Determinants of socio-economic development of Podkarpackie voivodships

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Abstract

This article attepts to distinguish the major developmental determinants of podkarpackie voivodships powiats. Amongst 43 previously chosen variables describing the socio-economic development of powiats 5 key factors of socio-economic development of powiats has been distinguished. A determinant related to the level of the economic development as well as increase in life quality plays the most important role as it explains almost 45% of communalities. Factors related to environment protection (explaining around 12% of total variance, tourism development (around 10%), demographic component (around 7%) as well as determinant of entrepreneurship development are of equal importance, though the level of prevalence of different determinants in particular powiats of Podkarpackie voivodship is diversified.

1.   Introduction

Socio-economic development is a very complex category that is influenced by many economic, social, technical and technological or even ecological. Investigating the main determinants of the regional development helps to choose the appropriate methods of applying regional and local politics that can contribute to its development. It is crutial especially to economically weaker regions such as Podkarpackie voivodship. The aim of this article is to identify and assess the key determinants of the development of Podkarpackie voivodship powiats. The base for the investigation has been drawn from powiats statistic data of 2011. Factor analysis has been chosen as the main investigating method[2].

2.   Using factor analysis to distinguish the key determinants of powiats development

The basic set of statistical indexes proposed in comparative analysis of Podkarpackie voivodshp powiats consists of 42 features as listed above:

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[2] Factor analysis is a set of methods and numeric procedures allowing to convert the underlying correlated core data into a new system of mutually independent factors or principal components. The method is of great use when it comes to reducing a set of many indicators or distinguishing principal factors. STATISTICA system has been used to the calculations. The principles of factor analysis can be found in: [1] [2] [3] [4] [5] [6].

2.1. Demographic potential and job market

X_1- Population per 1 km^2 (S), X_2- Population growth rate per 1000 (S), X_3- Infant mortality per 1000 (D), X_4- Internal migration and emigration balance per 1000 (S), X_5- The employed per 1000 (S), X_6- Working age population of % of total population (S), X_7- Non-working age population per 100 of working age (D), X_8- Registered unemployment rate (D), X_9 - The unemployed of ages 24 and less in total % of the unemployed (D).

2.2. Economic potential

X_{10}- The industry and construction workers in total % (S), X_{11}- Investment outlays in enterprises per capita in PLN (S), X_{12}- Gross value of fixed assets per capita in PLN (S), X_{13}- Sold production of industry per capita in PLN (S), X_{14}- The private sector employed per 1000 (S), X_{15}- The employed in services in total % (S), X_{16}- Powiat budget revenue per capita in PLN (S), X_{17}- Share of capital investments of the total spendings from the powiat budget (S), X_{18}- Entities of national economy recorded in the region register (REGON) per 10 000 (S), X_{19}- Natural legal persons conducting economic activity per 10 000 (S).

2.3. Socio-technical potential

X_{20}- Medical doctors per 1000 (S), X_{21}- Dentists per 1000 (S), X_{22}- Consultations provided in clinics per capita (S), X_{23}- People per pharmacy (D), X_{24}- Dwellings per 10 000 (S), X_{25}- The water pipes system in kilometers per 100 km^2 (S), X_{26}- The sewage network in km per 100 km^2 (S), X_{27}- The gas distribution network in kilometers per 100 km^2 (S), X_{28}- Users of water pipes system in total % (S), X_{29}- Users of sewage network in total % (S), X_{30}- Users of gas distribution network in total % (S), X_{31}- Water pipe water usage in households per capita in m^3 (S), X_{32}- Electric energy consumption in households in cities per capita in kWh (S), X_{33}- Gas network gas usage in households per capita in w m^3 (S), X_{34}- High school students per 10 000 (S), X_{35}- Student access to computer usage in elementary schools (D), X_{36}- Hard surface public roads (public roads) in km per 100 km^2 (S), X_{37}- Post offices per 10 000 (S), X_{38}- Tourists overnight stays per 1000 (S), X_{39}- Borrowed public library copies per member (S), X_{40}- Particle pollution in tons per year (D), X_{41}- Pollutant gases emission in tones per year (D), X_{42}- Expenditure on fixed assets supporting environmental protection per capita in PLN (S), X_{43}- Population using sewage plants in total % (S).

Using symbols (S) - stimulant, (D) - destimulant the given features has been described, regarding the content-wise meaning of each feature.

On the first stage of the analysis, too diversified features (coefficient of variation ≤ 0.1) has been eradicated, namely two of the variables: X_6- Working age population of % of total population (S), X_7- Non-working age population per 100 of working age (D).

Afterwards, unification of the variables has been made and the matrix of coefficients correlation has been distinguished. On the next stage, the eigenvalues of R matrix correlation have been stated. In table 1 the eigenvalues λ_j of matrix correlation, % of total variance h_j and communalities H_k has been provided in a decreasing order.

Factor	Eigenvalues λ_j	% of total variance h_j	Cumulative eigenvalues H_k.
1	18.37982	44.82883	44.82883
2	4.84099	11.80729	56.63611
3	4.03739	9.84729	66.48340
4	2.89608	7.06361	73.54701
5	1.77985	4.34111	77.88811
6	1.62354	3.95985	81.84796
7	1.22485	2.98744	84.83540
8	1.02866	2.50892	87.34432
9	1.02067	2.48944	89.83376

Table 1 Eigenvalues of consecutive underlying factors.

Taking into consideration the methods of defining the number of common factors (eigenvalue, scree plot and the share of general variance being explained by the key factors) the five key factors have been accepted as the key determinants of socio-economic development of powiats (they account for about 78% of communalities). At the same time, the factor scores for subsequent key factors have been given (table. 2, table.3). High enough (according to the module) factor scores (with scores ≥ 0.7) contributing to the given key factor have been marked in boldface. The data from table. 1 show that the first factor (F1) constitutes the major determinant of socio-economic development of Podkarpackie voivodship powiats, explaining almost 45% of communalities. It relates to 17 variables such as X_1, X_9, X_{15}, X_{16}, X_{18}, X_{19}, X_{20}, X_{21}, X_{29}, X_{24}, X_{25}, X_{26}, X_{27}, X_{34}, X_{35}, X_{36}, X_{43}.

Taking the above findings into consideration, one can conclude that factor F1 can be described as a determinant of the economic level and, broadly speaking, the life quality. The second key factor (F2) comprising almost 12% of overall information has been identified by

the variable X_{40}- Particle pollution in tons per year (D). This factor can be described as a determinant of environment protection. Factor F3 explaining 10% overall information has been identified by the variable X_{38}- Tourists overnight stays per 1000 (S), therefore can be described as a determinant of tourism development. Factor F4 describing about 7% of communalities concerns variable X_2- Population growth rate per 1000 (S), thus constitutes the important determinant of demographic situation. Factor F5 comprises 4.3% of overall information and is related to the variables X_5- the employed per 1000 (S) and X_{14}- the private sector employed per 1000 (S) that can be treated as determinants of the entrepreneurship development.

Feature	F1	F2	F3	F4	F5
X1	**0.965**	0.050	-0.063	-0.020	0.113
X2	-0.089	0.225	0.144	**0.886**	0.226
X3	-0.168	0.152	0.100	0.050	0.151
X4	-0.131	0.022	-0.151	0.422	0.320
X5	0.597	0.095	0.029	0.089	**0.751**
X8	0.470	0.266	-0.123	0.176	0.458
X9	**0.824**	-0.156	0.170	-0.278	-0.044
X10	0.295	0.652	-0.075	0.082	0.161
X11	0.151	0.159	-0.034	0.056	0.249
X12	0.428	0.466	0.588	0.077	0.245
X13	0.124	0.683	-0.058	0.109	0.261
X14	0.077	0.143	-0.076	0.150	**0.943**
X15	**0.954**	0.048	0.084	0.002	-0.104
X16	**0.920**	0.029	0.018	-0.190	-0.027
X17	0.151	-0.213	-0.158	-0.179	0.042
X18	**0.819**	0.120	0.376	0.172	-0.017
X19	**0.713**	0.099	0.448	0.233	-0.048

Table 2 Factor loadings matrix for the key factors
(Demographic and economic potential and job market).

Feature	F1	F2	F3	F4	F5
X20	**0.931**	0.083	0.033	-0.013	0.236
X21	**0.876**	0.139	0.047	0.014	0.211
X22	0.672	0.112	0.041	0.008	0.150
X23	0.524	0.271	0.065	-0.111	0.079
X24	**0.921**	0.149	0.016	-0.123	-0.072
X25	**0.874**	0.125	-0.110	0.051	0.253
X26	**0.883**	-0.004	-0.145	0.113	0.161
X27	**0.832**	0.027	-0.158	0.134	0.409
X28	0.321	0.171	-0.070	-0.079	0.002
X29	**0.779**	0.154	-0.046	-0.071	0.102
X30	0.365	0.208	-0.395	-0.013	0.279
X31	0.539	0.208	-0.097	0.057	0.124
X32	0.157	-0.109	0.130	-0.030	-0.051
X33	0.555	0.127	-0.222	-0.017	0.506
X34	**0.818**	0.111	-0.016	0.015	0.282
X35	**-0.899**	-0.032	0.063	0.055	0.005
X36	**0.844**	0.073	-0.187	-0.043	0.206
X37	-0.355	-0.250	0.548	-0.069	-0.279
X38	-0.014	-0.112	**0.958**	0.069	-0.095
X39	-0.056	0.014	-0.043	0.160	-0.133
X40	-0.068	**-0.956**	0.061	-0.123	-0.070
X41	-0.128	-0.315	0.013	0.045	0.017
X42	0.074	0.099	0.061	-0.191	0.021
X43	**0.732**	0.047	-0.050	-0.052	0.011

Table 3 Factor loadings matrix for the key factors (Socio-technical potential).

3.   Classification of powiats according to key developmental determinants

The key factor scores have been used to assess the degree of particular factor present in each powiat. The higher the factor score in the particular powiat, the bigger its influence on the region. Such approach allows for classification of powiats regarding the analysed factor. Table 4 includes the key factor scores in subsequent powiats.

Powiat	F1	F2	F3	F4	F5
Bieszczadzki	0.040	-0.530	-0.005	0.932	-1.659
Brzozowski	0.056	-0.432	-0.621	-0.355	0.566
Dębicki	-0.540	0.146	0.039	1.157	0.622
Jarosławski	-0.486	-0.817	-0.244	0.287	-0.052
Jasielski	-0.521	0.256	-0.134	-0.212	0.608
Kolbuszowski	-0.598	-0.806	-0.230	-0.600	0.065
Krośnieński	-0.374	-0.175	-0.206	-0.664	-0.758
Leski	-0.230	-0.448	4.658	0.203	-0.090
Leżajski	-0.428	-0.315	-0.169	-0.040	0.465
Lubaczowski	-0.787	-1.016	-0.304	-1.303	1.119
Łańcucki	-0.199	-0.233	-0.346	1.948	-0.510
Mielecki	-0.575	4.172	0.123	-0.350	0.617
Niżański	-0.315	-0.183	-0.775	-1.166	-1.315
Przemyski	-0.453	-0.593	-0.479	0.213	0.229
Przeworski	-0.571	-0.457	-0.322	-0.305	0.612
Ropczycko-sędziszowski	-0.437	0.511	-0.451	1.846	-0.872
Rzeszowski	-0.507	0.127	-0.216	1.024	0.252
Sanocki	-0.408	0.923	-0.215	0.433	-0.055
Stalowowolski	-0.164	0.766	0.144	-0.689	-0.538
Strzyżowski	-0.518	-0.796	-0.302	-0.316	0.468
Tarnobrzeski	-0.550	-0.302	0.280	-1.330	-0.033
m. Krosno	1.967	0.029	0.061	-0.591	2.716
m. Przemyśl	2.454	0.398	0.022	-1.794	-1.669
m. Rzeszów	2.830	-0.319	-0.248	1.738	0.932
m. Tarnobrzeg	1.313	0.092	-0.058	-0.066	-1.719

Table 4 Key factor scores of socio-economic development of powiats.

Figures 1-4 depicts the classification of powiats according to the five key factor scores. Regarding the degree of the economic development and the life quality determinants (F1), the key classifing positions of Podkarpackie voivodship are occupied by cities powiats such as: the town of Rzeszów, the town of Przemyśl, the town of Krosno, the town of Tarnobrzeg oas well as Brzozowski and Bieszczadzki powiats. The least presence of F1 can be observed in powiats such as: Lubaczowski, Kolbuszowski, Mielecki, Przeworski and Tarnobrzeski (Fig. 1).
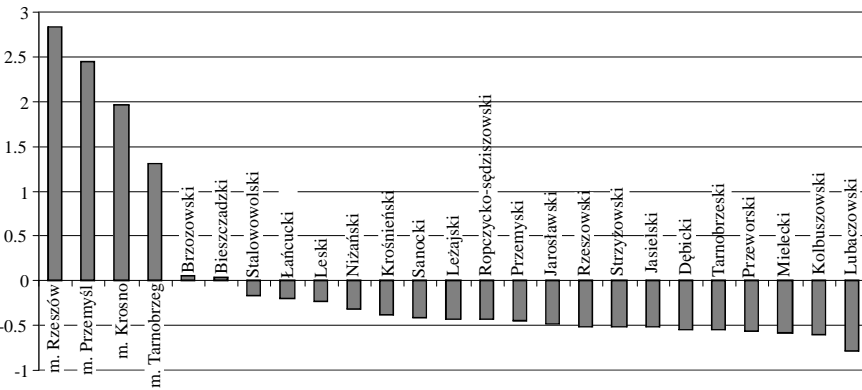
Fig. 1. Classification of Podkarpackie voivodship powiats according to the degree of F1 presence.

Podkarpackie voivodship powiats that are not prominently industralised appear to have F2 factor (which is a determinant of environment protection) well developed. Those are namely: Lubaczowski, Jarosławski, Kolbuszowski, Strzyżowski i Przemyski. The last position in this classification is occupied by powiats such as: Mielecki, Sanocki, Stalowowolski, Ropczycko-sędziszowski and the town of Przemyśl (Fig. 2).
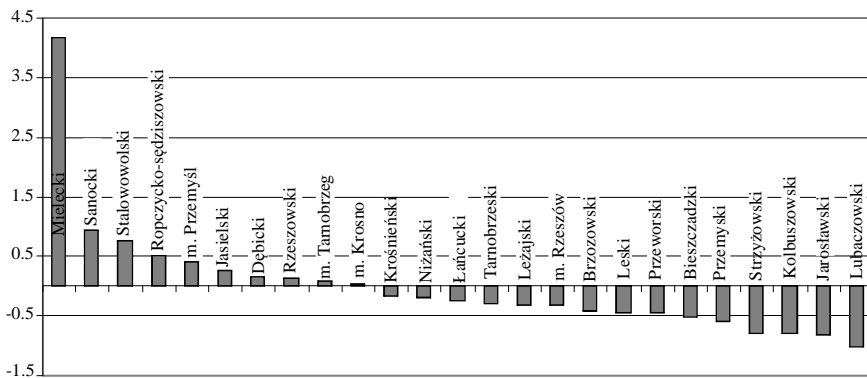

Fig. 2. Classification of Podkarpackie voivodship powiats according to the degree of F2 presence.
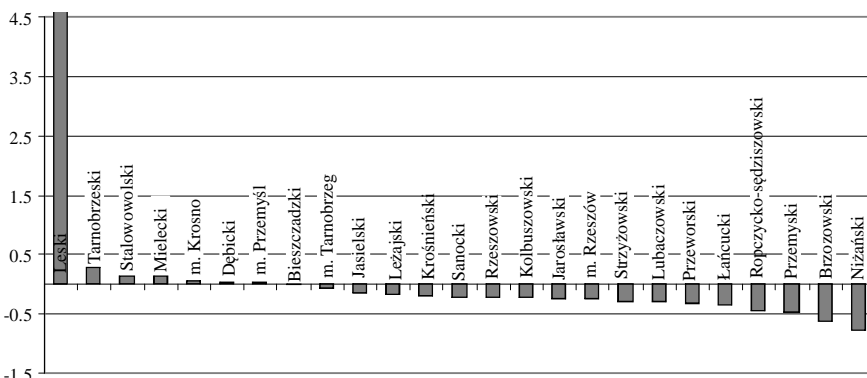

Fig. 3. Classification of Podkarpackie voivodship powiats according to the degree of F3 presence.

Leski powiat has been described as a lider regarding F3 factor that is a determinant of the tourism development. Significantly less presence of this factor can be observed in powiats such as: Tarnobrzeski, Stalowowolski, Mielecki and the town of Przemyśl. Powiats Niżański, Brzozowski, Przemyski, Ropczycko-sędziszowski and Łańcucki (Fig. 3) have place themselves at the end of the classification.

Powiats Łańcucki, Ropczycko-sędziszowski, the town of Rzeszów, Dębicki and Rzeszowski reflect significant presence of F4 factor as a determinant of demographic situation. The last position have been taken by powiats such as the town of Przemyśl, Tarnobrzeski, Lubaczowski, Niżański and Stalowowolski (Fig. 4).
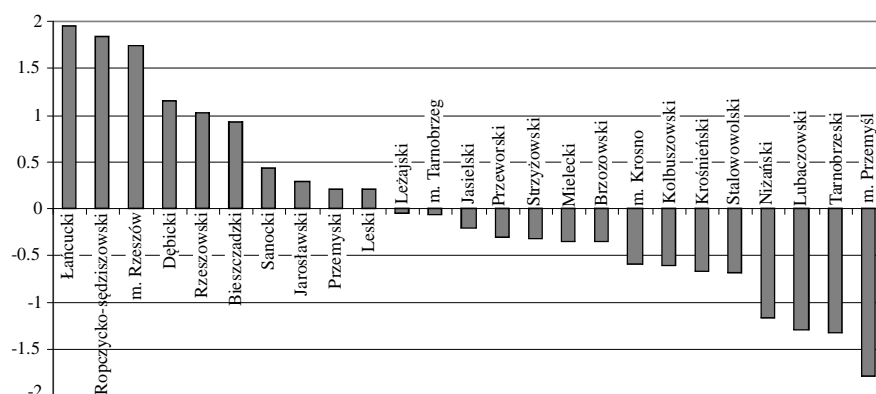

Fig. 4. Classification of Podkarpackie voivodship powiats according to the degree of F4 presence.

The most fertile conditions to the enterpreneurship development (F5) can be found in such towns as: the town of Krosno, Lubaczowski, the town of Rzeszów, Dębicki and Mielecki, whereas in powiats: the town of Tarnobrzeg, the town of Przemyśl, Bieszczadzki, Niżański and Ropczycko-sędziszowski the development in this field is of the least significance.

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