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*POSSIBILITIES OF ASSESSING THE DIVERSITY OF ECONOMIC
GROWTH AT A LEVEL LOWER THAN NUTS 3*

**MOŻLIWOŚCI OCENY ZRÓŻNICOWANIA WZROSTU
GOSPODARCZEGO NA POZIOMIE NIŻSZYM NIŻ NUTS 3**

Key words: regional development, spatial development, rural areas, cluster analysis

Słowa kluczowe: rozwój regionalny, rozwój przestrzenny, obszary wiejskie, analiza skupień

Abstract. The study presents a method enabling the assessment of the economic growth of communes (NUTS 4) and counties (NUTS 5). It allows overcoming problems coming up during the investigation of developmental processes occurring inside provinces (NUTS 2), resulting from the fact that state statistics services do not measure the amount of the GDP produced at this level. Below there are results of analyses for Mazovian Province.

Researching development processes taking place inside provinces, which are considered as 2nd level in the Nomenclature of territorial units for statistics in the European Union (NUTS 2) requires specification of the spatial distribution of production. The information that state statistics services provide on this subject is insufficient, because subregions, so called NUTS 3, for which the Central Statistics Office (CSO) in Poland is assigning the value of the GDP, refer to too large areas and are diversified internally. [Lusawa 2004]. Information relating to counties (NUTS 4) and communes (NUTS 5) would prove to be more useful. These are not available, however. The problem was solved by showing a strong correlation between the GDP per capita measured at the NUTS 3 level and internal income of communes aggregated at this level and calculated per inhabitant. This dependence occurred both when the CSO isolated 45 [Lusawa 2007] and when their number was increased to 66. The calculation results are shown in table 1. The strength of the relation perceived (value R^2 in the models for individual years exceeded 87.6%) allowed making the assumption that dependence between the internal income of communes and the GDP produced in their area will be similar to that observed at the NUTS 3 level. Therefore, knowing precisely the amount of income of individual communes, it is possible to estimate the amount of the GDP per capita in individual communes. This sort of estimate must be burdened with an error stemming from the dissimilar structure of production in individual units. Enterprises belonging to different sectors of economy conducting activities in dissimilar organizational structures and on a different scale transfer to a commune's budget different part of the GDP. Realizing this weakness of the proposed measure, it was decided, however, to use it making the assumption that:

Table 1. The results of estimating the parameters of equations of straight-forward regression between the amount of internal income per capita of communes aggregated at the NUTS 3 level and the amount of the GDP calculated by the CSO at this level

Year for which calculations were made	Constant	Coefficient	R^2 [%]	Standard error of prediction
2004	2678.38	21.00	88.54	3040.84
2005	4005.15	18.78	87.75	3498.43
2006	5110.99	17.51	87.60	3867.50

Source: internal calculations.

1. It will not be used for calculating the GDP, and only for estimating its diversity in space.
2. Units of administrative division will be grouped as per statistical similarity of a feature under analysis (a method of analysing concentrations), which will considerably reduce the said error.

In order to assess the diversity of economic growth in individual units of administrative division, a measure was used, which was named an Index of Human Resources Productivity (IHRP). It allows assessing the diversity of the GDP as converted into an inhabitant's head. The calculations were done with the aid of the software Statgraphics statistics package version 5.0 by using data concerning all 314 communes of Mazovia Province available at the Regional Data Bank of the Central Statistics Office on the website www.stat.gov.pl.

In order to underline that the analysis aim to assess the diversity rather than are an attempt to estimate the amount of the GDP, the calculation results were subjected to zero unitarization. The formula below was used for this purpose.

$$V_{un} = \frac{V_n - V_{min}}{V_{max} - V_{min}}$$

Explanation:

V_{un} – unitarized value of an n th observation,

V_n – value of an n th observation,

V_{min} – minimum value of an observation in a group subject to unitarization,

V_{max} – maximum value of an observation in a group subject to unitarization.

This method is used in economic research and allows showing individual observations against the background of the entire collectivity. The value of the calculated indices fits into a range from 0 (an observation with the lowest value of a measured feature) to 1 (an observation marked with the highest value). For distinction, the value of the IHRP after unitarization was named IUHRP).

Results of analysis

Using the IUHRP allows to make an assessment of the spatial diversity of economic growth in a region. The first thing that draws one's attention is a strong left asymmetry of the distribution of this measure. As it was mentioned in the part devoted to the methodology, the value of the index fits into a range $<0.1>$. The value of the bottom quartile in the population under investigation accounted for 0.04, medians 0.06, top quartile 0.11. It denotes that as much as 75% of the communes under investigation only inconsiderably exceed in terms of development a unit marked by the lowest value of a feature under investigation. By the Cluster analysis method six groups of communes were isolated, typified by the statistical similarity of economic development (table 2).

Cluster 1. included 188 (59.87% of the population covered by the investigation) of the most poorly developed communes. The average IUHRP value in this group accounted for 0.044, but it varied from 0 (Rościszewo, Sierpc districts) to 0.07 (Mała Wieś, Płock County). Rural communes (167) prevailed in this group. Urban-rural communes numbering 20, formed 12% of the group. Moreover, one town was found among the units under discussion. The area of the communes belonging to this group varied from 15 sq km (Łaskarzew Town, Garwolin County) to 372 sq km (Chorzele, Przasnysz County). The population of these units in 2007 totalled from 2575 citizens (Czarnia, Ostrołęka County) to 19275 (Nasielsk, Nowy Dwór Mazowiecki districts). The internal

Table 2. A profile of concentrations (groups) of communes of Mazovian Province isolated on the basis of the Index of Population Productivity (IHRP)

Concentration number (cluster)	Count of concentration	Percentage of population under investigation	Value of IUHRP in 2006	Population density [people/sq km]		Average number of town inhabitants [thousands]
				rural communes	urban-rural communes	
1	188	59.87	0.044	48	68	4.8
2	46	14.65	0.091	55	111	11.2
3	55	17.52	0.154	66	162	39.5
4	13	4.14	0.267	155	257	29.5
5	9	2.87	0.411	175	314	49.5
6	3	0.96	0.772	190	-	1702

Source: internal calculations.

income of these units fitted into the limits from PLN 296 to 727 as converted into an inhabitant's head. They averaged PLN 554 per capita with an average in the province of PLN 863.

Cluster designated with number 2 is formed by 46 communes (14.65% of units under investigation), among which 4 towns (Maków, Przasnysz, Raciąż and Sierpc) lying in the north part of the province, 9 urban-rural communes and 34 rural communes are found. The value of the IUHRP fitted into the limits from 0.08 to 0.11 (on average 0.09). Like in the previous concentration, units with low population density dominated. On average 95 people lived in 1 sq km (the average in the province 145 people per sq km). They were therefore communes of agricultural nature, typified by a lower level of income. The average for the province was exceeded by 21 communes. The highest income of PLN 946 per capita was reached by the urban commune of Sierpc. The range of income variability in this group was relatively small. The difference between the highest and lowest income accounted for PLN 210.

Cluster 3 covers 23 towns, 13 urban-rural communes and 19 rural communes. Internal income of the units averaged PLN 1195 as converted into an inhabitant's head. The diversity of internal income of communes, converted into an inhabitant was relatively small in this group and to a slight degree depended on a type of unit. Rural communes averaged PLN 1130, urban-rural ones PLN 1225, urban ones – PLN 1229 per capita. The average amount of the IUHRP in this group reached 0.15.

Cluster 4 composed 13 communes belonging to surrounding districts of Warsaw. Most of them (9) are situated on the left (west) bank of the Vistula. They are units with a high degree of urbanization. Only two out of them indicated population density smaller than 100 people per 1 sq km. They were the communes of Wieliszew and Żabia Wola. The most densely populated rural commune belonging to this group was Raszyn - 451 people/1sq km. It seems that people were encouraged to settle in these units by the proximity of the capital as well as their wealth. The average value of the IUHRP reached 0.27, and average internal income of these units reached the level of PLN 1856.

Cluster 5, composed of 9 communes (2.9% of the population covered by investigation) was formed by: Płock and adjacent Słupno Commune, as well as seven units located in the direct neighbourhood of Warsaw, on the left bank of the Vistula. The average value of the IUHRP reached 0.41.

Cluster 6 was formed by: the capital city of Warsaw, as well as rural communes: Lesznowola bordering on the capital and, located slightly further, but also in the neighbourhood of the city, Nadarzyn. The average value of the IUHRP as calculated for this group reached 0.77, and the average amount of internal income as converted into an inhabitant – PLN 4811.

The analysis of the presented figures allows formulating a thesis that the economic development of communes is correlated positively with the degree of area urbanization. Data compiled in table 2 show that the IUHRP reflecting the amount of the GDP (per capita) yielded within a given unit increase as there is a rise in the size of towns and the population density of rural and urban-rural communes making up individual concentrations.

Spatial polarization of the development of the region

Transferring the calculation results onto a map shows the spatial diversity of the region (figure 1). It enables showing that Mazovia Province shows the signs of strong development polarization. It involves the shaping of the overdeveloped centre of the region comprising Warsaw and administrative units surrounding it. It illustrates the theory of a core and peripheries, presented in the studies by J. Friedemann and G. Myrdal [1972]. Comparing the presented results with earlier ones [Lusawa 2007] one could point out that the area gradually augments the distance separating it from the remaining part of the region. Investigations carried out by statistical methods allow specifying the range of this process for 50 km as counted from the city centre, that is 35 km from its borders [Lusawa 2007]. At this distance, an area, visible in the figure, is formed of congested population referred to in German literature as „Bacon Belt”¹. The shaping of this sort of areas around conurbations, given lack of an effective spatial policy may trigger adverse effects both for the city and areas located further and linked to it [Lusawa 2008].

¹ The term Bacon Belt is derived from the German word Speckguertel (a strip of pork fat or suet) and is used to define areas of affluence surrounding large urban conurbations.

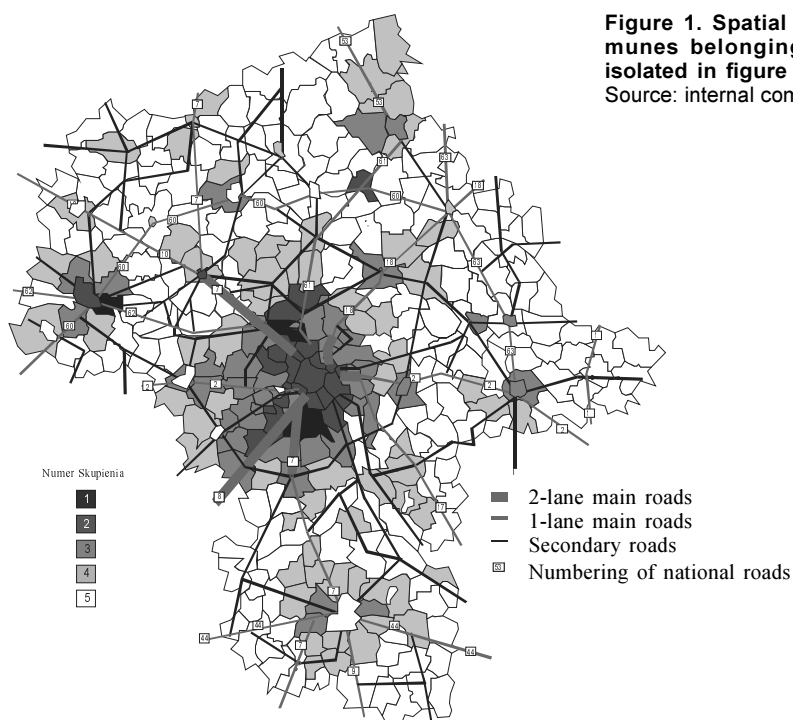


Figure 1. Spatial distribution of communes belonging to concentrations isolated in figure 1.

Source: internal compilation.

For peripheral areas, the situation described will mean suppressing developmental impulses coming out of Warsaw, with the concurrent intensification of the vortex effect². In consequence, one can expect the consolidation of currently observed adverse phenomena occurring in the social sphere (deformation of demographic structures) and ecological one (polluting the air with fumes, the issue of stacking municipal waste and, partially connected with it, the migration of wild species).

Conclusions

Previous experiences gained in the investigation of the spatial diversity of development indicate that the method under presentation may be an effective tool for isolating groups of communes marked by the statistical similarity of economic development. It is less sophisticated and subjective, and thus easier to be interpreted than that proposed by A. Sobala-Gwosdz (2005). It may form an introduction into in-depth analyses having practical importance. Until now, its usefulness has been checked to define:

- range of influences of development centres at regional level [Lusawa 2006, 2008] and subregional one (a study under preparation)
- analysis of migration phenomena having a substantial influence on the developmental potential of communes and counties [Lusawa 2005]
- formation around development centres of areas of increased population density [Lusawa 2008]

It also seems that it may be applied when investigating the mutual influences of conurbations such as Warsaw and Łódź or Radom and Kielce, as well minor centres such as Płock and Włocławek, Ostrołęka and Łomża. It may prove to be an interesting issue important for shaping regional policy to isolate correlated factors with economic growth and set parameters of the so-called envy function describing a population's preferences in selecting a place of residence.

² Vortex effect – a concept used by G. Myrdal for illustrating the process of accelerating the development of large conurbations benefiting from the resources (mainly human capital) of the regional surroundings. Peripheral units which bear the costs of recreating the resources are unable to generate appropriate means for development. As an example, communes situated in rural areas of Mazovian Province expended on average 46% of the means held on education in 2006. This way the development of large cities occurs to a large degree at the cost of other local communities.

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Streszczenie

W opracowaniu przedstawiono metodę umożliwiającą ocenę wzrostu gospodarczego gmin (NUTS 4) i powiatów (NUTS 5). Pozwala ona pokonać problemy pojawiające się podczas badań procesów rozwojowych zachodzących wewnątrz województw (NUTS 2) wynikające z faktu, że państwowe służby statystyczne nie mierzą wielkości PKB wytworzonego na tym poziomie. Zaprezentowano wyniki analiz dla województwa mazowieckiego.

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