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alphanumeric journal

The Journal of Operations Research, Statistics, Econometrics and Management Information Systems

Volume 3, Issue 1, 2015

2015.03.01.STAT.04

THE EVALUATION OF THE DEVELOPMENT AGENCY REGIONS IN TURKEY IN TERMS OF SOME SOCIOECONOMIC INDICATOR WITH FACTOR ANALYSES

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Received: 12 March 2015
Accepted: 20 May 2015

Abstract

The actual aim of this paper is to update the periodic studies on defining social-economic development levels of cities in Turkey according to established development agencies. It is believed that considering the development agencies as a one administrative authority would define levels of developments of regions better than considering the cities one by one as an individual. For doing this total values of development agencies of considered regions are found in the manner of their leading socioeconomic indicators and then development agencies regions will be interpreted by using Factor Analysis..

Keywords: Development of Social-Economic, Factor Analysis, Development Agency

Jel Code: C01,

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TÜRKİYE'DE KALKINMA AJANSI BÖLGELERİNİN BAZI SOSYOEKONOMİK GÖSTERGELER BAKIMINDAN FAKTÖR ANALİZİ İLE DEĞERLENDİRİLMESİ

Özet

Bu çalışmanın asıl amacı, Türkiye'de illerin sosyoekonomik gelişmişlik düzeyini belirlemek için dönem dönem yapılan çalışmaları kalkınma ajansı bölgelerine göre güncellemektir. İllerin bireysel olarak incelenmesi yerine kalkınma ajanslarının tek bir idari bölge olarak düşünülüp ele alınmasının bölgeler arası gelişmişlik seviyelerini daha iyi açıklayacağı düşünülmektedir. Böylece aynı bölgedeki bir ilin gelişmişlik seviyesi artsa bile diğer illerde böyle bir gelişme söz konusu değilse, bölgenin gelişmekte olduğu ve kalkınma ajansının doğru politikalar izlediği yönündeki iddiaların doğruluğu tartışılabilir olacaktır. Bu amaçla kalkınma ajansları kapsamında yer alan illere ait bazı sosyoekonomik göstergelerden yararlanarak her bir kalkınma ajansı bölgesi için söz konusu göstergelere ait toplam değerler bulunduktan sonra, elde edilen çok değişkenli veri yapısı Çok değişkenli istatistiksel analizlerden Faktör analizi kullanılarak kalkınma ajansı bölgeleri değerlendirilmiştir.

Anahtar Kelimeler : Sosyo-Ekonomik Gelişmişlik, Faktör Analizi, Kalkınma Ajansı
Jel Kodu : C01

1. Introduction

Statistical Region Units Classification (SRUC) is defined in Turkey according to the criterion of NUTS which is EU regional classification method and it is put into practice in 2002. SRUC aims making analyses of socioeconomic of regions and generating comparable data with the European United (EU) for reduction of difference development among regions. SRUC consists of three levels. Firstly, in conformity with governmental structure 81 cities are defined as regional units in level 3. 26 regions are defined as region units in level 2 by considering population with forming a group of cities which are similar in terms of economic, social, cultural and geographic manners. According to the same criteria, 12 regions are defined as region units in level 1 with forming a group of 26 regions (Url-1).

In 2006, the development agencies were established depending on State Planning Organization within adjustment laws to the European Union. There are 26 development agencies at present day and each of them corresponds to 26 statistical regions in level 2. These development agencies aim to accelerate regional development.

The actual aim of this paper is to update the periodic studies on defining social-economic development levels of cities in Turkey according to established development agencies. It is believed that considering the development agencies as a one administrative authority would define levels of developments of regions better than considering the cities one by one as an individual. For doing this total values of development agencies of considered regions are found in the manner of their leading socioeconomic indicators and then development agencies regions will be interpreted by using Factor Analysis.

2. Methods

One of multivariate statistical analysis methods, factor analysis, is used in this study. In factor analysis, it is represented that the variables $x_1, x_2, \dots, x_p$ as linear combinations of a few random variables $f_1, f_2, \dots, f_m (m < p)$ called factors. The factors are underlying constructs or latent variables that generate the x's. Like the original variables, the factors vary from individual to individual; but unlike the variables, the factors cannot be measured or observed. If the original variables $x_1, x_2, \dots, x_p$ are at least moderately correlated, the basic dimensionality of the system is

less than p. The goal of factor analysis is to reduce the redundancy among the variables by using a smaller number of factors (Rencher, 2002).

In factor analysis both the standardized variables and the original variables can be used. $\boldsymbol{X}$ (pxn) and $\boldsymbol{Z}$ (pxn) are defined as the original data matrix and standardized data matrix, respectively. It is benefited from covariance matrix when original data matrix (**X**) is used in analysis but the correlation matrix should be employed when standardized data matrix (**Z**) is used. These cases might give strongly different results. Measure unit is the most important criterion on the selecting the matrix type. If the measure units and variances of the variables are close enough, covariance matrix is used; otherwise correlation matrix is used (Tatlıdil, 2002).

The model of factor analysis with **Z** (pxn) which is derived from **X** (pxn) original data matrix is denoted as;

$$z_j = a_{j1}f_1 + \cdots + a_{jm}f_m + b_j u_j, j = 1, \dots, p \quad (1)$$

Where

a_{jm} : Factor loading of j_{th} the variable on m_{th} factor

f_m: m_{th} Common factor

u_j : Specific factor

b_j: Coefficient concerning specific factor.

This model is also defined as in matrix notation;

$$\boldsymbol{Z = AF + BU} \quad (2)$$

where

Z: Standardized data matrix (pxn)

A: Factor loadings matrix (pxm)

F: Factor matrix (mxn)

U: Specific factor matrix (pxn)

B: Diagonal coefficients matrix (pxp).

The actual aim of analysis is to obtain the $A = (a_{jm})$ matrix (Tatlıdil, 2002).

It is known that the variance of variable z_j in (1) is 1. The proportion which is explained by factors of this variance is called as communality and equals to sum of squares of factor loadings related to the variable. The proportion which cannot be explained by factors of this variance is named as specific variance and denoted as b_j^2. Thus equality (3) can be written in the following form:

$$Var(z_j) = \underbrace{a_{j1}^2 + \cdots + a_{jm}^2}_{h_j^2} + b_j^2, j = 1 \dots, p$$

$$1 = h_j^2 + b_j^2. \quad (3)$$

where

h_j^2 ; Communality

b_j^2; Specific variance

In factor analysis one of the important issues is to determine the proper numbers of factors. There are many various criteria in this subject.

The Criterion of Kaiser: The number of eigenvalues which are higher than 1 of correlation matrix is regarded as numbers of factors. This criterion is used commonly in many fields.

Catell Scree Test (Scree Plot): In this method, catell scree plot is drawn so that the number of component (factor) as 1,2,…,p are in the x-axis and eigenvalue are in the y axis. This plot shows decreasing eigenvalue while the numbers of component (factor) increase. In the plot, the number of component reflecting of point which slope loses is regarded as numbers of factors.

The Criterion of Explained Variance: When the total variance which is explained by eigenvalues is at least %80, the number of eigenvalues is defined as numbers of factors. Some references determine that this rate must be at least 2/3 (%67).

The criterion of Joliffe: The number of the eigenvalues which are 0.70 or greater than 0.70 is regarded as numbers of factors (Özdamar, 2004).

Finally, factor scores can be obtained. Factor scores are the values of estimation of each unit according to common factor structures. In each factor structure (for $F_1, F_2, \dots, F_m$) all variables $(X_j \text{ or } Z_j, j = 1,2, \dots, p)$ take part with different weights. While some of these variables play a significant role to define a factor, others don't. Common factor scores of all variables can be calculated by using factor loadings according to factor structure. The factor scores of $i - th$ unit are denoted as:

$$f_i = (A'A)^{-1}A' z_i \quad , \quad i = 1,2, \dots, n. \quad (4)$$

Thus the matrix of factor scores can be obtained as $\boldsymbol{F} = [f_1, f_2, \cdots, f_n\ ]: mxn.$

3. Application

For the purpose of evaluating the development differences among the regions, some of the socioeconomic indicators of the cities of which take part in Development Agencies are used. The development agency regions are evaluated by applying factor analysis, after the values of considered indicators for each of development agencies is calculated. In this application 19 variables are used and these are shown in Table 2.

Table 1. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.746
Bartlett's Test of Sphericity	Approx. Chi-Square	1040.66
	df	171
	Sig	.000

Factor loadings which are shown in Table 2 have an important cognitive content. Each column expresses weight of each variable in factors. On the other hand, each row expresses the relation of each variable with each factor.

Note that, the first 9 variables concentrate on 1th factor, second 8 variables on 2th factor and the rest of variables on 3th factor.

First factor is called as "socioeconomic development factor resting on the power of financial" by regarding the content of variables having high factor loading. Similarly, second factor is called as "the power factor of population and employment" and third factor is called as "the power factor of business".

Factor analysis assumes that the correlations among the variables are caused by common factors. Moreover a big part of correlations among variables emerges due to impact of only one factor. This factor is called as "general causal factor" in literature (Albayrak, 2003). In this survey, it is assumed that there is a general causal factor which effects to all indicators and causes the interaction of indicators. To sum up, general causal factor is the levels of socioeconomic development of regions.

From this point of view, 1st factor which has the greatest eigenvalue and the rate of variance explaining is taken as general causal factor. The factor scores which calculated according to first factor are considered as socioeconomic development index of regions and regions are sorted according to the value of index. Results are shown in Table 3.

Table 2. Factor Loadings

The Variables	1	2	3
Population density	.984	.007	.001
The share of region's export over Turkey	.985	.029	.106
The amount of export per capita	.757	.075	.517
The share of companies of manufacturing industry over Turkey	.986	.116	.057
The share of total capital of newly established companies over Turkey	.986	.043	-.048
The number of foreign capitalized companies per ten thousand people	.983	.060	-.087
Trademark application number per hundred thousand people	.903	.225	.185
The share of bank loans in the region over Turkey	.991	.090	-.015
The tax income share of the region over Turkey	.971	.081	.106
The number of live births per thousand women (ages between 15-49)	-.109	-.956	-.139
The rate of economically dependent population (ages between 0-14)	-.073	-.959	-.132
The rate of literacy	.087	.820	.353
The rate of lettered women population over total population	.160	.834	.332
The rate of secondary education schooling	.151	.923	.289
The rate of working young population over total population	.259	.906	.247
The rate of working population having health insurance (SGK) over total population	-.053	.923	.038
The employment rate	-.056	.828	-.127
The rate into employment with SGK of the employment in manufacturing industry	.183	.288	.861
The consumption of electric in manufacturing industry per capita	-.098	.373	.831

4. Conclusion

In the result of study, the most developed regions are TR10 (İstanbul), TR51 (Ankara), TR31 (İzmir), TR42 (Kocaeli, Sakarya, Düzce, Bolu, Yalova), TR41 (Bursa, Eskişehir, Bilecik), respectively. The values of socioeconomic development index are obtained as negative except these five most developed regions. Contrary to common belief, the region of TRC3 (Mardin, Batman, Şırnak, Siirt) is 10th and the region of TRC2 (Şanlıurfa, Diyarbakır) is 11th. Thus, these regions take part in the first %50. It is believed that this case is caused with the investments made to regions in the last years. The last region is also TR81 (Zonguldak, Karabük, Bartın).

Table 3. The ranking of socioeconomic development of regions

	Region Code	The Cities in Region	Index
1	TR10	İstanbul	4.746
2	TR51	Ankara	0.514
3	TR31	İzmir	0.306
4	TR42	Kocaeli, Sakarya, Düzce, Bolu, Yalova	0.165
5	TR41	Bursa, Eskişehir, Bilecik	0.115
6	TRC1	Gaziantep, Adıyaman, Kilis	-0.008
7	TR62	Adana, Mersin	-0.037
8	TR61	Antalya, Isparta, Burdur	-0.037
9	TR32	Aydın, Denizli, Muğla	-0.120
10	TRC3	Mardin, Batman, Şırnak, Siirt	-0.177
11	TRC2	Şanlıurfa, Diyarbakır	-0.187
12	TR52	Konya, Karaman	-0.199
13	TR33	Manisa, Afyonkarahisar, Kütahya, Uşak	-0.256
14	TR90	Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane	-0.280
15	TR72	Kayseri, Sivas, Yozgat	-0.286
16	TRB2	Van, Muş, Bitlis, Hakkari	-0.299
17	TR63	Hatay, Kahramanmaraş, Osmaniye	-0.303
18	TR83	Samsun, Tokat, Çorum, Amasya	-0.312
19	TRA2	Ağrı, Kars, Iğdır, Ardahan	-0.330
20	TRA1	Erzurum, Erzincan, Bayburt	-0.347
21	TRB1	Malatya, Elazığ, Bingöl, Tunceli	-0.357
22	TR71	Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir	-0.371
23	TR22	Balıkesir, Çanakkale	-0.407
24	TR82	Kastamonu, Çankırı, Sinop	-0.463
25	TR21	Tekirdağ, Edirne, Kırklareli	-0.524
26	TR81	Zonguldak, Karabük, Bartın	-0.538

As the aim of this study, some interesting results gained. When the 19 variables and methodology used in sorting of regions are applied for 81 cities, different results are occurred. These results are given in Table 4. For example; Kayseri is 14th in the ranking of socioeconomic development according to cities and it take part in the first %20. But, the region of TR72 (Kayseri, Sivas, Yozgat) is 15th in the ranking of socioeconomic development according to regions and it take part in the first %60. As a result, if the socioeconomic development is only examined according to cities, fallacious results can be obtained for the establishments which aim regional development.

In its the last study the Ministry of Development has investigated development of regions (Url-2). In this study any indicator value of region is the weighted arithmetic mean of the indicator values of the cities in the region. The populations of cities are used as weight. However, it is known that this method does not give true value of regions for some variables.

The Development Agencies deal with aims which strive to develop regions and reduce of development difference among regions. In the future, in the socioeconomic development index studies, it is considered that the socioeconomic development of regions must be also researched besides that of cities

Table 4. The ranking of socioeconomic development of cities

Order	City	Index	Order	City	Index	Order	City	Index
1	İstanbul	8.549	28	Bitlis	-0.090	55	Isparta	-0.223
2	Ankara	1.259	29	Samsun	-0.094	56	Kütahya	-0.231
3	İzmir	0.985	30	Muş	-0.105	57	Ardahan	-0.238
4	Kocaeli	0.567	31	Eskişehir	-0.141	58	Amasya	-0.248
5	Bursa	0.506	32	Kilis	-0.141	59	Bayburt	-0.255
6	Antalya	0.506	33	Balıkesir	-0.143	60	Gümüşhane	-0.258
7	Gaziantep	0.373	34	Adıyaman	-0.145	61	Zonguldak	-0.261
8	Adana	0.196	35	Hakkari	-0.153	62	Niğde	-0.269
9	Konya	0.096	36	Afyonkarahisar	-0.162	63	Yozgat	-0.277
10	Mersin	0.067	37	Erzurum	-0.165	64	Bartın	-0.278
11	Muğla	0.050	38	Bingöl	-0.166	65	Edirne	-0.280
12	Şanlıurfa	0.035	39	Ordu	-0.171	66	Bolu	-0.281
13	Denizli	0.015	40	Kahramanmaraş	-0.173	67	Kastamonu	-0.284
14	Kayseri	0.009	41	Malatya	-0.176	68	Osmaniye	-0.285
15	Hatay	0.006	42	Erzincan	-0.180	69	Tekirdağ	-0.286
16	Şırnak	0.005	43	Kars	-0.184	70	Artvin	-0.287
17	Diyarbakır	-0.003	44	Yalova	-0.192	71	Çankırı	-0.291
18	Trabzon	-0.035	45	Karaman	-0.193	72	Kırıkkale	-0.297
19	Mardin	-0.035	46	Nevşehir	-0.195	73	Sinop	-0.298
20	Iğdır	-0.039	47	Rize	-0.200	74	Uşak	-0.307
21	Sakarya	-0.043	48	Elazığ	-0.201	75	Kırşehir	-0.319
22	Van	-0.049	49	Sivas	-0.209	76	Tunceli	-0.323
23	Ağrı	-0.056	50	Çorum	-0.212	77	Karabük	-0.335
24	Batman	-0.067	51	Düzce	-0.217	78	Burdur	-0.342
25	Siirt	-0.068	52	Tokat	-0.218	79	Çanakkale	-0.359
26	Manisa	-0.082	53	Aksaray	-0.220	80	Kırklareli	-0.417
27	Aydın	-0.083	54	Giresun	-0.222	81	Bilecik	-0.459

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