Sołtys, Jacek

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TYPOLOGY OF PERIPHERAL, LOW DEVELOPED SUB-REGIONS IN THE EUROPEAN UNION

Jacek Sołtys

Gdansk University of Technology, Faculty of Architecture,

Department of Urban and Regional Planning

jacek.soltys@gmail.com

Abstract

A common phenomenon of development is the big difference in its levels, especially between metropolitan areas and other areas, called peripheries. There are also big differences in opportunities for development, including the location of new investment. Peripheral areas are characterized by features such as: high unemployment, relatively impoverished populations, and low territorial accessibility. A lack of development factors is the cause of low productivity. These realities become barriers to development. To overcome these barriers external policy interventions are needed as a part of the regional policy. This policy should be tailored to the areas' specific needs. Peripheral areas are also very different. The typology has been applied by the author to recognize these diversity. It is a preparation for a wider research project on the development of policies supporting peripheral areas. European Union's NUTS 3 level sub-regions are the subject of research, which meet the following criteria at the same time: gross domestic product (GDP) per capita below 75% of the EU average and the lack of metropolitan areas.

The first stage of the research is to establish a list of attributes and 24 variables. They take into account the level and dynamics of economic and socio-economic development, structure of economy by NACE, demography features and population density. The second stage is performing a statistical analysis, including multivariate calculations to check the correlations between the variables. The third stage is preparing the Principal Components Analysis. The fourth step is preparing a typology of sub-regions using the cluster analysis (the k-means algorithm). The last part of the article is the characteristics of the types and list of sub-regions in each of 6 types. The resulting clusters include between 44 and 69 sub-regions. The national specific of types is seen. In most states sub-regions belong to 1-2 type. Three types are formed by no more than 4 states.

Keywords: peripheral areas, regional policy, sub-regions, typology, European Union.

1. Introduction

Large differences in levels of development are a common phenomenon, especially between metropolitan areas and peripheral areas beyond. The term "peripheral area" refers to the theory of cores and peripheries of J. Friedman, relative to the theory of growth poles. The cores are territorial social subsystems with a high ability to generate innovation, the peripheries are all regions outside the cores (Domański, 2005).

The peripheries can be seen in different scales: European, national and regional. Taking into account the regional policy pursued by the regional authorities, development concentrates in the capital cities. These cities are "... important growth poles for their regional hinterland, though not necessarily a key development factor at the national level" (Wojnicka, 2009, p.45). Therefore, there are differences between sub-regions of the capitals of regions and other sub-regions. For this reason this typology was made for sub-regions at NUTS 3 level, despite the fact that there are less data for this level than for regions at NUTS 2 level. NUTS 2 is also considered not enough to capture specific territories, among others economic differentiations (Bauer, 2010).

In this article the **peripheral areas** are defined as non-metro regions according to Eurostat (Typology, 2012). Many metro-regions are the best developed agglomerations and their surroundings. These areas are most likely to develop in future. Factors and opportunities for development in many non-metro regions are insufficient. The emigration of young, better educated and the most entrepreneurial people weakens the further development potential. Deficiency of endogenous growth factors is a barrier to initiate the growth from inside. To overcome this barrier external intervention in regional policy is needed (Sołtys, 2011). This policy should be tailored to the areas' specific needs. Peripheral areas are also very different. The typology has been applied by the author as a first step to recognize these diversity.

One of the biggest problems of many peripheral sub-regions is a low level of development. For this reason this typology was made for sub-regions in which GDP per capita is below 75% of the EU average. Those criteria fulfil sub-regions in 19 states. There are no such sub-regions in: Austria, Cyprus, Denmark, Finland, France, Ireland, Luxembourg, Netherlands and Sweden.

The main **objective** of the typology was to investigate the diversity of sub-regions as a starting point for the selection of sub-regions for future comparative research in the subject "Regional development of peripheral areas – determinants and mechanisms".

Only data from the Eurostat were used, which determined the set of variables used in the typology. There are much less variables at NUTS3 level than at NUTS2 level. Most of data used in the typology concern the year 2011. Data from the Eurostat determined also years used in variables of dynamics (which are given in the next chapter): For some states data (from Eurostat) are only for the years 2006-2012, 2007-2010, 2007-2011 or 2007-2012. Lack of some demographic data (population change, migrations) for those years causes that typology does not include sub-regions in continental Croatia and some of the sub-regions in Germany (DED2F – Sächsische Schweiz-Osterzgebirge, DED42 – Erzgebirgskreis) and Italy (ITF46 – Foggia, ITF48 – Andria-Trani).

Methods used in the typology contains the Principal Components Analysis (PCA) and the cluster analysis using the k-means algorithm were applied. In the PCA a large number of related variables are transformed to a smaller set of uncorrelated variables (Jackson J.E., 1991). Cluster analysis is the preferred generic term for procedures which seek to uncover groups of data (Everitt et al., 2011). Processes of typology based on PCA and cluster analysis were described among others by Shepherd (2009) in terms of four main stages as follows:

1. Selection and preparation of variables (including standardization)
2. Finding patterns of variation in the data (using PCA)
3. Scoring sub-regions on the dimensions of Variation (by a matrix of transformed data)
4. Grouping sub-regions (using k-means method).

2. Establishing of variables

The 24 input variables characterizing each sub-region were chosen to cover the following aspects important for development of the sub-region:

1. Level of economic and socio-economic development.
2. Dynamic of economic and socio-economic development
3. Demography features included features as equivalent of quality of life.
4. Structure of economy by NACE.
5. Intensity of use of space.

The abbreviations of variables used in the further tables are in parentheses.

The level of the economic development is measured by gross domestic product per 1000 habitants. This indicator is presented as percentage of EU28 total based on euro per inhabitant (GDP).

The level of socio-economic development is measured by number of employees per 1000 inhabitants in working age, that is 15-64 years old (EMHP).

Dynamics of economic and socio-economic development is measured by following indicators:

- Rate of dynamics of number of employees in 2006-12 (EMPD)
- Rate of dynamics of gross value added at basic prices in 2007–2011:
  - in agriculture, forestry and fishing (VAD),
  - in industry (VID),
  - in construction (VCD),
  - in services (VSD).

There is lack of indicators for measuring the quality of life. For equivalent the following indicators are used as indicators dependent among others from the quality of life:

- net migration in 2007-2010 per 1000 inhabitants average in 2007-2011,
- rate of dynamics of total population change in 2007-2012 per 1000 inhabitants average in 2007-2012.

Two indicators concerning the age structure are also used:

- age dependency ratio – people in non-working age (younger than 15 or older than 64) per 100 working-age population (AGE1)
- people in post-working age (older than 64) – to the people-in pre-working age (younger than 15) (AGE2).

Functions of sub-regions were measured by:

Majority of indicators concerns structure of economy by NACE. Those are:

- Employees per 1000 habitants in working age (15–64):
  - in agriculture, forestry and fishing (EMAHP),
  - in industry (EMIHP),
  - in construction (EMCHP),
  - in services (EMSHP).
- Gross value added (rate in %):
  - in agriculture, forestry and fishing (VA%),
  - in industry (VI%),

  - in construction (VC%),
  - in services (VS%).
- Gross value added per 1000 habitants in working age (15–64):
  - in agriculture, forestry and fishing (VAHP),
  - in industry (VIHP),
  - in construction (VCHP),
  - in services (VSHP).

Four indicators of dynamics of gross value added by NACE (presented above) also concern structure of economy by NACE.

The intensity of use of space was measured by population density (DENS).

A **standardized measure** comparable between variables was input into the analysis.

The **correlations** between these 24 variables were calculated (Pearson's product-moment correlations). Correlations are not high. 25 correlation coefficients are higher than 0.40. The highest correlation coefficients are between:

- GDP and gross value added per 1000 habitants in working age in services (0.94),
- gross value added (in %) in industry and in service (negative coefficients – 0.92),
- employees in industry per 1000 habitants in working age and gross value added (in %) in industry (0.84),
- gross value added in services per 1000 habitants in working age and gross value added (in %) in services (0.83),
- GDP and gross value added in construction per 1000 habitants in working age (0.76),
- GDP and employees in services per 1000 habitants in working age (0,70).

When PCA is used, it is allowed using variables that are correlated.

3. Principal Components Analysis

To prevent redundancies through inter-correlations, to reduce the number of variables and to extract the important information from the table of input variable, Principal Component Analysis (PCA) is used, applying orthogonal Varimax rotation to maximise the factor differences (Abdi and Williams, 2010). "The main idea of PCA is to reduce the dimensionality of a data set consisting of a large number of interrelated variables, while retaining as much as possible of the variation present in the data set" (Lolliffe, 2002, p. 1). After the Varimax rotation, each original variable tends to be associated with one (or a small number) of components, and

each components represent only a small number of variables. Each component has a small number of large loadings and a large number of zero (or small) loadings (Abdi and Williams, 2010). Only components in which eigenvalue is greater than 1 should be taken for rotation.

After carrying out PCA, the eigenvalues were greater than 1 only for 7 components, so only those 7 components were used in a rotation and further procedure. Those components explain almost 80% of the total variance of all variables. Table 1. presents a matrix of loadings of 7 principal components.

Table 1. Principal components after rotation Varimax

Variables	PC1	PC2	PC3	PC4	PC5	PC6	PC7
DENS	0.11	0.19	0.11	-0.02	0.21	-0.69	-0.11
MIGR	0.38	0.07	0.05	-0.04	0.65	0.05	-0.20
POPD	0.46	0.23	0.02	-0.05	0.69	0.00	0.09
EMHP	-0.14	-0.12	0.93	-0.07	0.01	-0.10	-0.07
EMAHP	-0.79	0.02	0.36	-0.16	-0.06	0.20	-0.01
EMIHP	0.00	-0.89	0.13	-0.01	-0.06	-0.11	0.11
EMCHP	0.38	-0.10	0.57	0.48	0.01	0.01	0.04
EMSHP	0.56	0.37	0.51	0.01	0.11	-0.24	-0.13
EMPD	-0.12	0.04	0.09	0.22	0.58	-0.05	0.34
GDP	0.79	0.38	0.24	0.13	0.20	0.14	-0.07
VA%	-0.84	0.00	-0.11	-0.12	-0.02	0.37	-0.05
VI%	-0.10	-0.97	0.03	-0.03	-0.06	-0.03	0.03
VC%	0.02	-0.04	-0.05	0.93	0.09	-0.07	0.00
VS%	0.42	0.87	0.02	-0.11	0.04	-0.10	-0.01
VAHP	-0.15	0.36	0.03	-0.14	0.15	0.78	-0.06
VI_HP	0.62	-0.57	0.31	0.09	0.08	0.16	0.05
VCHP	0.58	0.27	0.18	0.66	0.14	0.07	-0.09
VSHP	0.68	0.63	0.21	0.04	0.14	0.04	-0.11
VAD	-0.41	-0.15	0.11	0.20	-0.03	0.02	0.10
VID	-0.37	-0.22	0.20	-0.29	0.05	0.06	0.44
VCD	-0.07	-0.23	-0.15	0.62	0.04	-0.17	0.55
VSD	0.03	-0.05	-0.11	0.05	0.02	0.08	0.86
AGE1	0.20	0.59	0.45	-0.15	-0.38	0.11	-0.23
AGE2	0.14	0.37	0.36	-0.18	-0.62	0.28	0.08

The component 1 correlates mainly with GDP, and negatively with two variables concerning agriculture with forestry and fishing (employees per 1000 habitants in working age, rate in % of gross value added). The component 1 can be termed as "economic development".

The component 2 has a very high negative correlation with variables concerning development of industry (employees per 1000 habitants in working age, rate in % of gross value added) and positive correlation with variable concerning development of services. This component can be termed as "service / industry".

The component 3 can be termed as "employment" (correlations 0,93 with variable number of employees per 1000 inhabitants in working age)

The component 4 correlates mainly with variables concerning development of construction. It can be termed as "development of construction".

The component 5 can be termed as variables concerning demography, but correlations is not high. It can be termed as "demography".

The component 6 correlates with variable "gross value added in agriculture, forestry and fishing per 1000 habitants in working age" (0,78). Negative correlation is with density (-0,69). This component can be termed as "development of agriculture".

The component 7 is correlated with variables concerning dynamics of gross value added at basic prices in 2007 – 2011 by NACE. The highest correlation concerns dynamics of services, lower – construction (0,55), industry (0,44) and dynamics of number of employees (0,34). Tis component can be termed as "dynamics of development, mainly of services".

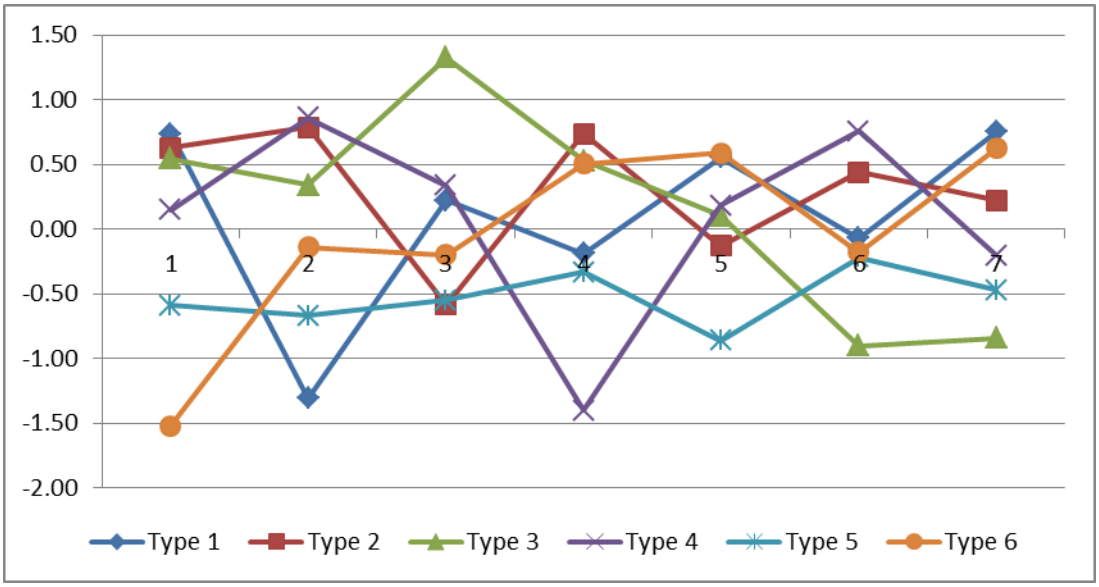
4. Types and its description

The typology was based on the transformed data matrix for 7 principal components. The final stage is to cluster sub-regions according to their scores on the 7 main dimensions in this transformed data. The data analyst Jarosław Łosiński made the typology using the k-means algorithm. It is based upon the numerical 'distances' between the objects (sub-regions) when represented by the scores on the 7 component dimensions. The algorithm finds a division within the data in which the sub-regions within each cluster are as close to each other and as far from sub-regions in other clusters as possible (Shepherd, 2009).

A total of 5 typologies have been done – from 3 to 7 clusters. Before choosing final typology, each type was characterized by: minimum, maximum, average, and standard deviation of each component. "The critical decision on the number of groups making up the typology is a subjective one" [...] as a compromise between more detail […] and more generality" (Shepherd, 2009, p. 8). It was concluded that the typologies comprised of 6 and 7 clusters

better describes the set of the sub-regions and are better suited for interpretation than others typologies. Out of these typologies, the one comprising 6 clusters was chosen. Each type is characterized by: average (Figure 1), minimum, maximum, and standard deviation of each component (Table 2). When minimum or maximum is extreme, minimum or maximum without extreme (for compact group of values) is also presented in the table.

Figure 1: Types cluster profiles using the average values of the principal components



The resulting clusters include between 44 and 69 sub-regions.

Table 2. Quantitative characteristic of types by principal components

Type	Cases	Measure	PC1	PC2	PC3	PC4	PC5	PC6	PC7
1	46	Max.	*2.10*	*0.88*	*1.59*	*1.71*	*5.12*	1.40	*2.19*
			1.40	0.30	1.20	1.00	1.60		1.90
				-2.70	-0.91	-1.30	-0.70	-1.00	-0.30
		Min.	-0.36	*-3.50*	*-1.37*	*-1.94*	*-1.15*	*-2.74*	*-0.82*
		Standard deviation	0.49	0.74	0.61	0.64	0.91	0.71	0.71
2	69	Max.	1.43	1.84	1.05	2.49	*2.36*	*3.84*	1.65
							1.70	2.20	
			-0.40	-0.30					-0.70
		Min.	*-0.73*	*-0.64*	-2.01	-0.98	-2.42	-1.19	*-1.10*
		Standard deviation	0.40	0.52	0.78	0.78	0.93	0.81	0.74
3	44	Max.	*1.46*	*2.40*	*4.51*	1.47	*3.44*	*1.13*	*1.17*
			1.71	1.90	2.30		1.60	0.80	0.80
			-0.25	-0.80			-1.10	3.40	-2.00
		Min.	*-0.97*	*-1.23*	-0.14	-0.77	*-2.20*	*-7.12*	*-2.27*
		Standard deviation	0.55	0.76	0.87	0.64	0.92	1.58	0.90
4	48	Max.	1.38	1.79	*2.27*	-0.33	*2.33*	*2.71*	*1.78*

					1.60		1.40	2.20	0.70
				-0.50	-0.80		-1.30		-1.10
		Min.	-1.22	*-0.74*	*-1.18*	-2.65	*-1.73*	-0.93	*-1.42*
		Standard deviation	0.64	0.56	0.75	0.63	0.85	0.82	0.66
5	67	Max.	*0.82*	*0.86*	*1.17*	1.08	0.66	0.62	*1.90*
			0.50	0.40	0.50				1.08
					-1.90	-1.60			
		Min.	-2.51	-2.24	*-2.27*	*-2.18*	-2.94	-1.07	-1.88
		Standard deviation	0.65	0.70	0.65	0.64	0.86	0.41	0.85
6	46	Max.	-0.09	*1.22*	*1.85*	*2.71*	*2.19*	1.08	*2.74*
				0.70	0.85	1.90	1.60		1.98
			-3.10	-0.70	-1.60	-0.60			-1.50
		Min.	*-3.52*	*-1.23*	*-2.05*	*-1.47*	-1.42	-1.31	*-2.07*
		Standard deviation	0.93	0.47	0.91	0.80	0.62	0.52	1.12

Extreme values are in italic. The smaller the standard deviation, the darker the field.

When standard deviation is smaller, cluster has lowest dispersion in terms of the given factor. Data in Table 2 provide, that clusters are spread. That is more readable in Table 3, in which the simplified characteristic of types is described.

Table 3. The simplified characteristic of types by principal components (without extreme)

Type	PC1	PC2	PC3	PC4	PC5	PC6	PC7
1	++ -	+ ---	++ -	++ --	++ -	++ --	++ 0^-
2	++ -	++ -	++ ---	+++ -	++ ---	+++ --	++ -
3	++ -	++ -	+++ 0^-	++ -	++ --	+ ---	+ ---
4	++ --	++ -	++ -	0^+ +++	++ --	++ -	+ --
5	+ ---	+ ---	+ --	++ --	+ ---	+ --	++ --
6	0^- ---	+ -	+ --	++ -	++ --	++ --	+++ --

+++ – very high, ++ – high, + – pretty high, 0^+ – intermediate above 0, 0^- – intermediate below 0, - – pretty low, -- – low, --- – very low.

From this reason there is a difficulty of types describing. These are disadvantages of typology which differ typology from classification:

– Large range (in some types very large range) of values of components in one type

– Similar values of one component in more than one type.

From these reasons types must be characterised by several components at once, not by single components.

The characteristic of the types by input variable raw values is more readable for types interpretation (Table 4).

Table 4. Quantitative characteristic of types by input variable raw values

Type		GDP	EMAHP	VA%	EMIHP	VI%	VIHP	VS%	VSHP	EMHP	VC%
1	max.	72	*176*	*9,6*	*304*	*64*	13,7	*80*	*16,5*	*784*	*13,5*
		136	7,4	274	53	8,5	70	12,61	736	9,1
	min.	27			23		38		471	
		21	11	1,0	78	*15*	2,7	*30*	2,5	*435*	3,3
2	max.	74	119	*12,9*	148	30	7,0	87	19,9	609	15,3
				10,6							13,6
	min.	32	7	1,0	27	5	0,9	57	7,2	358	4,8
						1	*0,3*				
3	max.	74	*390*	6,5	198	32	7,1	87	21,8	*901*	12,1
			263							777	
	min.	36	1	0,1	40	5	1,3	57	9,4	577	5,1
					22				6,7	531	
4	max.	73	*346*	18,9	134	*34*	*8,4*	92	*22.3*	*790*	8,0
			287			23	5,8		19,4	717	
	min.	36	36	1,6	20	1,5	0,3	62	*9,8*	426	1,5
								57			
5	max.	*58*	*480*	*21,2*	*307*	54	*5,2*	73	*13,6*	*1036*	11,0
		36	297	19,5	248		4,4		10,0	664	
	min.	10	6	2,1	71	14	0,5	32	1,9	378	3,3
										343	0,7
6	max.	36	*462*	*27,4*	197	*46*	3,1	69	6,8	781	*15.9*
			374	24,1		41					12.8
	min.	10	20	3,0	73	12	0,4	35	1,7	411	4,1
					46					*364*	*2,7*

Source: Eurostat and own calculations

The simplified characteristic of types is as follows:

- Type 1. Medium and more developed[1], industrial (in most sub-regions share of industry in gross value added is between 35 and 64%)
- Type 2. Medium and more developed. Well developed services and construction.
- Type 3. Medium and more developed, with highest employment, more than in type 2 employees in industry, the lowest share of agriculture.
- Type 4. Medium and more developed, the best developed agriculture (therefore 2. component is lower than in types 1–3) and services, in certain sub-regions very low devel-

[1] Descriptions must be treated as relative. GDP of all sub-regions is less than 75% GDP average in UE.

oped industry and construction, the lowest density (in majority of sub-regions less than 45 habitants per km^2). The age structure in this type is the oldest.

- Type 5. Medium and less developed, in certain sub-regions pretty high share of industry (in most sub-regions share of industry in gross value added is between 30 and 54%). In all sub-regions population has decreased. In 81% of sub-regions net migration is negative.
- Type 6. Less developed (GDP 10–36% of EU28 total / average), in certain sub-regions high share of agriculture (3,0-27,4%). In almost all sub-regions (except 2) net migration is negative, but in 43,5% of sub-regions the population has increased. The age structure in this type is the youngest.

The quantitative typology can only be the first step for the selection of sub-regions for future comparative research. Statistical characteristics of sub-regions are not enough for the planning of regional policy. Typology or classification based on spatial analyses is necessary concerning among others: transport accessibility, distance from metropoly, characteristic of regional settlement networks including size of the main settlement nodes, their impact areas as activation centres (as centres of daily urban systems) and as sub regional centres (Sołtys J., 2012). These features can be identified from date of states and regional statistical offices and by cartographical analysis. It is also necessary to take into account the individual characteristics of the sub-regions with respect to competitiveness of products, stability of economy, clusters and other economic details, human and social capital, efficiency of institutions, etc. Some of these features can be known from diagnosis for strategic planning using SWOT or marketing analysis. There are also important political considerations for the regional and urban policy including the readiness of the partnership.

5. Cluster membership

General typology result by states is shown in Table 5.

The national specific of types is seen very clearly, especially in types: 4, 3 and 6. **Type 4** is formed mainly by 42 Greek sub-regions. It consists also 5 Portuguese sub-regions and one Spain sub-region. **Type 3** consists all 27 sub-regions of the United Kingdom and majority of Portuguese sub-regions. **Types 6** is composed by sub-regions from 4 post-socialist states: majority of Polish sub-regions and sub-regions from Bulgaria, Romania and Slovakia. **Type 5** also consists sub-regions from 4 post-socialist states (except Portuguese one): all Lithuanian, majority of Bulgarian, Estonian, Hungarian, Latvian and Romanian. **Type 1** is the most "international", but 63% of sub-regions are from 3 states: Czech Republic (all 13 sub-regions

from this state), Poland and Slovenia (almost all sub-regions, except 1). **Type 2** is formed by all Belgian sub-regions, almost all German sub-regions, and Southern European sub-regions from: Italy (all 21 sub-regions), Spain (majority of sub-regions), Croatia, Greece, Malta, Slovenia and Portugal.

Table 5. The overall result of the typology by states

State	Type						Number of	
	1	2	3	4	5	6	sub-regions	types
Belgium		6					6	1
Bulgaria	1				15	8	24	3
Czech Republic	13						13	1
Germany	1	25					26	2
Estonia			1		4		5	2
Greece		2		42			44	2
Spain		8	1	1			10	3
Croatia	2	4			1		7	3
Hungary	2				12		14	2
Italy		21					21	1
Lithuania					8		8	1
Latvia	1				4		5	2
Malta	1	1					2	2
Poland	7					24	31	2
Portugal	4	1	15	5	1		26	5
Romania	1				21	12	34	3
Slovenia	9	1					10	2
Slovakia	4					2	6	2
United Kingdom			27				27	1
Number of sub-regions	46	69	44	48	66	46	319	6
Number of states	12	9	4	3	8	4	19	19

Sub-regions from 5 states belong only to one type for each state: All sub-regions from the Czech Republic belong to type 1, from Belgium and from Italy – to type 2, from the United Kingdom – to type 3, from Lithuania – to type 5. Almost all Greek sub-regions (except 2) belong to type 4. Almost all German sub-regions (except 1) and Spain (except 2) belong to type 2. Almost all Hungarian sub-regions (except 2) belong to type 5. Bulgarian and Romanian sub-regions (except 2) belong to types 5 and 6, Polish – to types 1 and 6. Portuguese sub-regions are the most diverse. They belongs to 5 types. In any other states sub-regions belongs to no more than 3 types.

The national specific of types is also seen in other regional typologies, for example in the demographic typology (Bauer R., 2010), and especially in the typology concerned health (Development, 2010).

The contens of the types is as follows:

Type 1

BG[2]: Stara Zagora

CZ: Stredoceský kraj, Jihocecký kraj, Plzenský kraj, Karlovarský kraj, Ústecký kraj, Liberecký kraj, Královéhradecký kraj, Pardubický kraj, Kraj Vysocina, Jihomoravský kraj, Olomoucký kraj, Zlínský kraj, Moravskoslezský kraj

DE: Helmstedt

HR: Primorsko-goranska zupanija, Istarska zupanija

HU: Komárom-Esztergom, Gyor-Moson-Sopron

LV: Pieriga

MT: Malta

PL: Piotrkowski, Ciechanowsko-plocki, Tarnobrzeski, Gorzowski, Zielonogórski, Jeleniogórski, Legnicko-Glogowski,

PT: Ave Entre Douro e Vouga, Baixo Vouga, Península de Setúbal

RO: Ilfov,

SI: Podravska, Koroska, Savinjska, Zasavska, Spodnjeposavska, Jugovzhodna Slovenija, Notranjsko-kraska, Gorenjska, Goriska

SK: Trnavský kraj, Trenciansky kraj, Nitriansky kraj, Zilinský kraj

Type 2

BE: Arr. Ath, Arr. Soignies, Arr. Thuin, Arr. Waremme, Arr. Virton, Arr. Philippeville,

DE: Barnim, Havelland, Märkisch-Oderland, Potsdam-Mittelmark, Mecklenburg-Strelitz, Nordvorpommern, Nordwestmecklenburg, Ostvorpommern, Parchim, Gifhorn, Wolfenbüttel, Cuxhaven, Harburg, Osterholz, Trier-Saarburg, Kusel, Rhein-Pfalz-Kreis, Südwestpfalz, Mansfeld-Südharz, Plön, Kyffhäuserkreis, Sömmerda, Weimarer Land, Greiz, Altenburger Land

[2] BE – Belgium, BG – Bulgaria, CZ – Czech Republic, DE – Germany, EE – Estonia, EL – Greece, ES – Spain, HR – Croatia, HU – Hungary, IT – Italy, LT – Lithuania, LV – Latvia, MT – Malta, PL – Poland, PT – Portual, RO – Romania, SI– Slovenia, SK – Slovakia, UK – United Kingdom.

EL: Chalkidiki, Lefkada

ES: Albacete, Ciudad Real, Cuenca, Toledo, Badajoz, Cáceres, Huelva, Jaén

HR: Licko-senjska zupanija, Zadarska zupanija, Splitsko-dalmatinska zupanija, Dubrovacko-neretvanska zupanija

IT: Benevento, Avellino, Brindisi, Lecce, Matera, Cosenza, Crotone, Vibo Valentia, Reggio di Calabria, Trapani, Agrigento, Caltanissetta, Enna, Ragusa, Siracusa, Nuoro, Oristano, Ogliastra, Medio Campidano, Carbonia-Iglesias, Rieti

MT: Gozo and Comino / Ghawdex u Kemmuna

PT: Região Autónoma dos Açores (PT)

SI: Pomurska

Type 3

EE: Põhja-Eesti

ES: Melilla (ES),

PT: Minho-Lima, Cávado, Tâmega, Douro, Algarve, Baixo Mondego, Pinhal Litoral, Pinhal Interior Norte, Dão-Lafões, Pinhal Interior Sul, Beira Interior Norte, Beira Interior Sul, Cova da Beira, Oeste, Médio Tejo,

UK: Durham CC, Northumberland, Sefton, Wirral, Barnsley, Doncaster and Rotherham, East Derbyshire, South Nottinghamshire, Isle of Wight, Medway, Cornwall and Isles of Scilly, Torbay, Isle of Anglesey, Conwy and Denbighshire, South West Wales, Central Valleys, Gwent Valleys, Powys, Clackmannanshire and Fife, East Lothian and Midlothian, Scottish Borders, East Dunbartonshire, West Dunbartonshire and Helensburgh & Lomond, East Ayrshire and North Ayrshire mainland, Caithness & Sutherland and Ross & Cromarty, Eilean Siar (Western Isles), East of Northern Ireland (UK), North of Northern Ireland (UK), West and South of Northern Ireland (UK)

Type 4

EL: Evros, Xanthi, Rodopi, Drama, Kavala, Imathia, Kilkis, Pella, Pieria, Serres, Grevena, Kastoria, Karditsa, Larisa, Magnisia, Trikala, Arta, Thesprotia, Ioannina, Preveza, Kerkyra, Kefallinia, Aitoloakarnania, Achaia, Ileia, Evvoia, Evrytania, Fthiotida, Fokida, Argolida, Arkadia, Korinthia, Lakonia, Messinia, Lesvos, Samos, Chios, Dodekanisos, Irakleio, Lasithi, Rethymni, Chania

ES: Almería

PT: Alto Trás-os-Montes, Alto Alentejo, Alentejo Central, Baixo Alentejo, Lezíria do Tejo

Type 5

BG: 15 Vidin, Montana, Vratsa, Pleven, Lovech, Veliko Tarnovo, Gabrovo, Ruse, Razgrad, Shumen, Sliven, Pernik, Kyustendil, Haskovo, Smolyan,

EE: 4 Lääne-Eesti, Kesk-Eesti, Kirde-Eesti, Lőuna-Eesti,

HR: Sibensko-kninska zupanija

HU: 12 Veszprém, Vas, Zala, Somogy, Tolna, Heves, Nógrád, Jász-Nagykun-Szolnok, Szabolcs-Szatmár-Bereg, Bács-Kiskun, Békés, Csongrád,

LT: 8 Alytaus apskritis, Klaipedos apskritis, Marijampoles apskritis, Panevezio apskritis, Siauliu apskritis, Taurages apskritis, Telsiu apskritis, Utenos apskritis,

LV:4 Kurzeme, Latgale, Vidzeme, Zemgale,

PT: Serra da Estrela

RO: 21 Bihor, Bistrita-Nasaud, Maramures, Salaj, Alba, Covasna, Harghita, Mures, Sibiu, Botosani, Buzau, Vrancea, Arges, Dâmbovita, Prahova, Teleorman, Gorj, Vâlcea, Arad, Caras-Severin, Hunedoara

Type 6

BG: Silistra, Dobrich, Targovishte, Burgas, Yambol, Blagoevgrad, Pazardzhik, Kardzhali.

PL: Sieradzki, Skierniewicki, Ostrolecko-siedlecki, Nowosadecki, Bialski, Chelmsko-zamojski, Pulawski, Krosnienski, Przemyski, Sandomiersko-jedrzejowski, Lomzynski, Suwalski, Pilski, Koninski, Leszczynski, Koszalinski, Stargardzki, Nyski, Grudziadzki, Wloclawski, Elblaski, Elcki, Slupski, Starogardzki.

RO: Satu Mare, Bacau, Neamt, Suceava, Vaslui, Braila, Tulcea, Calarasi, Giurgiu, Ialomita, Mehedinti, Olt.

SK: Banskobystrický kraj, Presovský kraj.

Conclusions

The investigation has shown that it is possible to carry out typology for sub-region at NUTS 3 level, despite the fact that there are less data for this level than for NUTS 2 level. Based on available data, it is possible to construct indicators that are important for the evaluation of regional development. The typology would be better if there were more data.

There are disadvantages of typology which differ typology from classification: large range of values of components and variables in one type and similar values in more than one type. From those reasons types must be characterised by several components at once, not by single components.

The national specific of types is seen very clearly. In any states (except Portugal) sub-regions belongs to no more than 3 types. In most states sub-regions belong to 1-2 type. Three types are formed by no more than 4 states.

Statistical characteristic of sub-regions are not enough for the planning of regional policy. Typology or classification based on spatial analyses is necessary concerning among others: transport accessibility, distance from metropoly, characteristic of regional settlement networks including size of the main settlement nodes, their impact areas as activation centres (as centres of daily urban systems) and as sub regional centres. It is also necessary to take into account the individual characteristics of the sub-regions with respect to competitiveness of products, stability of economy, clusters and other economic details, human and social capital, efficiency of institutions.

The direction of further researches should focus on:

- Searching for an appropriate set of variables;
- Testing methods (including making decision on the number of types) by doing typologies and classification in a larger set of sub-regions, especially for all non-metro sub-region in EU.

References

1. Abdi, H. and Williams, L. J. (2010): *Principal component analysis*. WIREs Comp Stat, 2: 433–459. doi: 10.1002/wics.101.
2. Bauer R. (2010): *Scaling through Space: A Demographic Typology of European Regions*, Department of Geography & Regional Research University of Vienna, VID Colloquium – 14.12.2010 (slides), http://www.oeaw.ac.at/vid/download/col101214rb.pdf.
3. *Development of a regional typology – Aim, methods and results. Work package 6 – Typology of regions in Europe* November (2010) I2SARE – Work package 6 – Typology of regions in Europe – November 2010 http://www.i2sare.eu/
4. Domański R. (2005): *Geografia ekonomiczna. Ujęcie dynamiczne*, Wyd. Naukowe PWN Warszawa.
5. Eurostat: Official webpage of European Union Statistics, available online at http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database
6. Everitt B.S., Landau S., Leese M, Stahl D. (2011): *Cluster Analysis*, Wiley, Chichester.
7. Jackson J. E. (1991): A User's Guide To Principal Component, John Wiley & Sons, New York
8. Lolliffe I.T. (2002): *Principal Component Analysis*, Springer, New York.

9. Shepherd J. (2009): Typology of the Smaller Rural Sub-regions of England, Rural Evidence Research Centre Birkbeck College, www.rerc.ac.uk

10. Sołtys J. (2011): *Towns in the regional policy of activation of peripheral areas – choosing problems – the case of northern Poland*, in: "New Challenges for European Regions and Urban Areas in a Globalised World" – 51st International European Congress of the Regional Science Association, 30.08-03.09. 2011 r., Barcelona-Spain,

11. Sołtys J. (2012): *Spatial condition of activation of peripheral areas – the case of Northern Poland*, in: ERSA (European Regional Science Association) Congress 'Regions in Motion - Breaking the Path' 52nd European Congress of the RSAI, Bratysława, 21-25.08.2012.

12. Typology of metro regions (2012): http://epp.eurostat.ec.europa.eu/portal/page/portal/region_cities/metropolitan_regions

13. Wojnicka E. (2009): *Metropolie jako bieguny wzrostu*, [in:] *Potencjalne metropolie ze szczególnym uwzględnieniem Polski Wschodniej*, Z. Makieła (Ed.), „Studia KPZK PAN", vol. CXXV, Warszawa, p. 30-46.

14. Zasada I, Loibl W., Köstl M., Piorr A. (2013*): Agriculture under human influence: a spatial analysis of farming systems and land use in european rural-urban-regions* – European Countryside, 2013 - degruyter.com, Europ.Countrys. 1 2013,· p. 71-88.