

AN ATTEMPT TO DETERMINE THE FUNCTIONAL AREA OF WARSAW WITH THE USE OF THE MEASURE OF RELATIVE DEVELOPMENT LEVEL AND HELLWIG'S MEASURE

Mariola Chrzanowska, Nina Drejerska, Iwona Pomianek

Warsaw University of Life Sciences – SGGW

Abstract. Mazovian Voivodeship is an area where socio-economic situation is significantly diverse. It is a real challenge for regional development policy which in Poland aims at increasing competitiveness and achieving cohesion by 2020. The use of selected taxonomic measures to compare the development level of selected communes in Mazovia allowed to determine whether the regional policy so far has led to socio-economic growth of all or just some of the investigated communes. Those urban-rural and rural communes of the highest development level in the Mazovia region seem to create a quite coherent area around Warsaw; it was proved by the results of statistical analysis with the use of the relative development level and Hellwig's measure for the years 2002 and 2009.

Key words: regional development, regional policy model, taxonomic measure, Mazovia Voivodeship

INTRODUCTION

The beginning of the twenty-first century was a period of an extensive discussion, both in Poland and other European countries, and also at the level of the European Union on a choice of a model of regional policy. Representatives both of the theoretical sphere as well as practitioners of regional policy took into consideration a compensatory model and polarization-diffusion model.

The first one, the compensatory model, assumes as the main goal to equalize inter-regional differences and get social, economic and territorial cohesion. It means that funds should be directed to the regions and the people unable to overcome the constraints of development on their own [Drejerska 2010, pp. 45–54]. However, it occurred to be economically inefficient. Such kind of support improved the situation of disadvantaged re-

Corresponding author: Warsaw University of Life Sciences – SGGW, Faculty of Economic Sciences, Nowoursynowska 166, 02-787 Warsaw, Poland, e-mail: mariola_chrzanowska@sggw.pl, nina_drejerska@sggw.pl, iwona_pomianek@sggw.pl

gions, although not through a profound change in their reconstruction. Increasing expenditures for the implementation of this model failed to bridge the gap between the regions of the highest and the lowest development levels. Differences between “the strong” and “the weak” regions did not disappear, even in relatively highly developed countries which were taking fairly intensive efforts to reduce them. It was even concluded that interregional differences are partly ‘a product’ of history and they result from natural and cultural conditions. Hence it is very difficult to overcome them. We can point to many examples of such inefficiency of the compensatory model; one of them is called “European Triple Mezzogiorno”¹. This term describes 18 regions of southern Italy, eastern Germany and eastern Poland with 7.5% of the EU area and 42 million people. They are characterized by unsatisfactory macroeconomic indicators, few prospects of development, low birth rate, high dependence on agriculture, underdeveloped industry and services.

To the contrary, the model based on competitiveness (sometimes described as the diffusion and polarization model) assumes dynamic growth in the major urban areas and then by creating appropriate conditions for diffusion, it will have a positive influence on development of the more remote areas. In a long-term perspective, it can have a positive effect on reducing interregional differences, including the basic indicator as the level of GDP *per capita*. However, this kind of approach confirms normal processes of diversification of social and economic development level which take place around the world. On the other hand, its opponents argue that we do not have any reliable mechanisms and instruments for spreading development from its centres to more distant areas so we cannot be sure that this diffusion will really take place in the future.

So far, the Polish regional policy seems to be close to the model based on competitiveness stressed in the Poland 2030 Report, which was created by the Board of Strategic Advisers to the Prime Minister of Poland [Boni 2009, p. 5]. This report uses directly the term of the polarization and diffusion model for the whole economic policy of Poland. However, the National Strategy of Regional Development 2010–2020: Regions, Cities, Rural Areas does not include this term literally (polarization and diffusion); it recalls the model based on competitiveness [National Strategy... 2010, p. 6].

RESEARCH METHOD

The Mazovian Voivodeship is a region of a highly diversified level of socio-economic development. Warsaw and its surroundings stand out both on the background of Mazovia and the entire country, creating a functional area of the capital agglomeration. Research in this field has been carried out by many authors²; however, as yet, no widely accepted method has not been adopted (both among academics and practitioners) for determination of functional areas indicating unambiguously legitimate criteria (variables). Therefore,

¹Potrójne Europejskie Mezzogiorno. Wyzwania dla spójności w Europie. The conference organized by the Ministry of Regional Development, 24–25 September 2009, Warsaw.

²For example [Strahl 2006], [Ekspercki Projekt... 2008], [Rosner 2008, pp. 18–30], [Bański 2009, pp. 210–228], [Bański, Komornicki, Kulikowski, Śleszyński, Czapiewski, Mazur 2009], [Pomianek 2010, pp. 227–239], [Wysocki 2010, pp. 305–364], [Heffner 2011, pp. 9–34], [Adamowicz, Janulewicz 2012].

attempts in this area seem to be justified – they may in fact reconcile theory and practice to achieve more optimal solutions in this field. This is particularly significant in the context of the new paradigm of development policy which assumes territorialization of both the EU cohesion policy and other sectoral policies. Greater flexibility in delimitation of cohesion policy areas, not just construction on the basis of administrative boundaries, is postulated in the Fifth Cohesion Report of the European Commission.

The aim of the paper was an attempt of determination of the functional area of Warsaw using the relative development level and the measure of Hellwig. Detailed research objectives also included:

- comparison of the local development level of selected communes in the Mazovia region,
- determination, on the basis of the selected indicators, of characteristics of communes with the highest and the lowest development levels described through the results of selected taxonomic methods,
- analysis of the results obtained in 2009 in comparison with the year 2002.

The analysis took into account the data of the Local Data Bank of the Central Statistical Office for 279 urban and rural-urban communes in the Mazovia region. The paper has been prepared as a part of the project entitled “Economic and social determinants of rural areas development of the Mazovia region in the suburban and external zone of Warsaw”, No N N114 145240, financed by National Science Centre (Poland).

The selection of variables was based on their importance for the study of entrepreneurship, demography, infrastructure, social and technical infrastructure. To a large extent it also depended on the availability of data at the local level and in selected years. As a result, the following set of variables was taken into account:

- 1) demographic dependency ratio (post-working age population per 100 people at working age),
- 2) percentage of children aged 3–6 years provided with pre-school education,
- 3) number of foundations per 1,000 people,
- 4) number of associations and social organizations per 1,000 people,
- 5) unemployed as a % of the population at working age,
- 6) number of natural persons conducting economic activity per 1,000 people (private sector),
- 7) number of commercial companies per 1,000 inhabitants (private sector),
- 8) number of commercial companies with foreign capital per 1,000 inhabitants (private sector),
- 9) number of dwellings completed per 10 thousand inhabitants,
- 10) residents using water supply system as a % of the total population,
- 11) residents using sewage system as a % of the total population,
- 12) number of students per 1 computer with Internet access for students’ use – primary schools, excluding special schools,
- 13) number of students per 1 computer with Internet access for use by students – lower secondary schools, excluding special schools.

The research consisted of the following stages:

1) The Hellwig's measure (SMR)³ was calculated for each researched year. Then the studied objects were assigned to one of three groups:

- Group I (highly developed communes)

$$SMR_i < \overline{SMR} - s_{SMR}$$

- Group II (communes of a medium level of development)

$$\overline{SMR} - s_{SMR} \leq SMR_i \leq \overline{SMR} + s_{SMR}$$

- Group III (low developed communes)

$$SMR_i \geq \overline{SMR} + s_{SMR}$$

where: \overline{SMR} – arithmetic mean of the Hellwig's measure;

s_{SMR} – standard deviation of the Hellwig's measure.

2) At the second stage, the relative level of development (BZW)⁴ was set for each year. Similarly to the first stage, the studied objects were assigned to one of three groups on the basis of the calculated values:

- Group I (highly developed communes)

$$BZW_i \geq \overline{BZW} + s_{BZW}$$

- Group II (communes of a medium level of development)

$$\overline{BZW} - s_{BZW} \leq BZW_i \leq \overline{BZW} + s_{BZW}$$

- Group III (low developed communes)

$$BZW_i < \overline{BZW} - s_{BZW}$$

where: \overline{BZW} – arithmetic mean of the BZW measure;

s_{BZW} – standard deviation of the BZW measure.

3) At the end, the results obtained with both measures in both years were compared. In addition, the correlation of coefficients was calculated between individual measurements.

Statistical methods applied to compare objects (in this case rural and urban-rural communes of the Mazovia region) allow studying objects taking into account several factors simultaneously, which increases the efficiency of analyses. These indicators of development can also provide information both on the current state of development as well as on changes in its level with regard to individual communes. The application of statistical

³For more information see [Hellwig 1968, pp. 307–327].

⁴For more information see [Łuniewska and Tarczyński 2006].

techniques for modelling the development of Mazovian communes in 2002 and 2009 allowed to determine an area characterized by the highest level of development and a strong relationship with Warsaw – this area can be perceived as the functional area of Warsaw.

RESULTS

The results of the *BZW* measure calculations were used to establish a ranking of rural and urban-rural Mazovian communes in 2002 and 2009. In Table 1, only the beginning and the end of the list are presented because of limited space for the paper.

The Hellwig's measure (*SMR*) was also a base for ranking investigated communes (Table 2).

Table 1. Ranking of communes according to the *BZW* measure in 2002 and 2009

Ranking place	2002		2009	
	Commune	BZW_i	Commune	BZW_i
1	Raszyn	0.41	Lesznowola	0.64
2	Łomianki	0.38	Raszyn	0.41
3	Lesznowola	0.37	Piaseczno	0.39
4	Michałowice	0.36	Łomianki	0.37
5	Nadarzyn	0.33	Nadarzyn	0.37
6	Konstancin-Jeziorna	0.31	Michałowice	0.37
7	Wyszków	0.31	Konstancin-Jeziorna	0.34
8	Piaseczno	0.29	Grójec	0.34
9	Wieliszew	0.30	Izabelin	0.34
10	Grójec	0.27	Błonie	0.30
...
270	Radzanów	0.10	Leoncin	0.12
271	Tezów	0.10	Radzanów	0.12
272	Trojanów	0.09	Łyse	0.12
273	Zbuczyn	0.09	Lelis	0.12
274	Świercze	0.09	Łaskarzew	0.11
275	Dąbrówka	0.08	Szulborze Wielkie	0.11
276	Klembów	0.08	Trojanów	0.10
277	Szulborze Wielkie	0.08	Poświętne	0.10
278	Poświętne	0.08	Czarnia	0.10
279	Strachówka	0.07	Strachówka	0.09

Source: Authors' calculations.

Table 2. Ranking of communes according to the Hellwig's measure in 2002 and 2009

Ranking place	2002		2009	
	Commune	SMR_i	Commune	SMR_i
1	Michałowice	0.67	Lesznowola	0.96
2	Łomianki	0.67	Raszyn	0.77
3	Raszyn	0.66	Nadarzyn	0.70
4	Nadarzyn	0.65	Łomianki	0.67
5	Lesznowola	0.64	Michałowice	0.65
6	Konstancin-Jeziorna	0.60	Piaseczno	0.64
7	Wieliszew	0.60	Konstancin-Jeziorna	0.63
8	Piaseczno	0.59	Izabelin	0.60
9	Jabłonna	0.59	Grójec	0.59
10	Wyszków	0.57	Ożarów Mazowiecki	0.59
...
270	Czarnia	0.44	Radzanów	0.45
271	Osieck	0.44	Szydłowo	0.45
272	Świercze	0.44	Domanice	0.45
273	Poświętne	0.44	Poświętne	0.45
274	Przyłęk	0.44	Lelis	0.45
275	Domanice	0.44	Łaskarzew	0.44
276	Zbuczyn	0.43	Trojanów	0.44
277	Tczów	0.43	Czarnia	0.44
278	Szulborze Wielkie	0.42	Szulborze Wielkie	0.44
279	Strachówka	0.42	Strachówka	0.43

Source: Authors' calculations.

The leading positions of both rankings in both years were occupied by communes which are immediate neighbours of Warsaw, for example Łomianki, Konstancin-Jeziorna, Raszyn, Ożarów Mazowiecki or communes situated relatively close to Warsaw (the second or third line of neighbourhood) and with a good access to Warsaw, mainly through good roads, for example Nadarzyn. In the case of these communes it is even difficult to describe them as urban-rural ones; although they are classified as such according to the formal administrative approach, their social and economic situation makes them closer to real suburbs of Warsaw than areas having something in common with rural issues. Some more distant communes as Błonie or Grójec were also classified in the group of the most developed units; each of them has its own unique potential but they have also something very important in common – very good, as for the Polish conditions, access to transport.

The last positions in the rankings were usually occupied by considerably remote communes; typically this distance was longer than 100 km. However, there are some exceptions like Poświętne or Strachówka. They are quite close to Warsaw in terms of physical

distance but they do not have any good access to transport. Moreover, they can be characterized by considerable afforestation or a low development of the settlement network. It should be also stressed in this place that the interpretation of the results of the conducted statistical analysis is limited because of data accessibility as well as difficulties in measuring of some aspects of life quality. That is why, the results in the investigated communes cannot be widely interpreted, for example in relation to life quality of inhabitants of these units.

The next phase of the research included division of each the rankings into three groups – high, medium and low developed communes. The results of these classifications are presented in the following graphs (Figs 1, 2, 3 and 4).

The figures illustrate quite stable and coherent (especially from the perspective of the Hellwig's measure) area around Warsaw which can be perceived as its functional area. In the case of both indicators – the number of communes in the first group (majority of them are the closest to Warsaw) decreased, which can be a sign of consolidation of the functional area and establishment of relations that connect these communes with the capital city more tightly.

The last phase of the research included calculation of correlation coefficients between individual measurements (Table 3).

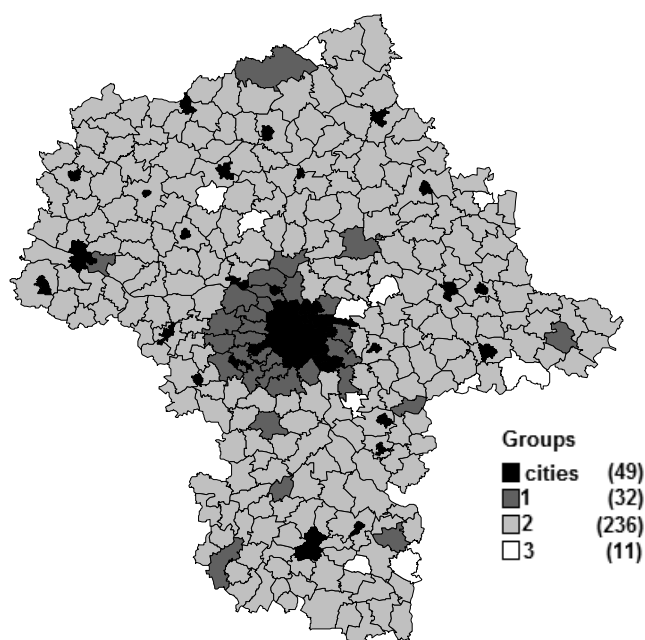


Fig. 1. Urban-rural and rural communes of the Mazovia region according to the Hellwig's measure (SMR) in 2002

Source: Authors' elaboration.

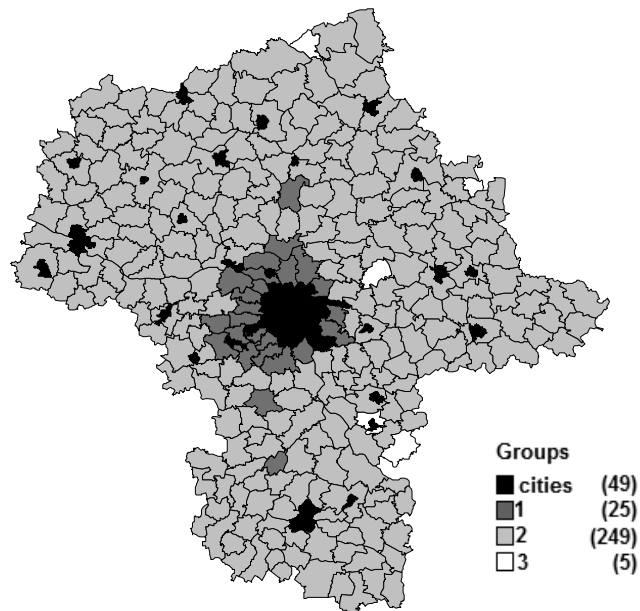


Fig. 2. Urban-rural and rural communes of the Mazovia region according to the Hellwig's measure (*SMR*) in 2009

Source: Authors' elaboration.

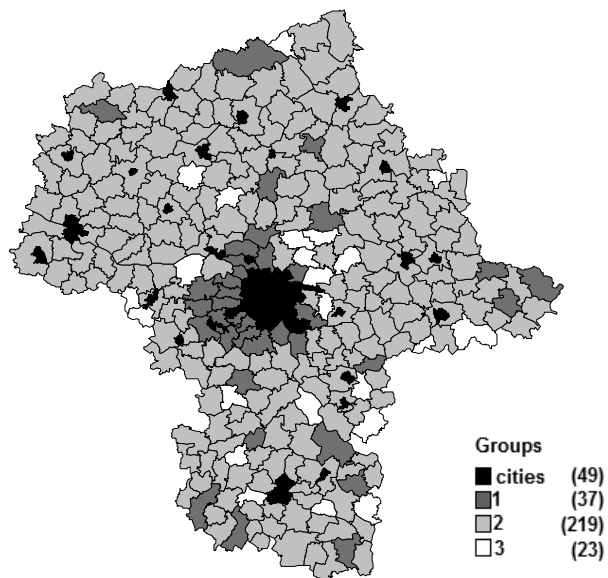


Fig. 3. Urban-rural and rural communes of the Mazovia region according to the *BZW* measure in 2002

Source: Authors' elaboration.

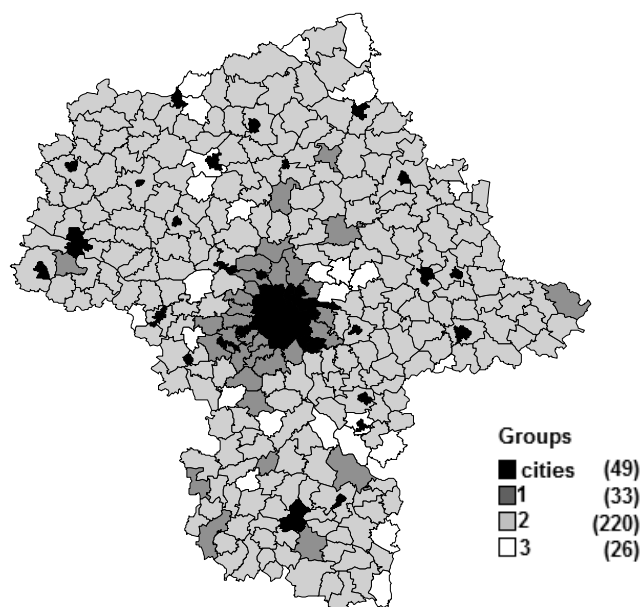


Fig. 4. Urban-rural and rural communes of the Mazovia region according to the *BZW* measure in 2009

Source: Authors' elaboration.

Table 3. Spearman correlation coefficient for rankings

	SMR_i 2002	SMR_i 2009	BZW_i 2002	BZW_i 2009
SMR_i 2002	1	0.83	0.94	×
SMR_i 2009		1	×	0.95
BZW_i 2002			1	0.83
BZW_i 2009				1

Source: Authors' calculations.

Analyzing the correlation between the rankings of the same year, very strong correlation can be noticed. The rankings of communes constructed using the two measures slightly differ. On the other hand, the Spearman correlation coefficient calculated for rankings built on the base of the same measures for different years indicates strong interdependence. In other words, there were no significant changes in the ranking of communes comparing the years 2002 and 2009.

CONCLUSIONS

Development of a commune is largely dependent on processes occurring in the so-called development centres. The centre of the Mazovia region, Warsaw, influences neighbouring communes, and thus accelerates their growth. Therefore, communes with

the highest level of development are located in this area (for example Lesznów, Łomianki). Communes of the lowest levels of development are peripheral ones (for instance Trojanów), those located in some distance from the main roads (e.g. Łyse, Lelis), but also those which are relatively close to Warsaw (for example Strachówka, Poświętne, Klembów) – communes which are not located directly at major transport routes; they do not use their internal potential and cannot overcome barriers.

The conducted analysis proves that a set of communes closest to Warsaw can be classified in a stable way as the functional area of the city. Moreover, the decrease in the number of communes classified as the most developed ones in the whole Mazovia region seems to be a sign of consolidation of development potential around Warsaw.

REFERENCES

- Adamowicz M., Janulewicz P., 2012. Wykorzystanie metod wielowymiarowych w określeniu pozycji konkurencyjnej gminy na przykładzie województwa lubelskiego (The use of multidimension methods to determine the competitive position of a commune on the example of Lubelskie Voivodeship). (in) *Metody Ilościowe w Badaniach Ekonomicznych* (Quantitative Methods in Economic Research) Vol. XIII, Issue 1 (in Polish).
- Bański J., 2009. Odrębność obszaru podmiejskiego w kontinuum miejsko-wiejskim (Separateness of suburban area in urban-rural continuum). *Czasopismo Geograficzne* 80 (4) (in Polish).
- Bański J., Komornicki T., Kulikowski R., Śleszyński P., Czapiewski K., Mazur M., 2009. Analiza zróżnicowania i perspektyw rozwoju obszarów wiejskich w Polsce do 2015 roku według kryterium powiązań z największymi aglomeracjami miejskimi i miastami oraz endogenicznego potencjału (Analysis of variation and perspectives for rural development in Poland by 2015, according to the criterion of relationships with major urban agglomerations and cities and endogenous potential). IGiPZ PAN (Polish Academy of Sciences), Expert report for the Ministry of Agriculture and Rural Development (in Polish).
- Boni M. (ed.), 2009. *Polska 2030. Wyzwania rozwojowe* (Development challenges). Kancelaria Prezesa Rady Ministrów, Warszawa (in Polish).
- Drejerska N., 2010. Good governance w polskiej polityce regionalnej (Good governance in Polish regional policy). *Zeszyty Naukowe SGGW w Warszawie, Ekonomika i Organizacja Gospodarki Żywnościowej* 83 (in Polish).
- Eksperski Projekt Koncepcji Przestrzennego Zagospodarowania Kraju 2008–2033 (Expert project of National Spatial Development Concept). IGiPZ PAN (Polish Academy of Sciences), MRR (Ministry of Regional Development), Warszawa 2008 (in Polish).
- Heffner K., 2011. Regionalny wymiar dychotomii rozwoju obszarów wiejskich (Regional dimension of rural development dichotomy). *Studia KPZK PAN* Vol. CXXXVII, Warszawa (in Polish).
- Hellwig Z., 1968. Zastosowanie metody taksonomicznej do typologicznego podziału krajów ze względu na poziom rozwoju oraz zasoby i strukturę wykwalifikowanych kadr (Application of the taxonomic method for typological distribution of countries due to the level of development and the structure of resources and qualified staff). *Przegląd Statystyczny* 15.4. (in Polish).
- Łuniewska M., Tarczyński W., 2006. *Metody wielowymiarowej analizy porównawczej na rynku kapitałowym* (Methods of multidimensional comparative analysis on the capital market). Wydawnictwo Placet, Warszawa (in Polish).
- National Strategy for Regional Development 2020: Regions, Cities, Rural Areas. Ministry of Regional Development, 13 July, Warszawa 2010.

- Pomianek I., 2010. Poziom rozwoju społeczno-gospodarczego obszarów wiejskich województwa warmińsko-mazurskiego (Socio-economic development level of rural areas of Warmia and Mazury province). *Acta Scientiarum Polonorum, Oeconomia* 9 (3), 227–239 (in Polish).
- Rosner A., 2008. Zróżnicowanie przestrzenne struktur społeczno-gospodarczych i poziomu rozwoju obszarów wiejskich (Spatial differentiation of socio-economic structures and level of rural development). (in) T. Markowski, Z. Strzelecki (eds.), *Obszary urbanizacji i semiurbanizacji wsi polskiej a możliwości ich rozwoju w ramach PROW 2007–2013 (Urbanization and semi-urbanization area of Polish countryside and opportunities for their development within RDP 2007–2013)*. *Studia KPZK PAN (Polish Academy of Sciences) Vol. CXIX, Warszawa* (in Polish).
- Strahl D., 2006. *Metody oceny rozwoju regionalnego (Methods of assessment of regional development)*. Wyd. AE we Wrocławiu (Wrocław University of Economics), Wrocław (in Polish).
- Wysocki F., 2010. *Metody taksonomiczne w rozpoznawaniu typów ekonomicznych rolnictwa i obszarów wiejskich (Taxonomic methods in the diagnosis of economic types of agriculture and rural areas)*. Uniwersytet Przyrodniczy w Poznaniu (Poznan University of Life Sciences), Poznań (in Polish).

PRÓBA WYZNACZENIA OBSZARU FUNKCJONALNEGO WARSZAWY Z WYKORZYSTANIEM MIERNIKA WZGLĘDNEGO POZIOMU ROZWOJU ORAZ MIARY HELLWIGA

Streszczenie. Województwo mazowieckie jest obszarem o dużym zróżnicowaniu sytuacji społeczno-gospodarczej. Stanowi to ogromne wyzwanie dla polityki rozwoju regionalnego, w której do 2020 roku zaplanowano w Polsce zarówno wzmocnienie konkurencyjności, jak i osiągnięcie spójności. Zastosowanie wybranych miar taksonomicznych do porównania poziomu rozwoju gmin Mazowsza pozwoliło na próbę wskazania tych gmin wiejskich i miejsko-wiejskich, które składają się na obszar funkcjonalny Warszawy. Ponadto wyniki analiz przy użyciu względnego poziomu rozwoju (*BZW*) oraz miary Hellwiga wskazują na ukształtowanie się relacji stabilnych w czasie, co udowodniło porównanie wyników dla lat 2002 i 2009.

Słowa kluczowe: rozwój regionalny, model polityki regionalnej, miernik taksonomiczny, województwo mazowieckie

Accepted for print – Zaakceptowano do druku: 28.02.2013

