

Ranking of development degree of cities of Lorestan province of Iran by using numerical taxonomy

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Research Article

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Ranking of development degree of cities of Lorestan province of Iran by using numerical taxonomy

Fatemehalsadat Afsahhosseini *

Abstract

The regional imbalance might have harmful consequences. According to principle 48 of Iran Constitutional Law, the government is obliged to eliminate any discrimination in different regions (provinces and cities) in using natural resources and national capitals, provide context for the growth of all regions proportionate with talents by maintaining constructive competitive, distribute economic activities in different areas in an appropriate way and use the capabilities and relative advantages regarding the country regional and international role optimally. Lorestan province has the second grade of unemployment in the country and regional imbalance has harmful economic and social consequences.

Keywords: Regional imbalance, regional planning, development, ranking, numerical taxonomy

Introduction

Regional imbalances may have detrimental consequences. The most important detrimental effects are: First, there are permanent regional differences in living standards that anger and discontent is a result of them. People emphasize this issue in search of jobs who are waiting to find a job and people who are poor in terms of living standards. Second, high levels and permanent unemployment in the less privileged areas that will have detrimental social and economic consequences. Third, differences in economic development areas can have serious economic costs to the fast growth of areas through extra demands for the social capital [15]. According to article forty-eighth of the Iranian constitution, the government is obliged to: remove any discrimination in the areas (province and city) of the country's natural resources and national assets. It provides a developing situation in all regions according to their talents and with maintaining constructive competition, distributed properly economic activities in different regions of the country, used optimally from capabilities and comparative advantages as regional and international roles of the country (Article Forty-Eight of Iranian constitution).

Towards realizing Article forty-eighth of the Iranian constitution and according to the "gradual reduction of regional disparities is one of the country's development policy program and the first important step is areas recognition [3]. Understanding talents and capabilities of areas and planning to expand and strengthening competitive and comparative advantages based on talent, on the one hand leads to the intensification of economic growth rates and on the other hand will increase balance between regions along with economic competition expansion, because of attracts of more resource [15]. In other words, to understand the differences in regional development, it is necessary to examine the current status of each area to be able to reduce or eliminate of difference, provides a regional plan in this way [7]. Habitat Conference in 2001, reducing inequalities introduced one of the main outlines and elements to achieve sustainable development [11].

Different statistical methods are designed for measuring development rates and level of different regions, We can determine development rates of areas by combination a set of indicators and

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divided a set into more and less homogeneous subset. The numerical taxonomy is one of these methods [15] that we used in this study for ranking cities of Lorestan province.

Khorram-Abad is the capital of Lorestan province that is one of the western cities of Iran. It is necessary to do purposeful planning to the development of this province because of the high unemployment rate and large population and appropriate potential of natural resources. With knowledge of the level of each city and its ranking can be a good plan for the development of the less developed city and finally the province's development.

Background of Research

In the world: Many research on the measurement of regional disparities is done at the global level, World Development Report 2009 is one of them. In this report is mentioned in focusing on the economic activity in countries, particularly in cities and huge growing inequality in developing countries. Based on findings, economic development has been uneven, and the policies adopted to create spatial balance will result in only poverty reduction programs in UNU-WIDER Regerson Nel [18] projects [2].

In Iran: Asghar Tala Minai [13] was a first person who has been done ranking and classification of regions in Iran with the title of analysis of the regional characteristics in Iran in 1349. In this study, in addition to the analysis of quantitative models in determining central locations, he was performed classification of population centres in the Isfahan region by using of several numerical methods such as factor analysis method. There are also two other important books in this field that include:

- Razavi et al., 2019 [19]: Political environment of economic planning in Iran: Ranking of country's provinces in terms of development degrees by using of numerical taxonomy for year 1365.
- Abd Elrahman, 1993 [1]: Urbanization and regional disparities in Iran after the Islamic Revolution: Ranking of provinces by using of numerical taxonomy and identification of differences in different provinces in terms of development levels before and after the revolution in two times 1977 and 1987.

In the years after the Islamic Revolution, a number of governmental research centres carried out some studied in the field of underserved identification regions and determine levels of development that some important of them are includes:

- Construction projects office of Informatics Department of Budget and Planning Organization, 1977: Classification of provinces of Iran country, a model to determine priorities for reducing regional differences: by using of numerical taxonomy (50 selected indicator), they recognized that Markazi province was as an ideal province and Ilam and Kohgiluyeh and Boyer-Ahmad provinces were the most disadvantaged provinces in Iran.
- Management and Planning Organization, 1981: Regional imbalances in Iran: by using of numerical taxonomy (45 indicators), Markazi province was in the first place, and Ilam and Kohgiluyeh and Boyer-Ahmad provinces were in the last place in terms of development.
- Research and Studies Center of Planning and Architecture, 1992: Assessment of industrial development of the country's regionals: by standardized rating method (55 Industrial Indicators) was conducted. Two options were examined as the end result of a study that in both options, Tehran province was the most active province in the country.
- Management and Planning Organization, 1994: Introduction to causes of regional inequality in Iran: it was ranked country's provinces based on two separate indicators per

capita GDP and per capita cost of private consumption. In this study, country's provinces are in three income groups that Tehran is in the first place.

- Management and Planning Organization, 1994: a framework for analyzing and integrating regional indicators: by using of factor analysis (18 indicators) was conducted. Tehran provinces were in the top with 16 points.
- Management and Planning Organization, 1999: Ranking based on relative prosperity by using of factor analysis: it performed by using factor analysis and cluster analysis. Results of this study shown Tehran Province was the most developed and Kohgiluyeh and Boyer Ahmad province were the least developed provinces of the country.
- Business Studies and Research Center, 2009: a comparative analysis of industrial development in different provinces: it was conducted by using numerical taxonomy methods and combination of factor analysis and numerical taxonomy. Developed industrial provinces of the country were: Ilam, Kermanshah, Hormozgan, Kohgiluyeh and Boyer Ahmad and Sistan and Baluchestan.

In Lorestan Province: one of the studies that specifically have been conducted about Lorestan province and the results are as follows:

- Hashemi, 2013 [5]: Portrait of development in decuple urban areas of Lorestan province is unbalanced and uneven in triple fields of economic, social and cultural. None of the cities of Lorestan Provinces has been developed level. Medium to high cities were Khorram-Abad, Borujerd, Aligudarz and Dorud cities in some cases and other cities were medium to lower, and only two cities of Borujerd and Khorram-Abad were moderate to high in terms of development. Delfan city was deprived in all fields.
- Mohammadi et al., 2012 [16]: In this study, development degrees of cities of Lorestan province in housing and utilities-infrastructure, agriculture and industry services, by using of 61 socio-economic indicators and there were calculated by factor analysis and numerical taxonomy methods in two time periods in 2003 and 2008, and development degrees of cities were calculated and ranked in each section, and Finally inequality coefficient between cities was discussed.
- Mohseni, 2006 [17]: The results of cluster analysis for selected indicators for the study showed that in general, cities of province were in three clusters. Azna, Selseleh, Delfan and Dorud cities were in the lowest cluster, and Poldokhtar and Koohtasht cities were in the middle cluster, and Khorram-Abad and Borujerd and Aligudarz cities were in the highest cluster in terms of development.

Data

Khorram-Abad is the capital of Lorestan province that is one of the western cities of Iran. It is a mountainous area, and the almost Zagros Mountains is covered it. This area is one of the earliest old settlements of human-based on archaeological findings. (This province has 28308 square kilometres area (07/1% of the country) and more than 1,754,243 people. (Urban population: 32/61%, rural population: 72/38%).). The second unemployment rate in Iran belongs to Lorestan Province with 9.14%. This is the thirteenth province of Iran in terms of population, and it is one of Iran's most populous provinces. Lorestan Province has the third rank in water reserves, and it has 12% of the country's waters. In the latest changes in the division of the country, the province has ten cities, 25 towns, 27 districts and 84 rural districts and 2,861 villages with inhabitants. Provinces of Lorestan Province are Aligudarz, Borujerd, Khorram-Abad, Delfan, Dorud, Kuhdasht, Azna, Poldokhtar, Selseleh and Doreh- Chaghni (Table 1).

Table 1: General Specifications of cites of Lorestan Province based on country division.

Cities	Area (Km)	Population	Inhabitant in urban areas	Inhabitant in rural areas	Uninhabitable	Number of districts	Number of cities	Number of villages	Number of inhabited villages
Aligudarz	5444	140275	89520	50691	64	3	2	11	362
Borujerd	1711	337631	245737	91894	0	2	2	7	192
Korram-Abad	4935	487167	354855	132034	278	4	4	17	609
Delfan	2546	144161	62190	81971	0	2	2	10	432
Dorud	1349	162800	100977	61823	0	2	2	5	134
Kuhdasht	3982	218921	111736	107060	125	5	5	11	304
Azna	1360	71586	41706	29842	38	2	2	4	91
Poldokhtar	3849	75327	32594	42371	362	2	2	7	269
Selseleh	1503	73154	33133	40021	0	2	2	6	266
Doreh-Chegeni	1629	43221	3503	39709	9	3	2	6	202
Sum	28308	1754243	1075951	677416	876	27	25	84	2861

Source: Statistical Yearbook 1390 for Lorestan Province

Methodology

We used from in analysis stage to provide the information required which were using data contained statistical yearbook, texts (books and articles), local and foreign, visual documents such as maps and more. Indicators were selected through studies conducted. Stages of numerical taxonomy model were done, and finally, the results of this method were analyzed, and the ranks of regions were identified in terms of development.

Numerical Taxonomy: Taxonomic analysis is a method of grading regions in terms of development. Taxonomy: Taxonomic analysis is used to different classification in sciences. Numerical taxonomy is a type of taxonomic analysis that is a numerical evaluation of similarities and proximity between taxonomic units and ranking their elements taxonomic groups [9; 21]. Numerical taxonomy stages are:

First step: formation of matrix of data: for this purpose, we are considered n for different region that has m indicator, so we can define vectors as follows:

$$\begin{aligned}
 &B_1(x_1, x_2, x_3, \dots, x_m) \\
 &B_2(x_1, x_2, x_3, \dots, x_m) \\
 &\vdots \\
 &\vdots \\
 &\vdots \\
 &B_n(x_1, x_2, x_3, \dots, x_m)
 \end{aligned}$$

Each of regions (n region) due to a number of indicator (m indicator) have been introduced. These vectors can be also wrote in the form of a matrix. Thus, the matrix X is defined as follows:

$$X = \begin{bmatrix} X_{11} & \cdots & X_{1m} \\ \vdots & \ddots & \vdots \\ X_{n1} & \cdots & X_{nm} \end{bmatrix}$$

In this matrix, x_{11} represents the first region and the first indicator and x_{12} represents the second indicator and the first region where the first indicator is for row (target region) and the second indicator is for column (target indicator), therefore, x_{nm} represents m indicator of n region.

Second step: formation of standard matrix of data: Each of matrix data refers to various indicators that have not same units. Matrix of data gets standard because of separation of indicators from unit and eliminate units inconsistency problem. For standardizing matrix X , first average standard deviation of each column is calculated. Then Z -standard formula is used to standardize data matrix and it placed in the form of a new matrix Z :

$$Z_{ij} = \frac{X_{ij} - \bar{X}_{ij}}{S_j}$$

$$\bar{X}_{ij} = \frac{\sum_{i=1}^n X_{ij}}{n} : \text{Columns average}$$

$$S_j = \sqrt{\frac{\sum_{i=1}^n (X_{ij} - \bar{X}_{ij})^2}{n}} : \text{Standard Deviation of columns}$$

$$Z = \begin{bmatrix} Z_{11} & \cdots & Z_{1m} \\ \vdots & \ddots & \vdots \\ Z_{n1} & \cdots & Z_{nm} \end{bmatrix}$$

The largest amount of each column is called ideal values. Features of standard matrix of data are: indicators has become to scale unit, b) Standard Deviation is one and mean is zero.

Third step: calculating composite intervals between regions and determine the shortest intervals: By having standard matrix Z can be found differences (intervals) of any region than any other region in each of indicators and achieved composite intervals between regions in terms of a set of indicators.

$$D_{ab} = \sqrt{\sum (Z_{aj} - Z_{bj})^2}$$

a and b shows two evaluated areas in terms of their composite intervals, so that:

$$D_{ab} = 0 \quad D_{bb} = 0 \quad D_{ab} = D_{ba}$$

We can indicate obtained from composite intervals in the matrix:

$$D = \begin{bmatrix} 0 & \cdots & D_{1m} \\ \vdots & \ddots & \vdots \\ D_{n1} & \cdots & 0 \end{bmatrix}$$

Diameter of interval matrix is zero and also symmetrical. Each matrix element represents an interval between two regions. An area that is closer and more similar to target region, is a region that it has a lowest values of composite interval. According to importance of minimum intervals, a separation of column on matrix D is considered and inserted minimum amount of each row. In other words, this column represents the shortest interval between I region and other regions.

Fourth step: Find homogeneous regions: we can considered unmeaning intervals which are higher or lower than certain values. This amounts, in fact, limits are too high and too low and can be obtained as follows:

$$D_+ = \bar{D} + 2S_d$$

$$D_- = \bar{D} - 2S_d$$

$$\bar{D} = \frac{\sum d_i}{n} : \text{Average of the shortest interval}$$

S_d : Standard Deviation of shortest interval

Regions where their intervals are between two ranges of D_+ and D_- , there are similar and placed in a group and two regions that their intervals are more than D_+ range, indicates that there is no similarity in terms of development .

Fifth step: Categories homogeneous regions and determine the development model: The development model is an interval of each city and the ideal city for each of indicators. When indicators are smaller, it means intervals between region and ideal region is less and more developed, and when indicators are greater, it is a reason of region underdevelopment and is equal to:

$$C_{io} = \sqrt{\sum (Z_{ij} - Z_{oj})^2}$$

Sixth step: Calculate development degrees of regions: After determining development model for each of regions, we are paid to development degrees which their values are varies between zero and one and when is near to zero number, indicates more development and when is near to one number, indicates lack of development and it is achieved by the following formula (Hehmat-Nia et al, 1392):

$$F_i = \frac{C_{io}}{C_o}$$

$$C_o = \bar{C}_{io} + 2S_{io}$$

$$\bar{C}_{io} = \frac{\sum_{i=1}^n C_{io}}{n} : \text{Mean}$$

$$S_{io} = \sqrt{\frac{\sum_{i=1}^n (C_{io} - \bar{C}_{io})^2}{n}} : \text{Standard Deviation}$$

Indicator

Definition: indicator is numbers that are used to measuring fluctuations of variable factors through time. In other words, we can apply to index variables by the convert of per capita variables, ratios, percentages, etc. [6]. Objective and subjective indicators can measure regional inequalities. Objective indicators are measurable.

Subjective indicators are obtained by asking people [10]. Given that studies of social, economic, cultural and health indicators are one of the important components of development process [8] using of these indicators can be a good criterion to determine position and status of regions. We used from 37 indicators in the fields of infrastructural, health, socio-cultural, economic, agricultural and industrial development to determine development levels of cities of Lorestan province which are detailed as follows:

Infrastructural: 1. Percent of electronic consumer's types, 2. Percent of villages have electricity, 3. Percent of cities that have gas supplies, 4. Percent of villages that have gas supplies 5. Natural gas consumption (cubic meters) to population (per capita natural gas consumption), 6- consumption of petroleum products (cubic meters) to population (per capita consumption of petroleum products), 7. Water consumption (cubic meters) to the population living in urban areas in the city (per capita amount of water), 8. Sewerage network length (km) in urban areas per thousand inhabitants in the city, 9. Number of public residences in urban and rural areas per thousand square kilometers, 10 roads under the Department of Roads and Urban Development (km) per thousand square kilometers, 11. 11. Number of postal units providing postal services for thousands of people, 12. Number of active housing cooperatives enterprises per thousand

population, 13. Number of active cooperative enterprises of transportation per thousand population, 14. Number of rural cooperative enterprises per thousand inhabitants in the village.

Healthcare: 15. The number of pharmacies per thousand population, 16. Number of active treatment center per hundred thousand inhabitants, 17. Number of beds of active treatment center per hundred thousand inhabitants, 18. Number of doctors, dentists and pharmacists per thousand inhabitants, 19. Number of urban health centers per thousand inhabitants in the city, 20. Number of rural health centers per thousand inhabitants in the village, 21. Number of active rural health centers per thousand inhabitants in the village.

Socio-cultural: 22. Percent of rural and urban literate's population over 6 years (Percent of total literacy), 23. Percent of members of public libraries, 24. Number of public libraries per ten thousand population, 25. The number of cases referred to the Public Library members, 26 number of books in the public library members, 27 number of books in the public library to population (per capita of books in public libraries), and 28. Number of cinemas per hundred thousand inhabitants.

Economy: 29. Percent of the working population, 30. Number of Bank units per thousand inhabitants, 31. Percent of employees in industrial workplaces with 10 employees to total employment.

Agriculture: 32. Yield in wheat (kg), 33. Number of active agricultural cooperative enterprises per thousand inhabitants, 34. Total area of agricultural land (agricultural, horticultural (hectares)) exploitation of land population (per capita total area of agricultural land).

Industrial Development: 35. Number of active cooperatives enterprises per thousand population, 36. Number of active mining cooperative per thousand inhabitants, 37. Number of industrial workshop with 10 employees and more per thousand population.

Data and standard of data of indicators: Available data of indicators for these cities with the exception of Doreh-Chegeni city (because of incompletes in statistic f this city) in table 2 and standard indicators data provided in table 3:

Table 2: Indicators data

Cities	Infrastructure													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Aligudarz	28.2	74.03	50	8.56	743.71	0.64	60.21	0.99	2.39	55.38	0.51	0.17	0.02	0.26
Borujerd	32.79	83.85	100	16.15	760.13	0.66	64.23	0.47	12.86	91.76	0.28	0.31	0.03	0.18
Korram-Abad	28.96	100	75	8.54	682.97	0.65	64.37	1.49	8.71	75.79	0.35	0.25	0.1	0.27
Delfan	23.11	85.88	100	6.48	375.54	0.27	52.92	2.02	1.57	50.67	0.3	0.03	0.05	0.16
Dorud	29.84	99.25	100	25.37	1883.56	1.01	78.21	1.53	8.9	76.35	0.41	0.14	0.03	0.15
Kuhdasht	21.38	93.09	40	3.62	263.33	0.48	56.8	0.54	0.5	58.76	0.42	0.02	0.03	0.17
Azna	38.15	97.8	100	17.58	801.21	1.07	80.05	0.76	0.74	66.91	0.61	0.14	0.03	0.23
Poldokhtar	29.09	85.87	100	1.86	460.57	1.45	80.59	1.54	2.34	57.42	0.58	0.09	0.12	0.28
Selseleh	27.77	83.46	100	29.7	531.27	0.86	67.93	1.68	2.66	117.1	0.79	0.1	0.1	0.25

Mean	28.8 1	89.2 5	85	13.1	722.4 8	0.7 9	67.2 6	1.22	4.52	72.2 4	0.4 7	0.1 4	0.0 6	0.2 2
Standard Deviation	4.92	8.81	24.2 4	9.73	473.5 6	0.3 5	10.2 7	0.55	4.45	21.2 2	0.1 7	0.1	0.0 4	0.0 5
Cities	Healthcare							Social-Cultural						
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Aligudarz	0.08	0.71	0.85	0.46	0.26	0.2 4	1.28	77.3 3	3.85	0.21	4.4 1	7.5 3	0.2 9	0.7 1
Borujerd	0.12	0.89	0.9	0.41	0.17	0.1 4	0.89	83.3 8	2.28	0.15	6.3 6	12. 3	0.2 8	0.5 9
Korram-Abad	0.13	2.67	2.18	0.67	0.2	0.1	0.86	84.8	3.4	0.16	3.0 6	6.8 3	0.2 3	0.6 2
Delfan	0.06	0.69	0.57	0.34	0.29	0.1	0.93	73.7 1	2.81	0.28	1.1 5	7.3 1	0.2 1	0.6 9
Dorud	0.12	1.23	1.05	0.34	0.2	0.0 8	0.74	83.4 6	2.63	0.12	2.0 4	5.9 7	0.1 6	0.6 1
Kuhdasht	0.06	0.46	0.58	0.37	0.2	0.0 7	0.8	75.0 5	2.7	0.27	1.2 4	7.9 4	0.2 1	0
Azna	0.11	1.4	0.68	0.74	0.38	0.1 7	1.11	80.8 1	3.97	0.28	1.0 9	7.4 7	0.3	0
Poldokhtar	0.08	1.33	0.72	0.56	0.37	0.1 4	1.18	77.6 2	5.1	0.27	1.7 3	8.3 8	0.4 3	0
Selseleh	0.1	1.37	0.52	0.42	0.36	0.1	1.1	78.7 2	3.84	0.14	3.6 2	6.8 9	0.2 6	1.3 7
Mean	0.1	1.19	0.89	0.48	0.27	0.1 3	0.99	79.4 3	3.4	0.21	2.7 4	7.8 5	0.2 6	0.5 1
Standard Deviation	0.03	0.65	0.51	0.15	0.08	0.0 5	0.19	3.92	0.89	0.07	1.8	1.8	0.0 8	0.4 5
Cities	Economy			Agriculture			Industrial Development							
	29	30	31	32	33	34	35	36	37					
Aligudarz	78.0 5	0.21	5.1	2306	0.22	0.5 6	0.15	0.53	0.33					
Borujerd	82.7 4	0.27	6.34	2383	0.15	0.1 7	0.14	0.02	0.29					
Korram-Abad	70.1 4	0.26	0.88	1943	0.44	0.2 8	0.14	0.07	0.08					
Delfan	71.9 3	0.11	0	2083	0.18	0.9	0.06	0.01	0					
Dorud	66.5 3	0.19	5.74	2898	0.47	0.2 3	0.13	0.07	0.14					
Kuhdasht	59.6 9	0.12	0	2169	0.19	0.8 8	0.02	0	0					
Azna	74.9 8	0.27	1.61	3702	0.31	0.7 6	0.06	0.1	0.17					

Poldokhtar	68.65	0.27	0	2481	0.23	0.54	0.04	0.04	0	
Selseleh	52.02	0.21	0	3381	0.7	0.6	0.07	0.01	0	
Mean	69.41	0.21	2.19	2594	0.32	0.55	0.09	0.09	0.11	
Standard Deviation	9.33	0.06	2.73	606.76	0.18	0.27	0.05	0.17	0.13	

Source: author's calculations by using 1390 Statistical Yearbook of Lorestan province

Table 3: Standard indicator data

Cities	Infrastructure													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Aligudar z	0.12- 2-	1.73- 3-	1.44- 4-	0.47- 5-	0.04 4	0.43- 7-	0.69- 8-	0.42- 5-	0.48- 9-	0.79- 10-	0.24 4	0.3 0.3	1.00- 13-	0.8 0.8
Borujerd	0.81 1	0.61- 2-	0.62 2	0.31 1	0.08 8	0.37- 9-	0.30- 6-	1.36- 7-	1.87 7	0.92 2	1.12- 3-	1.7 1.7	0.75- 8-	0.80- 14-
Korram-Abad	0.03 3	1.22 2	0.41- 3-	0.47- 8-	0.08- 5-	0.40- 6-	0.28- 9-	0.49 9	0.94 4	0.17 7	0.71- 2-	1.1 1.1	1 1	1 1
Delfan	1.16- 7-	0.38- 9-	0.62 2	0.68- 10-	0.73- 4-	1.49- 10-	1.40- 6-	1.45 5	0.66- 8-	1.02- 3-	1.00- 4-	1.10- 5-	0.25- 6-	1.20- 14-
Dorud	0.21 1	1.14 4	0.62 2	1.26 6	2.45 5	0.63 3	1.07 7	0.56 6	0.98 8	0.19 9	0.35- 10-	0 0	0.75- 13-	1.40- 14-
Kuhdash t	1.51- 2-	0.44 4	1.86- 7-	0.97- 8-	0.97- 9-	0.89- 10-	1.02- 3-	1.24- 6-	0.90- 4-	0.64- 5-	0.29- 10-	1.20- 11-	0.75- 12-	1.00- 13-
Azna	1.9 7	0.97 2	0.62 2	0.46 6	0.17 7	0.80.8 8	1.25 5	0.84- 6-	0.85- 7-	0.25- 8-	0.82 2	0 0	0.75- 13-	0.2 0.2
Poldokhtar	0.06 6	0.38- 9-	0.62 2	1.16- 7-	0.55- 8-	1.89 9	1.3 1.3	0.58 8	0.49- 10-	0.70- 11-	0.65 5	0.50- 6-	1.5 1.5	1.2 1.2
Selseleh	0.21- 2-	0.66- 7-	0.62 2	1.71 1	0.40- 5-	0.2 0.2	0.07 7	0.84 4	0.42- 3-	2.11 1	1.88 8	0.40- 5-	1 1	0.6 0.6
Ideal values	1.9	1.22	0.62	1.71	2.45	1.89	1.3	1.45	1.87	2.11	1.88	1.7	1.5	1.2
Cities	Healthcare							Social-Cultural						
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Aligudar z	0.67- 8-	0.74- 9-	0.08- 10-	0.13- 11-	0.13- 12-	2.2 2.2	1.53 3	0.54- 10-	0.51 1	0 0	0.93 3	0.18- 9-	0.38 8	0.44 4
Borujerd	0.67 7	0.46- 8-	0.02 2	0.47- 10-	1.25- 11-	0.2 0.2	0.53- 9-	1.01 1	1.26- 10-	0.86- 11-	2.01 1	2.46 6	0.25 5	0.18 8
Korram-Abad	1 1	2.28 8	2.53 3	1.27 7	0.88- 9-	0.60- 10-	0.68- 11-	1.37 7	0 0	0.71- 2-	0.18 8	0.56- 7-	0.38- 9-	0.24 4
Delfan	1.33- 4-	0.77- 8-	0.63- 7-	0.93- 10-	0.25 5	0.60- 6-	0.32- 3-	1.46- 9-	0.66- 7-	1 1	0.88- 9-	0.30- 4-	0.63- 7-	0.4 0.4
Dorud	0.67 7	0.06 6	0.31 1	0.93- 10-	0.88- 9-	1.00- 11-	1.32- 3-	1.03 3	0.87- 8-	1.29- 10-	0.39- 4-	1.04- 5-	1.25- 6-	0.22 2
Kuhdash t	1.33- 4-	1.12- 5-	0.61- 6-	0.73- 8-	0.88- 9-	1.20- 11-	1.00- 12-	1.12- 3-	0.79- 7-	0.86 6	0.83- 4-	0.05 5	0.63- 7-	1.13- 4-

Azna	0.3 3	0.3 2	0.4 1-	1.7 3	1.3 8	0.8	0.6 3	0.3 5	0.6 4	1	0.9 2-	0.2 1-	0.5	1.1 3-
Poldokhtar	0.6 7-	0.2 2	0.3 3-	0.5 3	1.2 5	0.2	1	0.4 6-	1.9 1	0.8 6	0.5 6-	0.2 9	2.1 3	1.1 3-
Selseleh	0	0.2 8	0.7 3-	0.4 0-	1.1 3	0.6 0-	0.5 8	0.1 8-	0.4 9	1.0 0-	0.4 9	0.5 3-	0	1.9 1
Ideal values	1	2.2 8	2.5 3	1.7 3	1.3 8	2.2	1.5 3	1.3 7	1.9 1	1	2.0 1	2.4 6	2.1 3	1.9 1
Cities	Economy			Agriculture			Industrial Development							
	29	30	31	32	33	34	35	36	37					
Aligudarz	0.9 3	0	1.0 7	0.4 7-	0.5 6-	0.0 4	1.2	2.5 9	1.6 9					
Borujerd	1.4 3	1	1.5 2	0.3 5-	0.9 4-	1.4 1-	1	0.4 1-	1.3 8					
Korram-Abad	0.0 8	0.8 3	0.4 8-	1.0 7-	0.6 7	1.0 0-	1	0.1 2-	0.2 3-					
Delfan	0.2 7	1.6 7-	-0.8	0.8 4-	0.7 8-	1.3	0.6 0-	0.4 7-	0.8 5-					
Dorud	0.3 1-	0.3 3-	1.3	0.5	0.8 3	1.1 9-	0.8	0.1 2-	0.2 3					
Kuhdash t	1.0 4-	1.5 0-	0.8 0-	0.7 0-	0.7 2-	1.2 2	1.4 0-	0.5 3-	0.8 5-					
Azna	0.6	1	0.2 1-	1.8 3	0.0 6-	0.7 8	0.6 0-	0.0 6	0.4 6					
Poldokhtar	0.0 8-	1	0.8 0-	0.1 9-	0.5 0-	0.0 4	1.0 0-	0.2 9-	0.8 5-					
Selseleh	1.8 6-	0	0.8 0-	1.3	2.1 1	0.1 9	0.4 0-	0.4 7-	0.8 5-					
Ideal values	1.4 3	1	1.5 2	1.8 3	2.1 1	1.3	1.2	2.5 9	1.6 9					

Source: author's calculations by using of table 2 data

Findings

By having standard indicators data, the difference (interval) per region than any other region in each of the indicators were obtained. Then, composite intervals were obtained between regions in terms of indicators, and all regions were in a homogeneous group. After that development model, and degree were calculated as follows (Table 4 & 5):

Table 4: Composite intervals

Cities	Aligudarz	Borujerd	Korram-Abad	Delfan	Dorud	Kuhdash t	Azn a	Poldokhtar	Selseleh	The shortest distance
Aligudarz	0	7.86	8.77	8.3	9.17	8.85	7.85	8.24	9.19	7.85
Borujerd	7.86	0	7.84	9.89	7.43	10.11	9.01	10.11	10.01	7.43

Korram-Abad	8.77	7.84	0	9.2	6.99	9.51	8.22	8.36	8.41	6.99
Delfan	8.3	9.89	9.2	0	8.75	4.81	8.91	8.25	8.57	4.81
Dorud	9.17	7.43	6.99	8.75	0	9.13	8.08	9.72	7.95	6.99
Kuhdasht	8.85	10.11	9.51	4.81	9.13	0	9.01	8.75	9.35	4.81
Azna	7.85	9.01	8.22	8.91	8.08	9.01	0	5.86	7.83	5.86
Poldokhtar	8.24	10.11	8.36	8.25	9.72	8.75	5.86	0	7.74	5.86
Selseleh	9.19	10.01	8.41	8.57	7.95	9.35	7.83	7.74	0	7.74
Mean Shortest Distance: 6.48, Standard Deviation Shortest Distance: 1.18, High Limit Distances: 8.85, Low Limit Distances: 4.11										

Source: author's calculations by using of table 3 data

Table 5: Development model and grade of regions.

Cities	Development model	Development grade of regions
Aligudarz	11.19	0.70
Borujerd	11.48	0.72
Korram-Abad	10.73	0.67
Delfan	14.86	0.93
Dorud	11.82	0.73
Kuhdasht	15.85	0.99
Azna	10.10	0.63
Poldokhtar	11.34	0.71
Selseleh	11.02	0.69

Source: author's calculations by using of table 4 data

Analysis

Calculation of data shows cities of Lorestan province in terms of development level were between two categories as low development and underdeveloped and underprivileged:

Table 6: Ranking model of regions in terms of development based on numerical taxonomy

Cities	Development levels	Development grade
-	Relatively developed	0-0.25
-	High developed	0.25-0.50
Azna- Khorram(The most developed)-Abad – Selseleh-Aligudarz-Poldokhtar-Borujerd-Dorud	Low developed	0.50-0.75
Delfan- Kuhdasht (the most underdeveloped)	Underdeveloped and underprivileged	0.75-1

Source: author's calculations by using of table 5 data

Conclusion

Results show cities of Lorestan province has not a high development level, and we can categorize in two levels as low development and underdeveloped and underprivileged. Azna was the most developed and Kuhdasht was the most disadvantaged cities of the province. Development levels

of cities were includes, respectively: Azna, Khorram-Abad, Selseleh, Aligudarz, Poldokhtar, Borujerd, Dorud, Delfan and Kuhdasht.

In matching with past research that is done in the field of ranking cities of Lorestan province, concluded that: Khorram-Abad city was the highest development and Delfan city was one of the most disadvantaged and this results obtained in this study.

Khorram-Abad is the capital of the province, and it seems a reason of this city's development is because of that and also because of having a centralized feature of the country, like capitals of most provinces, it gets more attention than any other city. And also lack of development in Defan city that is the western city of Lorestan province can be seen because of far distance from the capital of the province. Considering that this province is the second-largest country in terms of unemployment, and regional imbalances have harmful economic and social results, it is necessary to remove regional imbalances in this province that is one of the regional planning priorities of the country. More attention is required to Delfan and Kuhdasht cities that are the most disadvantaged cities, especially Delfan city. It should also attention to Borujerd city because it is one of the tourist and industrial centres of province and it can play a significant role in economic growth.

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