypermarket and by the shopping center of Královo

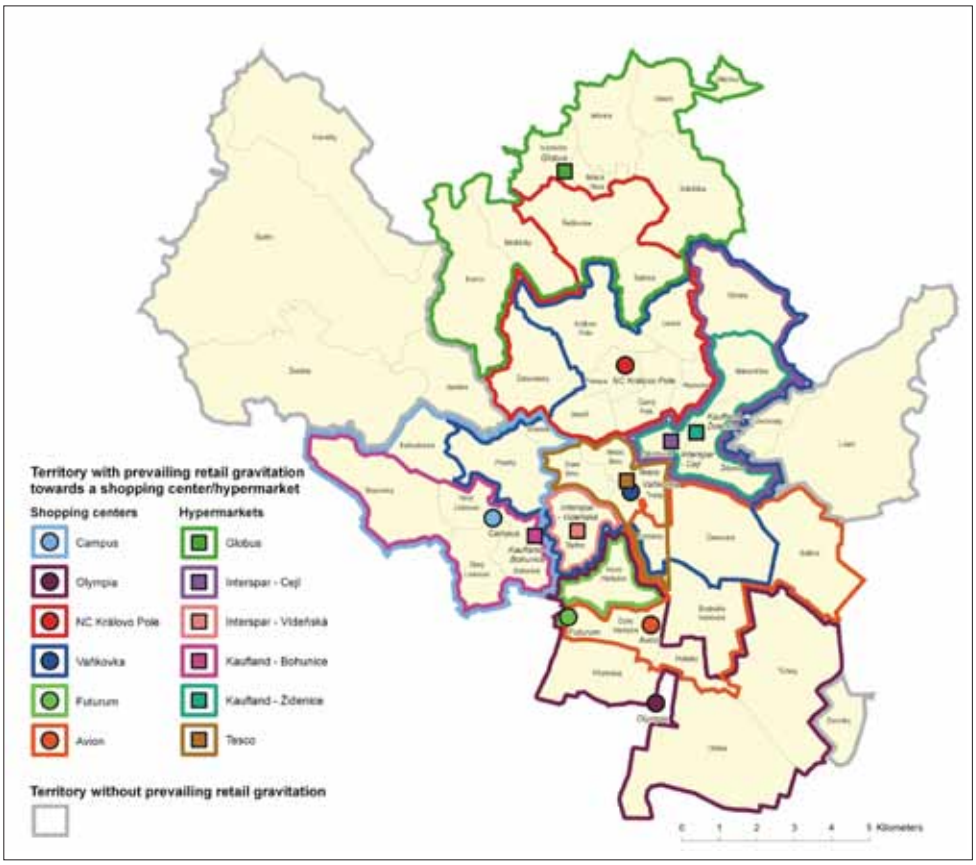

Fig. 5: Gravitation to shopping centers and hypermarkets of the inhabitants of municipal districts
Source: Authors´ research

Pole – their spheres of influence partially overlap. In the south, we can find the dominant Olympia shopping mall and the Avion Shopping Park, while the youngest shopping center Campus Square gradually strengthens its position in the west and the Interspar and Kaufland hypermarkets hold their positions in the east. The Vaňkovka Shopping Centre and the Tesco hypermarket compete for customers in the densely populated inner city; their competition in non-food products (specialized goods) is clearly being won by the first subject especially for young and middle-aged customers. Some municipal districts in the north-west, east and south-east of the city do not exhibit a clear gravitation to shopping centers and hypermarkets; their inhabitants divide their favor evenly among multiple subjects. These are both large housing development complexes (Bystrc, Kohoutovice, Vinohrady, Líšeň and Slatina) and suburbs with small populations and rural developments (Kníničky, Žebětín and Dvorska).

Besides the spatial location of districts within the Brno City and their proximity to shopping centers and hypermarkets also the factors of district size and population (that determine the local supply and demand) significantly affect the shopping gravitation of inhabitants. The bigger is the size of a district, the higher is the percentage of people shopping at the place of their residence (daily, weekly and specialized – with insignificant differences in the latter case). Consequently, the inhabitants of smaller districts tend to shop much more in the shopping centers and hypermarkets. For more detailed analysis see Tab. 2.

With regard to the socio-demographic characteristics of inhabitants, the results of our research proved that the share of persons shopping at their place of residence is the highest in the oldest-age category while differences among other age categories are negligible. Despite the fact that seniors tend to watch for various discounts offered by supermarkets and shopping centers located in the outskirts of Brno and then take an advantage of them in their free time (meaning "anytime") using cheap public transport, the trend did not statistically reflect in their preferences for daily shopping. Seniors also have the lowest share among the visitors of shopping centers as concerns the weekly shopping.

Teenagers are most frequently represented among shoppers in the inner city in the case of daily shopping (probably because a majority of secondary schools are located there) and they also constitute the most frequent category among the visitors of shopping

Factors	Category	Dependent variables					
		daily shopping in (…)			weekly (weekend) shopping (…)		
		place of residence	city centre	shopping centers	place of residence	city centre	shopping centers
District size (population)	< 5,000	40%	16%	**24%**	9%	14%	**47%**
	5,000–10,000	65%	**20%**	7%	36%	**16%**	25%
	10,000–20,000	77%	8%	6%	46%	10%	23%
	> 20,000	**85%**	4%	1%	**49%**	11%	13%
Age	15–19 years	64%	**24%**	4%	32%	**16%**	**35%**
	20–29 years	66%	12%	10%	35%	**16%**	28%
	30–9 years	67%	10%	**11%**	35%	10%	29%
	50–59 years	68%	11%	**11%**	36%	15%	25%
	60 and more	**77%**	6%	6%	**43%**	11%	16%
Education	Basic or secondary without GCE	**72%**	10%	8%	**44%**	**12%**	19%
	Secondary with GCE	67%	12%	10%	33%	**12%**	27%
	Tertiary	67%	10%	**12%**	32%	**12%**	**32%**
Economic activity	Work in Brno	69%	10%	8%	**37%**	12%	26%
	Work outside Brno	49%	18%	20%	14%	4%	**57%**
	Student	56%	12%	**24%**	32%	8%	48%
	Unemployed	62%	**29%**	0%	24%	**33%**	33%
	Maternal leave	60%	5%	20%	23%	2%	35%
	Pensioner	**70%**	9%	8%	34%	1%	18%

Tab. 2: Differences in the shopping gravitation according to the district size, age, education and economic activity
Source: Authors´ research. Categories with the highest frequencies of the respected variables are in bold

centers. The share of people shopping in shopping centers slightly grows with the level of education. The frequency of shopping in shopping centers also correlates with the economic situation of households represented by their monthly income rates. These results can be interpreted in such a way that the shopping centers in the city outskirts are more frequently used by people with higher incomes, which are mostly related to higher achieved education. These people also more frequently commute to work by cars, which provide them with higher mobility and therefore wider choice of shopping locations.

Regarding the characteristics of economic activity, people working in Brno and retirees prevail among people shopping at their places of residence. The inner city is most frequently used for shopping by the unemployed, who combine their trips with other rounds not connected with work activities (services, gaming rooms, restaurants, etc.). Also people commuting to work out of Brno often shop in the centre (the ones who travel by public transport from stations located in the city centre). Shopping centers at the edge of Brno are primarily used by students, people working outside Brno (commuting daily by their own cars) and also by mothers at maternity leave (also traveling mostly by cars). Shopping beyond the place of residence (in other districts) is done for non-regular (weekly) shopping rather than for daily shopping. They are mostly visited by mothers on maternity leave (40%) and seniors (35%) – here we can see their trips for cheaper shopping, not however to distant shopping centers but to closer hyper- and supermarkets.

A more specific analysis of the survey results makes it possible to find out about the popularity of specific retailing units for the individual frequency types of shopping (for more details see Tab. 3). Especially supermarkets with branches in most municipal districts (in Brno: Albert 23 markets, Billa 10 markets, Brněnka – a regional chain, 25 markets) and small shops with foodstuffs or miscellaneous merchandise are preferred for daily shopping. The Kaufland (3 markets in Brno) and Tesco (4 markets in Brno) hypermarkets hold their positions, too. No significant preferences were demonstrated in the case of weekly shopping; the Globus hypermarket (1 market in Brno) and the Olympia shopping mall joined behind the above-mentioned chains in daily shopping. Specialized (irregular) shopping is dominated by the Vaňkovka shopping mall located in the inner city, followed by the Tesco and Olympia hypermarkets. The fourth place is occupied by small specialized shops in the inner city.

The mode of transport to shopping is primarily determined by the frequency, type and direction of shopping (see also Fig. 6). Daily shopping at the place of residence or in a closer neighborhood is mostly done on foot, as expected (60% of answers). Cars are most frequently used for weekly and specialized shopping (each 52%) – this is mostly given by the peripheral location and adaptation of shopping centers and hypermarkets for car transportation. When weekly and especially specialized shopping is done in the inner city, the public transport is widely used too (22% and 41%, respectively).

Cars are used for shopping slightly more frequently by men than women, which is quite surprising especially in the daily shopping. Cars are used for shopping most frequently by the middle generation (30–49 years) and least frequently by seniors over 60 years of age, as expected. The use of cars grows with the achieved education level and the use of public transport and walking decreases correspondingly.

If we focus on basic foodstuffs only, we can interpret the shopping frequency as well. Mothers on the maternity

Daily shopping		Weekly (weekend) shopping		Specialized (irregular) shopping	
Albert (Ahold) – supermarket	26%	Tesco – hypermarket	15%	Galerie Vaňkovka – shopping center	26%
Small shops except for larger chains	15%	Albert (Ahold) – supermarket	14%	Tesco – hypermarket	16%
Billa (Rewe) – supermarket	14%	Billa (Rewe) – supermarket	10%	Olympia – shopping center	15%
Brněnka – supermarket (regional chain)	7%	Globus – hypermarket	6%	Small specialized shops in the inner city	14%
Kaufland – hypermarket	7%	Olympia – shopping center	5%	Avion Shopping Park – shopping center	6%
Tesco – hypermarket	6%				

Tab. 3: Percentages of individual retailing units in all types of shopping. Source: Authors´ research

leave and working people from larger families do their shopping on the daily basis (37% of all answers). They mostly shop close to their places of residence. Retired people and the unemployed shop for foodstuffs twice or three times a week; once a week or a lower frequency is typical for the youngest age category 15–19 years (most of the shopping do their parents). Concerning gender and education, no significant statistical differences were discovered among the individual categories.

When considering the shopping for basic foodstuffs according to the types of retailing units, supermarkets are the most preferred units (over a half of all answers – see Tab. 1 above). They are followed by hypermarkets and smaller self-service shops. When considering social groups, the expectation was confirmed that smaller shops and discount shops are mostly used by older age categories, supermarkets and hypermarkets by young people and middle-aged generation. In terms of age, gender and education, shopping centres do not exhibit significant differences in the composition of their customers as compared with other types of shops.

Table 4 shows that over a half of all non-food shopping occurs in the shopping centers. They are distantly followed by hyper- and supermarkets and by smaller shops in the inner city. Older age groups (over 50 years) again prefer smaller shops in the vicinity of their places of residence and supermarkets; young and middle-aged generations do their shopping for non-food products especially in the shopping centers and hypermarkets. For example, 70% of respondents younger than 20 years shop in the shopping centers while only 25% of persons older than 60 years shop there. Education shows only a weak correlation – people with higher education shop more frequently in the shopping centers and smaller shops in the inner city while avoiding the supermarkets, which are mostly used by people with elementary education.

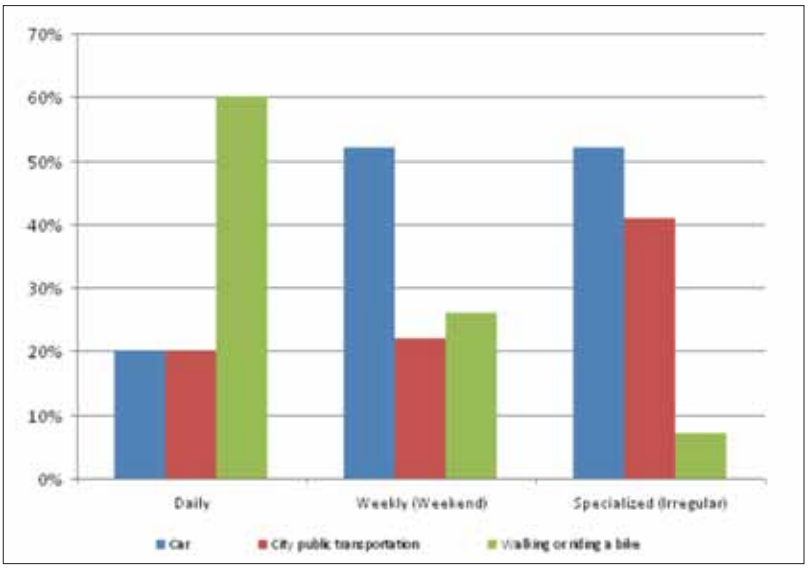

Fig. 6: Transport modes used for the three most frequent basic types of shopping. Source: Authors´ research

Figs. 7 and 8.: Crowded parking places of the Hypermarket Globus in days after Christmas holiday (a time of the first sales) and photo of the Galerie Vankovka – a shopping centre located close to the historic centre and the main railway station, an example of successful revitalization of a post-industrial brownfield site (Photos: Josef Kunc)

Food - retailing unit type		Non-food - retailing unit type	
Supermarket	54%	Shopping center	54%
Shopping center	20%	Hypermarket	15%
Smaller self-service shop	12%	Supermarket	13%
Shopping center	7%	Smaller shop in the inner city	12%
Shop with across-the-counter sales	4%	Smaller shop near the place of residence	5%
Discount shop	3%	Discount shop	1%

Tab. 4: Preferences for the individual types of retailing units for the shopping of food and non-food products
Source: Authors´ research

When asked: "*What type of shop do you really miss in the city?*", 77% of respondents replied that none. This simple answer is based to a great extent on the wide choice of retail units, which is typical for a city of Brno's size. It is a reaction to the currently peaking phase of the retailing network transformation, which has been going on for 20 years in the Czech Republic. Those respondents, who replied to this question descriptively, were mostly people younger than 20, who traditionally long for more shops with textiles and seniors who miss shops with domestic wares. Gender and education did not show any significant differences.

The preceding question was related to another question concerning a change in the respondents' shopping behavior in the past five years. This is a time that respondents were able to actually remember and put into context. For answers see the following Tab. 5. For over a half of the respondents nothing significant changed near their habitual shopping places. Increased numbers of shops and enlarged assortment at their places of residence and a need to do their shopping outside the place of residence due to the lack of supply were perceived by about the same numbers of respondents. Only 13% of respondents preferred the newly opened large-area markets; this was a reaction to the fact that hypermarkets and shopping centers appeared in Brno mostly about 10–12 years ago.

5. Discussion and conclusions

Our research conducted within the borders of Brno city was aimed at revealing some specific areas of retail gravitation and shopping behavior of the inhabitants. Daily shopping (mostly basic foodstuffs) is realized mostly at the place of residence (2/3 of answers) and in the close vicinity; supermarkets and small shops that are not part of established retail chains are the preferred shopping units. The role of hypermarkets and shopping centers has been secondary so far but, as pointed out in some studies based on commuting for retail shopping in urban environments (Marjanen, 1995; Szczyrba, 2002; Mitríková, 2008 and others), their role will grow in the future.

Weekly shopping is logistically much more balanced. Compared with our expectations specified in the hypothesis, the place of residence and its close surroundings (37% of answers) still prevails, followed by shopping centers at the edge of Brno and other municipal districts beyond the place of residence. Many locations (Fig. 4) recently saw the opening of new hypermarkets (and also supermarkets) with a wide supply of goods and frequent discounts, and people living in their vicinity take advantage of this. Significance of shopping centers at the edge of the city is already very apparent (28%).

The inner city (43% of answers) and shopping centers at the edge of the city (34%) are preferred for specialized or irregular shopping; here we expected a reverse order, though. The growing significance of shopping centers, with regard to smaller specialized shops in the inner city, for shopping performed both by the inhabitants of the city and its hinterlands, is rather clear from other research works as well (Szczyrba, 2002; Lowe, 2005; Crosby, 2005; McEachern, Warnaby, 2006; Van Leeuwen, Rietveld, 2011; Kunc et al., 2012a, 2012b). Localization of the popular shopping centre Galerie Vaňkovka and the department store Tesco with

Have you noticed, in the past five years, approximately, any change in your shopping behavior?	
No significant changes occurred in the vicinity of my habitual shopping places	51%
I shop close to my place of residence since the availability of shops and the assortment of goods increased there	17%
I shop mostly outside of my place of residence since the necessary shops and the assortment of goods are not available there	16%
New large-area markets were opened and I prefer them	13%

Tab. 5: Preferences for the individual types of retailing units selling food and non-food products
Source: Authors´ research

a hypermarket played a certain role in the preference for the inner city. The Galerie Vaňkovka shopping centre, which is located close to the historical centre and the main train station, can be regarded as an example of successful regeneration of a brownfield site (a complex of industrial factories) and revitalization of the city centre (a similar example is the Bullring shopping centre in the central part of Birmingham city, UK). If we abstract from the frequency types of shopping, the shopping centers are explicitly preferred for purchasing non-food products (54% of all shopping) while the supermarkets dominate with the same share in the shopping for foodstuffs.

The statistical analysis of the survey results revealed several correlations between the individual population groups and the places of shopping. The hypothesis was confirmed that the share of people shopping at their place of residence grows with age. On the contrary, it was not confirmed that young people explicitly prefer shopping centers mostly located in the city outskirts. It is the young people below 30 who are most represented among the people shopping in the inner city and only then among the people shopping in the shopping centers. This is a kind of need to confirm one's social status – to be seen in the brand-name shops and shopping centers, i.e. to be in the "center of action" – this has been corroborated in studies by Kunc et al. (2010), Jackson et al. (2011) and Spilková (2012b). Once again, the locality of the Vaňkovka shopping center, which immediately links with the historic inner city, plays its role in Brno. Education has no significant influence on retail gravitation; only in the case of shopping centers we can see a more significant increase in the share of shoppers with higher achieved education.

When considering specific population segments and their work activities in connection with the places of shopping, seniors are profiled as inhabitants of the city who prefer both their place of residence and other municipal districts of Brno. Seniors travel beyond their place of residence to take advantage of discount actions and discounted foodstuffs, drugstore goods, etc. offered by hypermarkets and supermarkets. The inner city is used for shopping mostly by the unemployed while the shopping centers are used by working people and mothers at maternity leave. A part of the working population takes an advantage of the possibility to do their shopping at the place of their work.

A majority of the respondents (60%) do their daily shopping within a walking distance; car trips dominate for the weekly and specialized shopping (for similar topics see e.g. Brown 1991; Marjanen, 1995; Findlay et al., 2001; Szczyrba, 2002; Mitríková, 2008; Wagner, Rudolph, 2010 etc.). Public transport is also much used for visits to the shopping centers in the city outskirts; it is mostly used by seniors, mothers at maternity leave and teenagers.

The last tested hypothesis did not provide an unambiguous answer to the question about an improvement in the selection of retail shops and expansion of services in most Brno municipal districts in recent years. The prevailing neutral answer about the scope of change in the habitual places of respondents' shopping reflects the current state of inaction connected with the global economic recession. Building of new retailing concepts in the Czech Republic stopped by 2008 and people have apparently "become accustomed" to the new retailing standard, which doesn't grow fast but gets gradually corrected by means of filling in gaps in the market, increasing competition and growing supply of services (see also Kunc et al., 2012b; Spilková, 2012).

Czech inner cities, including Brno, have been exposed to the constantly intensifying process of commercialization and driving of grocery stores out of the inner cities is one of the consequences of this process (Sýkora, 2001; Ilnicki, 2001; Poole et al., 2002; Kunc et al., 2012b). Floorspace of grocery stores in the Brno inner city (not only here but also in other municipal districts) has been gradually shrinking (Mulíček, Osman, 2009) and there has also been shrinking the floorspace of specialized non-foodstuffs shops. The center of shopping for both food and non-food products is being transferred to the housing development zones and to the city periphery where you can find supermarkets and hypermarkets, which are frequently parts of shopping centers.

On the other hand it is necessary to note that many small specialized shops, "evening grocery stores", farmer shops, etc. have recently opened in the Brno inner city and they have found their customers. It is well-known, that the Tesco chain, for example, is going to build a network of smaller grocery stores in the Czech inner cities (Tesco Express concept). Large developers with new shopping and administrative projects are going to enter the inner cities; competition will be tough, though. Developers certainly do not avoid building new shopping centers in the vicinity of historical city centers, see Brno. Just take a look at large Czech cities, such as Prague (e.g. the shopping center Nový Smíchov, or planned Copa center at Národní třída, which will certainly not be the only object of this type) and Ostrava (Nová Karolína) or nearby Bratislava (Aupark), Krakow (Galerie Krakowska), English Birmingham (BullRing shopping centre) and many others.

What will be the development of retailing within the context of the daily urban system in a central European

city such as Brno? The inner city will keep losing its position as far as weekly and irregular shopping is concerned. For daily shopping it will serve its residents who feel no need to travel somewhere else - this has been demonstrated by our research as well. Also the people working in the inner city will be able to take advantage of shopping facilities close to their places of work. Some small specialized shops will remain, large-area formats will be exceptions and if any of them get established they will be under very strong competition. New secondary "inner cities" will be gradually established around the shopping centers with strong gravity effects and they will attract residential and administrative functions. These and other similar questions will be answered in rather near future.

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References

BACON, R. W. (1995): Combined trips and the frequency of shopping. Journal of Retailing and Consumer Services, Vol. 2, No 3, p. 175–183.

BAUMAN, Z. (1996): From Pilgrim to Tourist – or a Short History of Identity. In: Hall, S., du Gay, P. [eds.]: Questions of Cultural Identity. Sage, London, p. 18–36.

BÄCKSTRÖM, K. (2006): Understanding Recreational Shopping: A New Approach. International Review of Retail, Distribution and Consumer Research, Vol. 16, No. 2, p. 143–158.

BERRY, B. J. L. (1967): Geography of Market Centres and Retail Distribution. Prentice Hall and Englewood Cliffs, New Persey, 125 pp.

BEZÁK, A. (2000): Funkčné mestské regióny na Slovensku. Geographia Slovaca Vol. 15, 89 pp.

BROWN, S. (1992): Retail Location: A Micro-scale Perspective. Avebury, Hants, 336 pp.

BUTLER, R. W. (1991): West Edmonton Mall as a Turist Atraction. The Canadian Geographer, Vol. 35, No. 3, p. 287–295.

CIMLER, P. (2001): Vliv globalizace na maloobchodní síť ČR. In: Bím, R. et al. [ed]: Koncentrace obchodních firem na českém trhu. Vysoká škola ekonomická, Praha, p. 67–93.

CLARK, G. L., FELDMAN, M. P., GERTLER, S. M., WILLIAMS, K. (2003): The Oxford Handbook of Economic Geography. Oxford University Press, New York, 776 pp.

COSHALL, J. T. (1985): Urban Consumers' Cognitions of Distance. Geografiska Annaler. Series B, Human Geography, Vol. 67, No. 2, p. 107–119.

CROSBY, N., HUGHES, C., LIZIERI, C., OUGHTON, M. (2005): A message from the oracle: The Land use impact of a major in-town shopping centre on local retailing. Journal of property research, Vol. 22, No. 2–3, p. 245–265.

DALLEN, T. J. (2005): Shopping tourism, retailing, and leisure. Channel View Publications, New York, 222 pp.

DICKEN, P. (2003). Global Shift. Sage Publications, London, 656 pp.

DRTINA, T., KRÁSNÝ, T. (1989): Mezinárodní srovnání vývojových tendencí maloobchodní sítě. Výzkumný ústav obchodu, Praha, 38 pp.

ENGLAND, J. (2000): Retail Impact Assessment: A Guide to Best Practice. Routledge, London, 240 pp.

FINDLAY, A. M., STOCKDALE, A., FINDLAY, A., SHORT, D. (2001): Mobility as a driver of change in rural Britain: An Analysis of the links between migration, commuting and travel to shop patterns. International Journal of Population Geography, Vol. 7, No. 1, p. 1–15.

FLOWERDEW, R., MARTIN, D. (2005): Methods in Human Geography. 2nd edition. Pearson Education, London, 392 pp.

FRIČ, P., POTŮČEK, M. (2004): Model vývoje české společnosti a její modernizace v globálním kontextu. Sociologický časopis, Vol. 40, No. 4, p. 415–431.

GUY, C. (1995): The Retail Development Process: Location, Property and Planning. Routledge, London, 240 pp.

GUY, C. M. (1998) Classifications of Retail Stores and Shopping Centres: Some Methodological Issues. GeoJournal, Vol 45, No. 4, p. 255–264.

HEINEBERG, H. (2006): Stadtgeographie. Verlag, Paderborn, 201 pp.

ILNICKI, D. (2009): Przestrzenne zrożnicowanie poziomu rozwoju usług w Polsce. Teoretyczne i praktyczne uwarunkowania badań. Uniwersytet Wrocławski, Wrocław, 315 pp.

JACKSON, V., STOEL, L., BRANTLEY, A. (2011): Mall attributes and shopping value: Differences by gender and generation cohort. Journal of Retailing and Consumer Services, Vol. 18, No. 1, p. 1–9.

JÜRGENS, U. (1994): Saalepark und Sachsenpark (Grossflächige Einkaufszentrum im Raum Leipzig-Halle). Geographische Rundschau, Vol. 46, No. 9, p. 516–523.

KNOX, P. L., PINCH, S. (2009): Urban social geography. 6th edition. Pearson Education Canada, London, 392 pp.

KOWALCZYK, A. (2005): Nowe formy turystyki miejskiej. Prace i studia geograficzne:. Vol. 35, p. 155–197.

KOŽELOUH, J. (2010): Environmentální dopady prostorové expanze velkoplošného maloobchodu v České republice 2003– 2009. Nesehnutí, Brno. Dostupné na: <http://www.nesehnuti.cz/publikace/vyzkum_2003-2009.pdf>.

KRÁSNÝ, T. (1990): Mezinárodní srovnání maloobchodní sítě. Výzkumný ústav obchodu, Praha, 50 pp.

KULKE, E. (1992): Veränderungen in der Standortstruktur des Einzelhandels: untersucht am Beispiel Niedersachsen. Lit, Münster, 280 pp.

KUNC, J., FRANTÁL, B., TONEV, P. (2010): Galerie Vaňkovka – studie nákupního chování návštěvníků. Masarykova univerzita, Brno, 14 pp.

KUNC, J., TONEV, P., SZCZYRBA, Z., FRANTÁL, B. (2012a): Commuting for retail shopping as a part of the daily urban system (Brno, the Czech Republic). Geographia Technica, Vol. 13, No. 1, p. 36–45.

KUNC, J., TONEV, P., SZCZYRBA, Z., GREPLOVÁ, Z. (2012b): Perspektivy nákupních center v České republice s důrazem na lokalizaci v urbánním prostředí: příklad města Brna. Urbanismus a územní rozvoj, Vol. XV, No. 2, p. 14–20.

VAN LEEUWEN, E. S., RIETVELD, P. (2011): Spatial consumer behaviour in small and medium-sized towns. Regional Studies, Vol. 45, No. 8, p. 1107–1119.

LENTNEK, B., LIEBER, S.R., SHESHKIN, I. (1976): Consumer Behavior in Different Areas. Annals of the Association of American Geographers, Vol. 66, p. 538–545.

LLOYD, R., JENNINGS, D. (1978): Shopping Behavior and Income: Comparisons in an Urban Environment. Economic Geography, Vol. 54, No. 2, p. 157–167

LOWE, M. (2005): The regional shopping centre in the inner city: A study of retail-led urban regeneration. Urban studies, Vol. 42, No. 3, p. 449–470.

MARJANEN, H. (1995): Longitudinal study on consumer spatial shopping behaviour with special reference to out-of town. Experiences from Turku, Finland. Journal of Retailing and Consumer Services, Vol. 2, No. 3, p. 163–174.

MARYÁŠ, J. (1983): K metodám výběru středisek maloobchodu a sfér. Zprávy GgÚ ČSAV, Vol. 20, No. 3, p. 61–81.

MATLOVIČ, R. (2000): Transformačné procesy intraurbánných štruktúr Prešova jako odraz celospoločenských zmien v ostatnom decéniu. In: Matlovič, R. [ed.]: Urbánné a krajinné štúdie, Vol. 3., Prešovská univerzita, Prešov, p. 27–38.

McEACHERN, M. G., WARNABY, G. (2006): Food shopping behaviour in Scotland: the influence of relative rurality. International Journal of Consumer Studies. Vol. 30, No. 2, p. 198–201.

MILLER, E. J., O'KELLY, M. E. (1983): Estimating shopping destination choice models from travel diary data. The Professional Geographer, Vol. 35, p. 440–449.

MITRÍKOVÁ, J. (2008): Geografické aspekty transformácie maloobchodu a nákupného správania sa na Slovensku (prípadové štúdie z miest Prešov a Košice). Geografické práce 14, Prešov, 213 pp.

MLČOCH, L., MACHONIN, P., SOJKA, M. (2000): Ekonomické a společenské změny v České společnosti. Karolinum, Praha, 273 pp.

MULÍČEK, O. (2007): Prostorové aspekty současného vývoje maloobchodní sítě. Urbanismus a územní rozvoj, Vol. X, No. 6, p. 14–20.

MULÍČEK, O., OSMAN, R. (2009): Průzkum maloobchodní sítě na území města Brna 2009. Masarykova univerzita, Brno, 36 pp.

MULÍČEK, O., OSMAN, R., SEIDENGLANZ, D. (2010): Časoprostorové rytmy města – industriální a postindustriální Brno. In: Vacková, B., Ferenčuhová, S., Galčanová, L. [eds.]: Československé město včera a dnes: Každodennost – Reprezentace – Výzkum. Pavel Mervart/Masarykova univerzita, Červený Kostelec/Brno, p. 195–220.

MUSIL, J. (2001): Vývoj a plánování měst ve střední Evropě v období komunistických režimů. Sociologický časopis, Vol. 37, No. 3, p. 275–296.

ORDELTOVÁ, M., SZCZYRBA, Z. (2006): Současná situace v maloobchodní síti českých měst – geografická sonda Zlín. Urbanismus a územní rozvoj, Vol. IX, No. 3, p. 13–16.

POOLE, R., CLARKE, G. P., CLARKE, D. B. (2002): Growth, concentration and regulation in European food retailing. European urban and regional studies, Vol. 9, No. 2, p. 167–186.

SCOTT, D. M., HE, S. Y. (2012): Modeling constrained destination choice for shopping: a GIS-based, time-geographic approach. Journal of Transport Geography, Vol. 23, p. 60–71.

SMOLOVÁ, I., SZCZYRBA, Z. (2000): Large commercial centers in the Czech Republic – landscape and regionally aspects of development (contribution to the study of the problematic). Acta Universitatis Palackianae Olomucensis, Geographica, Vol. 36, p. 81–87.

SPILKOVÁ, J. (2003): Nový fenomén: nákupní centrum a utváření nákupního chování spotřebitelů v transformačním období. Geografie, Vol. 108, No. 4, p. 277–288.

SPILKOVÁ, J. (2012a): Geografie maloobchodu a spotřeby. Karolinum, Praha, 246 pp.

SPILKOVÁ, J. (2012b): The birth of the czech mall enthusiast: The Transition of shopping habbits from utilitarian to leisure shopping. Geografie, Vol. 117, No. 1, p. 21–32.

STARZYCZNÁ, H. (2010): Vybrané aspekty internacionalizace vnitřního obchodu v teoretických přístupech a empirickém zkoumání v České republice v období transformace. E + M Ekonomie a management, Vol. 6, No. 1, p. 115–130.

STARZYCZNÁ, H., GABRYŠOVÁ, M., URBÁNEK, J. (2010): The influence of Globalization on Consumption and Consumer Market. In: Marketing miedzynarodowy-uwarunkowania i kierunki rozwoju. Polskie wydawnictwo Ekonomiczne, Warszawa, p. 58–68.

SÝKORA, L. (2001): Proměny prostorové struktury Prahy v kontextu postkomunistické transformace. In: Hampl, M. [ed]: Regionální vývoj: specifika české transformace, evropská integrace a obecná teorie. Univerzita Karlova, Praha, p. 127–166.

SZCZYRBA, Z. (2002): Shopping gravity of large-scale stores – example of Terno Olomouc hypermarket (contribution to the study of the problematic). Acta Universitatis Palackianae Olomucensis, Geographica, Vol. 37, p. 91–96.

SZCZYRBA, Z. (2005): Maloobchod v ČR po roce 1989 – vývoj a trendy se zaměřením na geografickou organizaci. Univerzita Palackého, Olomouc, 126 pp.

SZCZYRBA, Z. (2006): Geografie obchodu se zaměřením na současné trendy v maloobchodě. Univerzita Palackého, Olomouc, 90 pp.

SZCZYRBA, Z., SMOLOVÁ, I., FŇUKAL, M. (2006): Significant features of transformation of the services sector in an area – a case study for the micro-region of Olomoucko (contribution to research on the issue). Acta Universitatis Palackianae Olomucensis, Geographica, Vol. 39, p. 83–93.

TIMMERMANS, H., VAN DER HEIJDEN, R., WESTERVELD, H. (1982): Perception of urban retailing environments: An empirical analysis of consumer information and usage fields. Geoforum, Vol. 13, No. 1, p. 27–37.

VITURKA, M., MARYÁŠ, J., TOUŠEK, V., VYSTOUPIL, J. (1998). Investiční atraktivita vybraných měst České republiky. Masarykova univerzita, Brno, 120 pp.

WAGNER, T., RUDOLPH, T. (2010): Towards a hierarchical theory of shopping motivation. Journal of Retailing and Consumer Services, Vol. 17, No. 5, p. 415–429.

WĘCŁAWOWICZ, G. (2003): Geografia społeczna miast. PWN, Warszawa, 161 pp.

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MORAVIAN GEOGRAPHICAL REPORTS

Aims and Scope of the Journal

Moravian Geographical Reports [MGR] is an international peer-reviewed journal, which has been published in English continuously since 1993 by the Institute of Geonics, Academy of Sciences of the Czech Republic, through its Department of Environmental Geography. It receives and evaluates articles contributed by geographers and by other researchers who specialize in related disciplines, including the geosciences and geo-ecology, with a distinct regional orientation, broadly for countries in Europe. The title of the journal celebrates its origins in the historic land of Moravia in the eastern half of the Czech Republic. The emphasis at MGR is on the role of 'regions' and 'localities' in a globalized society, given the geographic scale at which they are evaluated. Several inter-related questions are stressed: problems of regional economies and society; society in an urban or rural context; regional perspectives on the influence of human activities on landscapes and environments; the relationships between localities and macro-economic structures in rapidly changing socio-political and environmental conditions; environmental impacts of technical processes on bio-physical landscapes; and physical-geographic processes in landscape evolution, including the evaluation of hazards. Theoretical questions in geography are also addressed, especially the relations between physical and human geography in their regional dimensions,

Instructions for authors

The journal, Moravian Geographical Reports, publishes the following types of papers:

(1) **Original scientific papers** are the backbone of individual journal issues. These contributions from geography and regionally-oriented results of empirical research in various disciplines normally have theoretical and methodological sections and must be anchored in the international literature. We recommend following the classical structure of a research paper: introduction, including objectives (and possibly the title of the general research project); theoretical and methodological bases for the work; empirical elaboration of the project; evaluation of results and discussion; conclusions and references. Major scientific papers also include an Abstract (up to 500 characters) and 3 to 8 keywords (of these, a maximum of 5 and 3 of a general and regional nature, respectively). With the exception of purely theoretical papers, each contribution should contain colour graphic enclosures such as photographs, diagrams, maps, etc., some of which may be placed on the second, third or fourth cover pages. For papers on regional issues, a simple map indicating the geographical location of the study region should be provided. Any grant(s) received to support the research work must be acknowledged. All scientific papers are subject to the peer-review process by at least two reviewers appointed by the Editorial Board. The maximum text size is 40 thousand characters + a maximum of 3 pages of enclosures. The number of graphic enclosures can be increased by one page provided that the text is shortened by 4 thousand characters.

(2) **Scientific communications** are published to inform the public of continuing research projects, scientific hypotheses or findings. This section is also used for scientific discussions that confront or refine scientific opinions. Some contributions may be reviewed at the discretion of the Editorial Board. Maximum text length for these scientific communications is 12 thousand characters.

(3) **Scientific announcements** present information about scientific conferences, events and international co-operation, about journals with geographical and related issues, and about the activities of geographical and related scientific workplaces. The scientific announcements are preferably published with colour photographs. Contributions to jubilees or obituaries on prominent scientific personalities are supplied exclusively on request from the Editorial Board. The maximum text length of the scientific announcements is 5 thousand characters.

(4) Moravian Geographical Reports also publishes **reviews** of major monographs from geography and other related disciplines published as books or atlases. The review must contain a complete citation of the reviewed work and its maximum text is 3.5 thousand characters. Graphics are not expected for the reviews section.

REVIEWERS OF PAPERS PUBLISHED IN MGR VOL. 20/2012

In the alphabetical order, we present a list of reviewers who reviewed articles published in numbers 1–4 of Vol. 2012. **The Editorial Board thanks them for the cooperation**.

Dr. Artur Bajerski, Prof. Milan Bufon, Prof. RNDr. Jaromír Demek, DrSc., Prof. Dr. hab. Zbigniew Długosz, Doc. Dr. Ing. Tomáš Dostál, RNDr. Vladimír Falťan, Ph.D., Dr. Dagmar Haase, Dr. Rey Hall, RNDr. Tomáš Havlíček, Ph.D., Mgr. Marcel Horňák, Ph.D., Dr. Gergely Horvath, RNDr. Pavel Chromý, Ph.D., Assoc. Prof. Alžběta Králová, Mgr. Petr Klusáček, Ph.D., Assoc. Prof. Tomasz Komornicki, Prof. Diana Kopeva, Ing. Michal Kovář, Assoc. Prof. RNDr. Jakub Langhammer, Ph.D., Prof. Walter Leimgruber, Assoc. Prof. ing. Vanda Maráková, Ph.D., Dr. Beata Michaliszyn, RNDr. Peter Podolák, Ph.D., RNDr. Norbert Polčák, Ph.D., RNDr. Jana Ružičková, Prof. Dr. Peter Schmitt-Egner, Prof. Noam Shoval, Assoc Prof. RNDr. Tadeusz Siwek, CSc., RNDr. Jana Spilkova, Ph.D., Assoc. Prof. Dr. ing. Jan Štykar, Ing. Jan Těšitel, CSc., Prof. Colin Thorne, Assoc. Prof. RNDr. Jaroslav Vašátko, CSc., Mgr. Ing. Magdalena Vaverková, Ph.D., Prof. Ing. Jozef Vilček, Ph.D., Assoc. Prof. Dr. Igor Žiberna, Prof. RNDr. Dr.h.c. Florin Žigrai, DrSc.

Fig. 9: Olympia – an example of „shopping and entertainment" centre, located directly on a highway connection Prague–Brno–Bratislava (Photo J. Kunc)

Fig. 10: Campus Square – a newer shopping centre located close to the University Hospital Brno (largest Medical Center in Moravia) and newly developed Masaryk University Campus (Photo J. Kunc)

Illustration related to the paper by J. Kunc, B. Frantál, P. Tonev and Z. Szczyrba

Fig. 2: General view of Olešnice from the West (Photo L. Jakešová)

Fig. 3: Olešnice dairy cooperative (Photo L. Jakešová)

Illustrations related to the paper by L. Jakešová and A. Vaishar