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THE MULTIVARIATE STATISTICAL ANALYSIS OF TOURIST ATTRACTIVENESS OF PROVINCES IN POLAND

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 tourist attractiveness 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: multivariate statistical analysis, cluster analysis, tourist attractiveness of provinces.

I. AN INTRODUCTION

The level of tourist attraction of provinces in Poland has been analized in the article. Taking into account that the concept of tourist attraction is a general multivariate characterization which should be measured to compare the analized objects (provinces), we have to state that this is one of many -very often used- imprecise definitions for which we often assume the general agreement to their meanings. What has a decisive role in the research of the meanings of these types ,apart from appropriate statistics methods, is the final number of diagnostic features representing an essential object of analysis.

The selection of variables characterising turistic attractiveness of Polish provinces was mainly dependent on substantial reasons and reach to information publicised in Statistical Yearbooks of Provinces published by GUS. The following statistical features have been considered:

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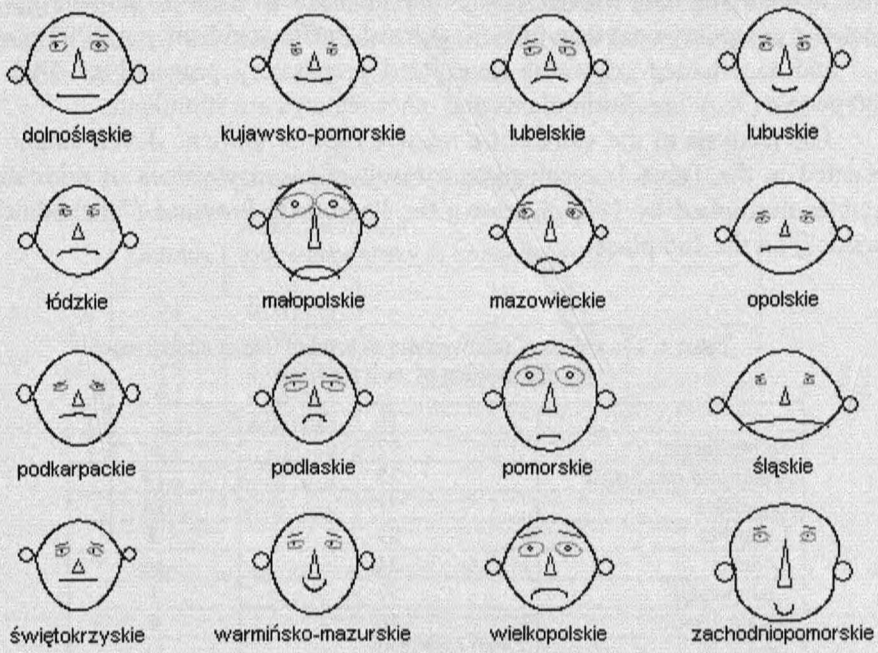
X_3 – collective tourist accommodation establishments total per 1000 people,
X_4 – number of beds in collective tourist accommodation establishments total per 1000people
X_5 – nights spent in collective tourist accommodation establishments total per 1000 people,
X_6 – foreign tourists accomodated in collective tourist accommodation establishments total per 1000 people,
X_7 – employed persons of total in a branch: hotels and restaurants per 1000 people,
X_8 – registered unemployment rate in %,
X_9 – hard surfache public roads in km of 1 km^2,
X_{10} – road traffic accidents per 1000 people,
X_{11} – shops total per 1000 people,
X_{12} – catering establishments total per 1000 people,
X_{13} – permanent small-retail sales outlets at marketplaces opened daily per 1000 people,
X_{14} – ascertained crimes in completed preparatory proceedings total per 1000 people,
X_{15} – museums with branches per 1000 people.

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.

II. THE RESULTS OF THE RESEARCH

With the aim to eliminate the quasi-stated variables the critical value of classic rate of variation was accepted on the level $V^*=0,15$ and therefore only shops total per 1000 people (X_{11}) turned out to have an insufficient level of variation. Others fourteen variables were accepted as final diagnostic variables and as a starting point during presentation of the results, analysed multidimensional[2] data were graphically illustarted with the use of multidimensional picture graphs as ones of the best genaral techniques of the exploral data analyses. 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. A visible variation of tourist attractiveness of Polish provinces can be noticed easily.

[2] Because of the description each of 16 analysed provinces with the use of the same fourteen we deal with 16 objects in 14-dimensional space.



Picture 1. Chernoff's faces

Source: a private ellaboration and estimation.

To establish the sequence in a linear order of Polish provinces with regard to general criteria which is the level of turistic 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* – 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 touristic attractiveness is claimed that the registered unemployment rate in % (X_8), road traffic accidents per 1000 people (X_{10}) and ascertained crimes in completed preparatory proceedings total per 1000 people (X_{14}) are destimulants and other features are stimulants.

The analysis of the values of a relative ratio of touristic development W_i presented in the Table 1. received as a result of average values of normalised variables multiplied by 100, places e.g the Pomerania Province ("zachodniopomorskie") on the 2nd place.

Table 1. The values of relative ratio of level of tourist attractivenes and the position of each province

	W	
Dolnośląskie	37	6
Kujawsko-pomorskie	25	14
Lubelskie	27	13
Lubuskie	39	5
Łódzkie	24	16
Małopolskie	57	1
Mazowieckie	40	4
Opolskie	29	11
Podkarpackie	31	10
Podlaskie	33	9
Pomorskie	40	3
Śląskie	35	7
Świętokrzyskie	25	15
Warmińsko-mazurskie	29	12
Wielkopolskie	35	8
Zachodnio-pomorskie	54	2

Source: own private ellaboration and estimation.

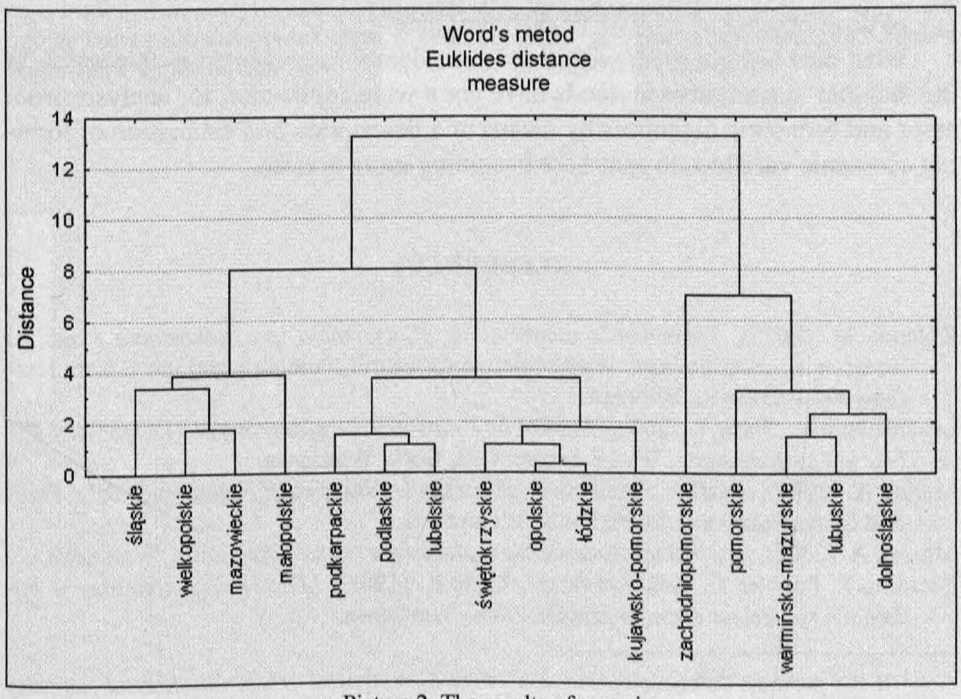
In order to search the agglomerations of provinces with similar level of tourist attractiveness the Ward's agglomerative method was used with the use of Euklides' distance. Using the variables normalised by the method of standarisation of fourteen diagnostic variables we received the tree of connections. When analysing this dendrogram , the division of Polish provinces into three groups seems to be sensible and 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 α. On the level of reliance α = 0.05 there are eight (of fourteen proposed variables) features significantly differentiating the groups of provinces with regard to level of attractiveness (see Table 2).

Table 2. Chosen results of one-factor-analysis of variance

Zmienna	Analiza wariancji Zaznaczone efekty są istotne z p <0,05			
	p			
X3	0,001359			
X4	0,007283			
X5	0,038605			
X6	0,003541			
X7	0,001239			
X8	0,000498			
X9	0,013850			
X14	0,003562			

Source: private ellaboration and estimation.



Picture 2. The results of grouping

Source: private ellaboration and estimation.

Comparing the proper statistics data in groups it is possible to make an attempt to characterize the gained groups of provinces. It is noticeable that the highest level of tourist attractiveness is gained by provines from a group: *śląskie, wielkopolskie, mazowieckie* and *małopolskie*. A slighlty lower level of attractiveness is represented by provinces from the group: *zachodniopomorskie, pomorskie, warmińsko-mazurskie, łódzkie, lubuskie* and *dolnośląskie*. The least attractive provinces seem to be from the group: *podkarpackie, podlaskie, lubelskie, świętokrzyskie, opolskie* and *kujawsko-pomorskie*)[3].

III. A CONCLUSION

On the basis of the carried out analysis it is to be stated that there is a noticeable diversification of tourist attractiveness of Polish provinces. Whether and to what degree the noticeable differences in e.g. a turistic management and development of Polish provinces will become greater and will intensify is to a large extent dependent on the appropriate policy of local authorities and proper institutions taking care of promotion of tourism in the region. The presented description and assessment can be useful for local authorities during forming the strategy of development of tourism in each province.

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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[3] If the province „zachodniopomorskie" were as a seperate group, the analysed variables would be also statistically relevant, whereas comparing proper statistics for selected - in this case- four groups "zachodniopomorskie" would be the most tourist attractive and the futher sequance of three groups would remain.

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ATRAKCYJNOŚĆ TURYSTYCZNA WOJEWÓDZTW W POLSCE PRZEDMIOTEM WIELOWYMIAROWEJ ANALIZY STATYSTYCZNEJ

W artykule analizie poddano poziom atrakcyjności turystycznej województw w Polsce. Pojęcie atrakcyjności turystycznej jest pewną ogólną, wielowymiarową charakterystyką, którą należy zmierzyć, aby porównać analizowane obiekty (w tym wypadku województwa), przy czym decydującą rolę w badaniach tego typu pojęć ma, poza odpowiednimi metodami statystycznymi, ostateczna lista zmiennych diagnostycznych reprezentujących merytoryczny przedmiot analizy. Ze względu na przyjęte kryterium ogólne reprezentowane przez ujęte w badaniu cechy przeprowadzono porządkowanie i grupowanie województw.