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LEVEL OF SOCIO-ECONOMIC DEVELOPMENT OF POLISH PROVINCES AFTER ENTERING THE EUROPEAN UNION

Abstract. Quantitative methods find a great application in analysis processes, diagnoses and economic prognoses by means of description and estimation of forming economic variables in time and space as well as expectations regarding direction and character of changes of these variables are becoming more precise. In the article the level of socio-economic development of Polish provinces has been analysed. The sequence of individual provinces has been established considering a stated general criterium represented by the suggested variables in the research and cluster analysis has been carried out to isolate subgroups of similar provinces.

Key words: level of socio-economic development, multidimensional analysis, ordering and classification of provinces

1. INTRODUCTION

The level of socio-economic development of Polish provinces has been analysed in this article. The sequence of particular provinces has been established considering the genaral criteria and the analysis of concentrations has been carried out in order to isolate subgroups of similar provinces.

The following statistical features have been considered:

X_1 – employed persons in services in % of total,

X_2 – employed persons per 1 000 people,

X_3 – registered unemployment rate in %,

X_4 – entities of the national economy recorded in the REGON register per 10 000 people,

X_5 – investment outlays (current prices) per capita in PLN,

X_6 – gross domestic expenditures on research-development activity R&D current prices per capita in PLN,

X_7 –budget revenue of provinces in PLN,

X_8 – average monthly gross wages and salaries in PLN,

X_9 – dwellings per 1 000 people,

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X_{10} – dwellings in which construction has begun in 2005,
X_{11} – passenger cars registered per 1 000 people,
X_{12} – ascertained crimes in completed preparatory proceedings in total,
X_{13} – students of higher education institutions per 10 000 population,
X_{14} – audience in theatres and music institutions per 1 000 population[1].

2. RESULTS OF THE RESEARCH

To illustrate graphically the analised multidimensionals data, multidimensionals graphs have been used as one of the best general techniques of exploratting analysis of data. The Chernoff's faces enable to show multidimensional observations in the form of profiles of human faces so that the similarity of analysed provinces can be estimated on the basis of resemblance of faces defined by means of twelve statistical features. It can be seen that for example the łódzkie province is similar to the province wielkopolskie on the basis of analysed features but it is different from the province podkarpackie.

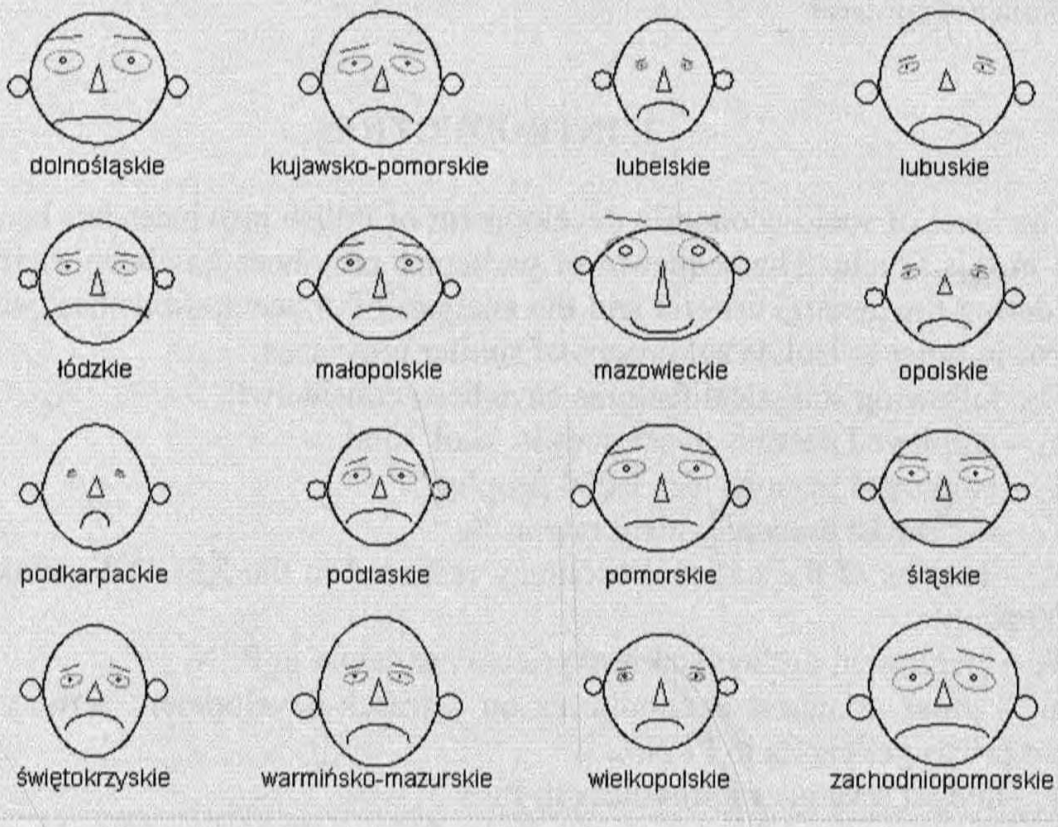


Fig 1. Chernoff's faces

S o u r c e: own calculations.

[1] Statistical data show the state at the end of the year 2005, they derive from: Statistical Yearbook of the Regions-Poland from 2006, GUS, Warszawa 2006, pp. 97–137.

To establish the sequence in a linear order of Polish provinces with regard to general criteria which is the level of socio-economics development represented by features taken into account in the research there has been used one of the methods of linear arrangements which is a *relative factor of development* (Sokołowski 2005, pp. 19–20) – an aggregate measure that is an arithmetical average of diagnostic variables reduced to comparison by the formula:

$$W_i = \frac{100}{m} \sum_{j=1}^{m} \alpha_j x'_{ij}, \tag{1}$$

where:

W_i – relative ratio of development,

m – amount of statistic features taken into consideration in the research,

α_j – importance of j- variable,

x'_{ij} – values of normalised statistic variables taken into consideration in the research.

Identifying a character of each of fourteen variables that appear in the research considering their impact on the socio-economic development it is claimed that the unemployment rate in % (X_3) and crimes stated in finished preliminary proceedings (X_{12}) are destimulants and other features are stimulants.

The analysis of the values of a relative ratio of socio-economic development W_i presented in the Table 1 received as a result of average values of normalised variables $X_1, X_2, \ldots, X_{14}$, multiplied by 100, places the providence łódzkie on the 7th place. However, the differences in the level of socio-economic development of Polish provinces are noticeable.

In order to search the agglomerations of provinces with similar level of socio-economic development the Ward's agglomerative method was used with the use of Euklides' distance. Using the variables normalised by the method of standarisation of diagnostic variables $X_1, X_2, X_3, \ldots, X_{12}$ what was received was the tree of connections presented at the graph 1. When analysing this dendrogram, the division of Polish provinces into 4 groups seems to be sensible. The groups comprise the following provinces:

Group I – province mazowieckie,

Group II – provinces: podkarpackie, świętokrzyskie, podlaskie i lubelskie,

Group III – provinces: opolskie, lubuskie, zachodniopomorskie, warmińsko-mazurskie and kujawsko-pomorskie,

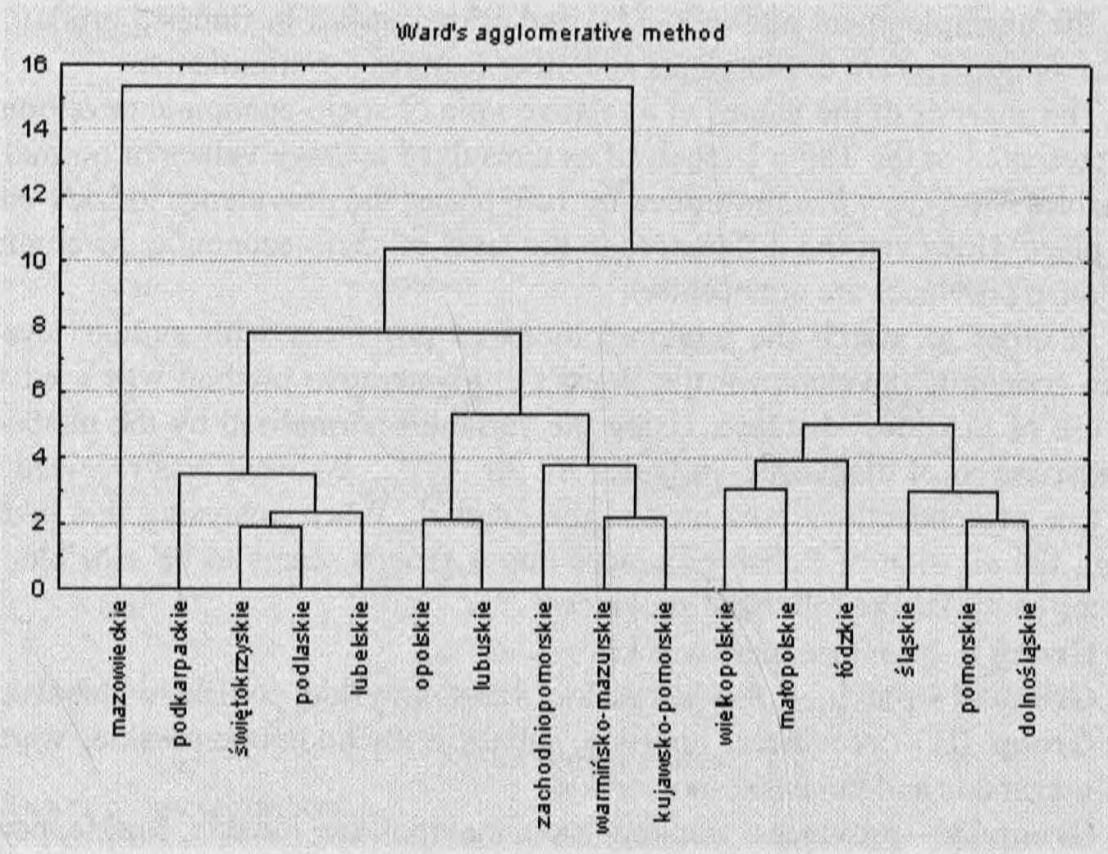
Group IV – provinces: wielkopolskie, małopolskie, łódzkie, śląskie, pomorskie and dolnośląskie.

Table 1

The values of relative ratio of level of development and the position **of** each province

Province	Index W	Position
Dolnośląskie	50	2
Kujawsko-pomorskie	32	12
Lubelskie	26	14
Lubuskie	38	9
Łódzkie	42	7
Małopolskie	45	5
Mazowieckie	91	1
Opolskie	35	10
Podkarpackie	20	16
Podlaskie	34	11
Pomorskie	47	3
Śląskie	44	6
Świętokrzyskie	29	13
Warmińsko-mazurskie	23	15
Wielkopolskie	46	4
Zachodniopomorskie	40	8

S o u r c e: own calculations.



Graph 1. The results of grouping

S o u r c e: own calculations.

To make the attempt to verify the received results the 1-factor-analysis of variance has been used. In order to check the zero hypothesis of the lack of interaction of classification factor (impact of every diagnostic variabe) on the results of composition of provinces on the grounds of the level of socio-economic development, the Fisher-Snedecor's test of relevance was used. The optimum decision is, therefore, the rejection of the zero- hypothesis for chosen level of reliance $\alpha = 0.05$.

Twelve of the suggested fourteen variables constitute the features that significantly diversify the groups of provinces. Only dwellings per 1 000 people (X_9) and passenger cars registered per 1 000 people (X_{11}) proved to be statistically irrelevant, therefore they didn't have signifiance when grouping the pro-vinces.

Table 2

Chosen descriptive statistics in groups

Mean averages													
Group	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_{10}	X_{12}	X_{13}	X_{14}	Index W
1	63.1	400.7	13.8	1 167.0	5 634.0	561.0	309.0	3 027.0	28 822.0	205 990.0	714.7	413.0	91.5
2	45.3	325.3	17.9	725.3	2 368.5	62.3	140.3	2 051.5	3 548.0	44 271.0	442.4	173.3	27.2
3	56.4	289.4	23.4	954.6	2 805.6	51.0	178.6	2 072.5	3 323.0	52 555.8	401.7	240.6	33.3
4	55.6	326.0	16.9	975.8	3500.2	168.0	169.7	2 249.1	7 701.2	122 351.5	513.0	237.8	45.6
All groups	53.8	319.0	19.0	918.5	3 133.6	129.6	173.8	2 193.1	6 614.8	86 247.6	473.2	234.6	40.0

Source: own calculations.

To compare the average values of groups it is possible to make an attempt to characterize the gained groups of provinces (table 2). The highest level of socio-economic development is obtained by the province mazowieckie (group I) that is shown by the fact of the lowest average level of unemployment rate with the highest average levels of remaining analysed variables (however, the fact of the highest level of commited crimes is alarming). Clearly the provinces from group IV are described by the lowest level of socio-economic development (that are provinces: wielkopolskie, małopolskie, łódzkie, śląskie, pomorskie and dolnośląskie). What should be noticed are high average levels of investment outlays (current prices) per capita in PLN and dwellings the construction of which has begun in 2005 as well as average salaries. However, a high level of ascertained crimes in completed preparatory proceedings is the drawback. The following position is occupied by provinces from group III (provinces: opolskie, lubuskie, zachodniopomorskie, warmińsko-mazurskie i kujawsko-pomorskie). To analyse average levels we should emphasize the noticeable, in this group, high percentage of the employed in services and the alarming highest unemployment rate.

Provinces: podkarpackie, świętokrzyskie, podlaskie and lubelskie (group II), according to the received results, are the districts that are characterized by the lowest level of socio-economic development. It is shown by the employed persons in services (in % of total), entities of the national economy recorded in the REGON register per 10 thousand population, investment outlays (current prices) per capita in PLN and the average monthly gross wages and salaries in PLN.

3. CONCLUSION

On the basis of the carried out analysis it is to be stated that there is a noticeable diversification of socio-economic development of Polish provinces. Accession of our country to the European Union and resulting from it enormous possibilities related with at least gaining and proper usage of resources of the union, give the chance for futher development of an enterprise, community, district, province or a country. Whether and to what degree noticeable differences in the level of socio-economic development will become greater depends to a large extent on appropriate policy of local authorities. The present description and assessment can be useful for local authorities during forming the strategy of development of provinces.

What also has got great weight for considerations presented in this article is the fact that quantitative methods have got a wide application for analysis processes and economic diagnoses by means of a description and estimation of forming economic variables in space are becoming more precise.

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POZIOM ROZWOJU SPOŁECZNO-GOSPODARCZEGO WOJEWÓDZTW W POLSCE PO WEJŚCIU DO UNII EUROPEJSKIEJ

Metody ilościowe znajdują szerokie zastosowanie w procesach analiz, diagnoz i prognoz gospodarczych a przy ich użyciu opis i ocena kształtowania się zmiennych ekonomicznych w czasie lub przestrzeni, jak również przewidywania dotyczące kierunku i charakteru zmian tych zmiennych stają się bardziej precyzyjne. Celem artykułu jest statystyczna analiza poziomu rozwoju społeczno-gospodarczego województw Polski. Ustalono kolejność poszczególnych województw z uwagi na przyjęte kryterium ogólne reprezentowane przez proponowane w badaniu zmienne oraz przeprowadzono analizę skupień celem wyodrębnienia podgrup podobnych województw.

Słowa kluczowe: poziom rozwoju społeczno-gospodarczego, analiza wielowymiarowa, porządkowanie i klasyfikacja województw.