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TYPOLOGY OF LOW DEVELOPED NON-METROPOLITAN SUB-REGIONS IN THE EUROPEAN UNION

TYPOLOGIA NISKO ROZWINIĘTYCH NIEMETROPOLITALNYCH PODREGIONÓW UNII EUROPEJSKIEJ

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Summary: This paper shows a typology of 319 NUTS-3 sub-regions in the European Union. The selected sub-regions are non-metropolitan sub-regions, whose gross domestic product *per capita* in 2011 was below 75% of the EU average. The objective of this typology was to recognize diversity in the examined sub-regions as a starting point for the selection of areas for future comparative research. The typology takes into account 24 variables related to the state and dynamics of socioeconomic development, demography, the functional structure of a sub-regions' economies and population density. Two methods applied to carry out the research were: Principal Component Analysis (PCA) and cluster analysis, which works using the *k*-means algorithm for grouping sub-regions into types. The last part of the paper presents characteristics of each type, characteristics of overall result by states and listing of type membership. In a similar typology previously prepared by the author, six types of sub-regions revealed national specifics that caused the difficulty of selecting sub-regions for international comparison. In contrast, the new typology described in this paper is based on four types and includes more sub-regions from more countries in each type.

Keywords: cluster analysis, European Union, non-metropolitan sub-regions, peripheral areas, typology.

Streszczenie: Artykuł prezentuje typologię 319 niemetropolitalnych podregionów Unii Europejskiej, w których produkt krajowy brutto na mieszkańca w 2011 r. był poniżej 75% średniej unijnej. Celem typologii było poznanie zróżnicowania badanych podregionów jako punkt wyjścia do wyboru obszarów przyszłych badań porównawczych. Typologia uwzględnia 24 zmienne dotyczące stanu i dynamiki rozwoju społeczno-gospodarczego, demografii, struktury funkcjonalnej gospodarki i gęstości zaludnienia. Zastosowano metody: składowych głównych (PCA) i analizy skupień z algorytmem k-średnich do grupowania podregionów w typy. Ostatnia część artykułu zawiera charakterystykę poszczególnych typów i ogólnego wyniku według państw oraz listy podregionów w każdym typie. W podobnej typologii

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uprzednio sporządzonej przez autora, z sześcioma typami, w ich składzie przejawiała się narodowa specyfika, co skutkowało trudnością wyboru podregionów do porównań międzynarodowych. Nowa typologia opisana w artykule zawiera cztery typy, w każdym z nich więcej podregionów z większej liczby państw.

Słowa kluczowe: analiza skupień, obszary peryferyjne, podregiony niemetropolitalne, typologia, Unia Europejska.

1. Introduction

Large differences in levels of development are a common phenomenon, especially when comparing metropolitan and non-metropolitan areas, which may also be called peripheries. They are defined within the European Union (EU) as non-metro-regions at NUTS-3 level according to Eurostat [*Typology of Metro Regions* 2012]. For this reason, the author intended to develop a typology of sub-regions at the level of NUTS-3. Peripheries can be seen in different scales: European, national and regional. Taking into account the perspective of a regional policy pursued by regional authorities, development typically concentrates in regional capital cities. Therefore, differences arise when we look at development in the sub-regions of regional capitals compared to other sub-regions. This is another reason for preparing a typology of sub-regions specifically at NUTS-3 level, and despite the fact that less data is currently available for this level than for regions at the level of NUTS-2.

If a lack of endogenous growth factors creates a barrier to initiating growth from the inside, external intervention in regional policy is needed to overcome this barrier. To help in policy-making, the author plans to research the subject "Regional development of peripheral areas – determinants and mechanisms." Thus, the author's **objective** in formulating the typology is recognition of diversity in the non-metro NUTS-3 sub-regions as a starting point for the selection of sub-regions for future comparative research in the above-mentioned subject. For the purpose of this study, a new typology was developed in contrast to a previous author's study where grouping sub-regions into six types had failed to achieve the objective because of their national specificity of types. In the new typology there are sub-regions from more countries in each type.

A low level of development is one of the biggest problems in many peripheries. For this reason, the typology was made for sub-regions in which GDP *per capita* is below 75% of the EU average. Those criteria are fulfilled by sub-regions in 19 countries, exclusive of: Austria, Cyprus, Denmark, Finland, France, Ireland, Luxembourg, the Netherlands and Sweden.

Although many typologies of EU regions have been elaborated, most of them have concerned NUTS-2 level. One of the most known typologies developed for regions at the NUTS-3 level is that according to the OECD's approach [Brezzi, Dijkstra, Ruiz 2011]. The new European Union typology [*Urban-rural Typology*] is similar to this typology. However, because both typologies classify regions as predominantly urban,

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intermediate or predominantly rural, the author believes them to be insufficiently comprehensive for the aforementioned objective.

For preparation of the typology, data was sourced solely from Eurostat. Most of the data used in the typology concerns 2011. Data from the Eurostat also predetermined the years for measurement of dynamics. For some countries, data from Eurostat only included the following periods: 2006–2012, 2007–2010, 2007–2011 or 2007–2012. Due to the lack of some data available for those years, the typology excludes 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).

Principal Components Analysis (PCA) and the cluster analysis were the two methods used in forming the typology. Shepherd [2009] describes the process of developing a typology based on these methods in terms of four main stages:

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. Selection of variables

As many as 24 variables for input were selected to characterize each sub-region and cover the following aspects important for regional development:

- level of economic and socioeconomic development,
- dynamics of economic and socioeconomic development,
- demographic features, including features equivalent to "Quality of Life,"
- structure of economy by NACE[1],
- intensity of use of space.

The level of economic development was calculated as gross domestic product (GDP)[2] per 1,000 inhabitants, which is presented as a percentage of the total for EU28, and based on euro per inhabitant. Level of socioeconomic development was measured by the employment rate per 1,000 inhabitants of working age, which is 15–64 years old (EM_I).

Dynamics of economic and socioeconomic growth were measured by the following indicators:

- growth rate of employment for the period 2006–2012 (EMD);
- growth rate of gross value added (GVA) at basic prices for the period 2007–2011; in:
  - agriculture, forestry and fishing (VAD),

[1] The acronym for "Nomenclature statistique des activités économiques dans la Communauté européenne" – "statistical classification of economic activities in the European Community" [Eurostat 2008].

[2] Abbreviations of variables shown in parentheses are used further in tables.

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  - industry (VID),
  - construction (VCD),
  - services (VSD);
- net migration rates for 2007–2010 per 1,000 inhabitants, as the average for 2007–2011 (MIGR);
- dynamics of total population change for the period 2007–2012 per 1,000 inhabitants, as the average for 2007–2012 (POPD).

Measurement of "Quality of Life" presented a challenge due to the lack of quantitative indicators. Thus, for the purpose of this study, net migration rates and dynamics of total population change were used as equivalents because they have been correlated with "Quality of Life."

Two demographic indicators concerning the age structure were also used:

- age dependency ratio – people of non-working age (younger than 15 or older than 64) per 1,000 working-age population (AGE1),
- ratio of people of post-working age (older than 64) – to the people of pre-working age (younger than 15) (AGE2).

The structure of economy was measured according to the following NACE indicators:

- employment rate per 1,000 inhabitants of working age (15–64); in:
  - agriculture, forestry and fishing (EMA_I),
  - industry (EMI_I),
  - construction (EMC_I),
  - services (EMS_I);
- gross value added (GVA) per 1,000 habitants of working age (15–64); in:
  - agriculture, forestry and fishing (VA_I),
  - industry (VI_I),
  - construction (VC_I),
  - services (VS_I);
- gross value added – rate in %; in:
  - agriculture, forestry and fishing (VA%)
  - industry (VI%),
  - construction (VC%),
  - services (VS%).

Intensity of space use was measured by population density – persons per square meter (DENS).

A **standardization** of variables was used in the analysis. Then the **correlations** between these 24 variables were calculated using Pearson's product-moment correlation coefficient. The resulting correlations were not high: only 19 correlation coefficients are higher than 0.50. The highest correlation coefficients appear between: GDP and VS_I, or gross value added per 1,000 habitants of working age in services (0.94), gross value added (in %) in industry and in service (negative coefficients – 0.92), employees in industry per 1,000 habitants of working age and gross value added

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(in %) in industry (0.84), gross value added in services per 1,000 habitants of working age and gross value added (in %) in services (0.83). When PCA is used, the use of variables that are correlated is allowed.

3. Principal Components Analysis

To prevent redundancies through inter-correlations, reduce the number of variables and extract the important information from the table of input variable, Principal Component Analysis (PCA) was used, while applying orthogonal Varimax rotation to maximize the factor differences. After this rotation, each original variable tends to be associated with one (or a small number) of components, and each component represents 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, Williams 2010]. Only those components in which eigenvalue is greater than 1 should be taken for rotation.

After carrying out PCA, the eigenvalues greater than 1 appear only for seven principal components, so only those seven components were used in rotation and the further procedure. These seven components, hereafter referred to as PC1, PC2, PC3, etc., explain almost 80% of the total variance of all variables. Table 1 presents a matrix of the loadings of seven principal components.

The first component, PC1, correlates mainly with GDP, and negatively with two variables concerning agriculture with forestry and fishing (employment per 1,000 habitants of working age, rate in % of gross value added). As a result, PC1 can be termed "economic development."

PC2 has very high negative correlations with variables concerning development of industry and positive correlation with the variable concerning development of services. As a result, PC2 can be termed "service/industry."

PC3 has a high correlation (0.93) with the number of employees per 1,000 inhabitants of working age, so it can be termed "employment."

PC4 correlates mainly with variables concerning the development of construction and thus can be termed "development of construction."

PC5 concerns variables of demography. It can be termed "demography."

PC6 positively correlates (0.78) with the variable "gross value added in agriculture, forestry and fishing per 1,000 habitants of working age." Negative correlation is with density (−0.69). This component can be termed "development of agriculture."

Similarly, PC7 correlates with the dynamics of gross value added by NACE. The highest correlation concerns the dynamics of services (0.86), with lower correlations for construction (0.55), industry (0.44) and the dynamics of the number of employees (0.34). This component can be termed "dynamics of development, mainly of services."

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Table 1. Principal components greater than 0.3 after Varimax rotation

Variables	PC1	PC2	PC3	PC4	PC5	PC6	PC7
GDP	0.79	0.38					
EM_I			0.93				
EMD					0.58		
VAD	−0.41						
VID	−0.37						0.44
VCD				0.62			0.55
VSD							0.86
MIGR	0.38				0.65		
POPD	0.46				0.69		
AGE1		0.59	0.45		−0.38		
AGE2		0.37	0.36		−0.62		
EMA_I	−0.79		0.36				
EMI_I		−0.89					
EMC_I	0.38		0.57	0.48			
EMS_I	0.56	0.37	0.51				
VA_I		0.36				0.78	
VI_IP	0.62	−0.57	0.31				
VC_I	0.58			0.66			
VS_I	0.68	0.63					
VA%	**−0.84**					0.37	
VI%		**−0.97**					
VC%				**0.93**			
VS%	0.42	**0.87**					
DENS						−0.69	

Source: author's own elaboration based on Eurostat.

4. Results

The typology was based on the transformed data matrix for seven principal components. The final stage in the process involved clustering the sub-regions according to their scores in the seven dimensions in the transformed data. Cluster analysis is the preferred generic term for procedures which seek to uncover groups of data [Everitt et al. 2011]. The data analyst Jarosław Łosiński made a typology using the *k*-means algorithm; and based it upon the numerical "distances" between

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the objects (sub-regions) when represented by the scores on the seven component dimensions. The algorithm found a division within the data in which the sub-regions within each cluster were as close to each other and as far from sub-regions in other clusters as possible [Shepherd 2009]. "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]. In the previous typology, which was based on the same set of data, the use of six types of sub-regions revealed national specifics. Now sub-regions have been clustered into four types. The typology with four types works better than the one with five or six types to realize the objective of the study (future comparative research) because in the new typology there are sub--regions from more countries in each type. A smaller number of types causes the loss of too many differences.

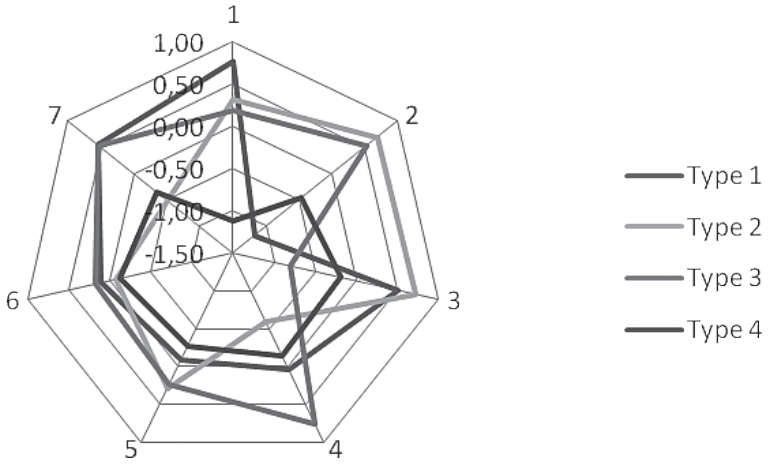

Figure 1. Types cluster profiles using the average values of the principal components

Source: author's own elaboration based on Eurostat.

Each of the four types were characterized by: average (see Figure 1), minimum and maximum of the principal components (see Table 2). The data in Table 2 show that clusters are spread. For this reason, there arises some difficulty in type description, which differs in typical classification. As opposed to typologies made from classification, the disadvantages of typologies made by grouping relate to:

- large ranges of values of components in one type;
- similar values of one component in more than one type.

For these reasons, types must be characterized by several components at once, not by single components. In classification each component would be split into classes, but seven components and seven classes would be too much. Some classes would contain no members [Banning 2000].

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Table 2. Quantitative characteristic of the types by principal components

Type	Measure	PC1	PC2	PC3	PC4	PC5	PC6	PC7
1	max.	2.10	0.48	4.51	2.47	2.27	2.21	2.19
	min.	−0.36	−3.50	−0.91	−1.65	−2.42	−1.28	−1.01
2	max.	1.46	2.40	4.22	1.47	5.12	2.71	1.78
	min.	−1.22	−1.16	−1.18	−2.65	−2.25	−7.12	−2.27
3	max.	1.34	1.84	1.37	2.71	2.36	3.84	2.74
	min.	−2.26	−0.80	−2.05	−0.98	−1.56	−1.31	−1.29
4	max.	0.31	0.86	1.85	2.67	2.19	1.08	1.98
	min.	−3.52	−2.15	−2.27	−2.18	−2.94	−1.07	−2.07

Source: author's own elaboration based on Eurostat.

The characteristic of the types by input variable before standardization is more readable for type description than the characteristic by principal components.

Table 3. Quantitative characteristics of the types by chosen input variable values (before standardization)

Type	Measure	GDP	EM_I	EMI_I	VI_I	VI%	VS_I	VS%	MIGR	POPD	AGE2
1	max.	73	898	307	13.7	63.8	16.4	67.1	16.2	109	325
	min.	17	476	60	2.6	20.9	2.5	29.6	−10.2	88	74
2	max.	74	1036	158	7.4	34.8	22.3	91.5	30.4	135	274
	min.	32	426	20	0.3	1.5	6.6	57.3	−3.7	85	51
3	max.	74	702	154	5.5	34.9	19.9	86.8	18.8	115	205
	min.	18	358	27	0.3	1.3	3.4	51.8	−11.2	93	59
4	max.	35	781	248	4.4	53.5	7.1	69.7	3.2	100	214
	min.	10	343	73	0.4	12.3	1.7	32.0	−14.2	82	76

Source: author's own elaboration based on Eurostat.

The simplified type characteristics can be summarized as follows:

Type 1: Medium and more developed[3] (GDP 17–73% of EU28), industrial (share of industry 34–64% in GVA in most sub-regions), the oldest age structure.

Type 2: Medium and more developed (GDP 32–74% of EU28), the best-developed services, well-developed industry (but less than in type 1), the highest employment, growing population in 76% of sub-regions.

Type 3: Medium and more developed (GDP 18–74% of EU28), well-developed services (but less than in type 1), the lowest employment, the highest share and dynamic of construction.

[3] Descriptions must be treated as relative. The GDP of all sub-regions is less than 75% GDP average in EU28.

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Type 4: Less developed (GDP 10–35 of EU28), fairly industrial (share of industry 29–54% in GVA in most sub-regions), the highest share of agriculture (11–27% in GVA in most sub-regions), 140–462 employees per 1,000 inhabitants of working age (in most sub-regions); negative net migration (except for ten sub-regions), decreasing population (except for one sub-region), the lowest density (14–61 inhabitants per 1 km^2 in most sub-regions).

General results of the typology by country are shown in Table 4.

Table 4. Overall result of the typology by country

Country		Type				Number of subregions	Total of types	% of sub-regions in one predominant type
Code	Name	1	2	3	4			
CZ	Czech Republic	13				13	1	100.0
LT	Lithuania				7	7	1	100.0
BE	Belgium	2		6		8	2	75.0
BG	Bulgaria			1	21	22	2	95.5
HR	Croatia	2		5		7	2	71.4
DE	Germany	7		19		26	2	73.1
HU	Hungary	3			11	14	2	78.6
IT	Italy	1		21		22	2	95.5
LV	Latvia		1		4	5	2	80.0
MT	Malta		1	1		2	2	50.0
SK	Slovakia	3		3		6	2	50.0
SI	Slovenia	9		1		10	2	90.0
ES	Spain		1	9		10	2	90.0
UK	United Kingdom	1	26			27	2	96.3
EE	Estonia	1	1		3	5	3	60.0
EL	Greece	1	41	2		44	3	93.2
PL	Poland	6		21	4	31	3	67.7
PT	Portugal	11	14	1		26	3	53.8
RO	Romania	1	1	1	31	34	4	91.2
	Total	61	86	91	81	319	4	28.5

Source: Eurostat and author's own calculations.

In most countries one type dominates, with the average 80% of sub-regions in a predominant type. Domination is a bit weaker in this typology compared to the typology of six types. In the typology based on six types, the average was 81% of

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dominant type, where sub-regions from five countries belonged only to one type for each country. Now only Czech and Lithuanian sub-regions have one type for the whole country. In ten countries at least 80% of sub-regions belong to one type. The most diverse sub-regions are in Poland, with rather diverse sub-regions existing also in Portugal, Germany and Slovakia.

The following list organizes specific sub-regions of countries according to type:

Type 1

BG[4]: Gabrovo, 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, Mansfeld-Südharz, Kyffhäuserkreis, Sömmerda, Weimarer Land, Greiz, Altenburger Land;

EE: Kirde-Eesti;

EL: Arkadia;

HR: Primorsko-goranska zupanija, Istarska zupanija;

HU: Komárom-Esztergom, Gyor-Moson-Sopron, Vas;

LT: Klaipedos apskritis;

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

PT: Minho-Lima, Cávado, Ave, Tâmega, Entre Douro e Vouga, Baixo Vouga, Pinhal Litoral, Pinhal Interior Norte, Pinhal Interior Sul, Médio Tejo, Baixo Alentejo;

RO: Sibiu;

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

SK: Nitriansky kraj, Trenciansky kraj, Trnavský kraj;

UK: Gwent Valleys.

Type 2

EE: Põhja-Eesti, EL: Achaia, Aitoloakarnania, Argolida, Arta, Chania, Chios, Dodekanisos, Drama, Evros, Evrytania, Evvoia, Fokida, Fthiotida, Grevena, Ileia, Imathia, Ioannina, Irakleio, Karditsa, Kasto ia, Kavala, Kefallinia, Kerkyra, Kilkis, Korinthia, Lakonia, Larisa, Lasithi, Lesvos, Magnisia, Messinia, Pella, Pieria, Preveza, Rethymni, Rodopi, Samos, Serres, Thesprotia, Trikala, Xanthi; ES: Melilla;

LV: Pieriga;

MT: Malta;

PT: Alentejo Central, Algarve, Alto Alentejo, Alto Trás-os-Montes, Baixo Mondego, Beira Interior Norte, Beira Interior Sul, Cova da Beira, Dão-Lafões, Lezíria do Tejo, Oeste, Península de Setúbal, Região Autónoma dos Açores, Serra da Estrela;

RO: Ilfov;

[4] The codes identify a country by name as listed in Table 4.

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

Type 3

EE: Põhja-Eesti;

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

ES: Melilla (ES);

LV: Pieriga;

MT: Malta;

PT: Alentejo Central, Algarve, Alto Alentejo, Alto Trás-os-Montes, Baixo Mondego, Beira Interior Norte, Beira Interior Sul, Cova da Beira, Dão-Lafões, Lezíria do Tejo, Oeste, Península de Setúbal, Região Autónoma dos Açores, Serra da Estrela;

RO: Ilfov;

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

Powys, Scottish Borders, Sefton, South Nottinghamshire, South West Wales, Torbay, West and South of Northern Ireland (UK), Wirral;

RO: Giurgiu;

SI: Pomurska;

SK: Banskobystrický kraj, Presovský kraj, Zilinský kraj.

Type 4

BG: Blagoevgrad, Dobrich, Haskovo, Kardzhali, Kyustendil, Lovech, Montana, Pazardzhik, Pernik, Pleven, Razgrad, Ruse, Shumen, Silistra, Sliven, Smolyan, Targovishte, Veliko Tarnovo, Vidin, Vratsa, Yambol;

EE: Kesk-Eesti, Lääne-Eesti, Lõuna-Eesti;

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

LT: Alytaus apskritis, Marijampoles apskritis, Panevezio apskritis, Siauliu apskritis, Taurages apskritis, Telsiu apskritis, Utenos apskritis;

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LV: Kurzeme, Latgale, Vidzeme, Zemgale;

PL: Chelmsko-zamojski, Pulawski, Sandomiersko-jedrzejowski, Sieradzki;

RO: Alba, Arad, Arges, Bacau, Bihor, Bistrita-Nasaud, Botosani, Braila, Buzau, Calarasi, Caras-Severin, Covasna, Dâmbovita, Gorj, Harghita, Hunedoara, Ialomita, Maramures, Mehedinti, Mures, Neamt, Olt, Prahova, Salaj, Satu Mare, Suceava, Teleorman, Tulcea, Vâlcea, Vaslui, Vrancea.

5. Conclusions

This study shows the possibility of carrying out a typological classification for sub--regions at the EU standard level NUTS-3, despite the fact that less data is available for this level than for the NUTS-2 level. Based on the available data, indicators that are important for the evaluation of regional development can be constructed. Nevertheless, more data would greatly improve the practicability of the typology.

Disadvantages of applying a typology, as opposed to classification, include a large range of values of components and variables in one type and similar values in more than one type. For these reasons, types must be characterized by several components at once, not by single components.

Statistical characterization of sub-regions is insufficient for the planning of a regional policy. A typology or a classification based on spatial analyses is necessary. It is also necessary to take into account the individual characteristics of sub-regions.

The direction of further research studies should focus on:

- identification of an appropriate set of variables;
- advancement of testing methods (e.g. for selecting the number of types) by doing typologies and classification for a larger set of sub-regions, especially for all the non-metropolitan sub-regions in the EU.

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