Comparative Study of Applying Methods of Measuring Development in Regional Studies: A Case Study of 15 Regions in Isfahan

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Abstract

The wave of using quantitative models in social sciences during the 1960s along with issues of development and underdevelopment expanded the application of these methods in determining the degree or level of development. The present study aims at investigating and comparing some of the methods for determining the degree of development (Morris, Taxonomy) and addressing the question whether all methods yield similar results in determining the level of development. To do so, the level of development of regions in Isfahan was determined by selecting a variable in the form of 9 indexes of development and applying the data in each of the studied methods. The comparison of the results obtained by each of the methods shows that the degree or level of development in the studied areas is different from one method to another due to the type, or nature and the difference in measuring the indexes, and the peculiarities and specific features of each region. Therefore, it is necessary to take precautions in applying models, and quantitative methods, and the measures taken in planning based on the obtained results.

Keywords: Degree and Level of Development; Morris Model; Taxonomy Model; Coefficient of Variation; Regions in Isfahan

1. Introduction

The primary fundamental theory of economic development and underdevelopment developed during 1950s (DHV Engineering consultancy, 31, 1992). Discussions about (Development and Underdevelopment) and expansion of the scope of these discussions drew a large number of economists to the center of the debate. Economists who took part in the discussions about economic development can be divided into two groups. The first group is liberal economists such as Colin Clark, Benjamin Heginiz, Lord Robbins, Joan Robenson, John Kenneth Galbraith. The second group is socialists economists, and socialists raised and trained in the West such as Morris Edeb, Paul Baran, Harry Magraf, Gunnar Myrdal (Jirvand, 1996, 13).

Overall, since the issues of development and underdevelopment broke out, different schools and views about development and underdevelopment have been proposed including the evolutionary school of development of modernization theory, the Marxist view of development and dependency theory (Azkia, 2002, 35).

Studying each of these theories and views shows that the objective of each is to study and analyze the factors that help create and develop inequalities and imbalances in different countries and regions in spite of the important role that infrastructural services and facilities play in improving the development of rural areas (Izadi Farameh, 2001, 32). Providing and running all services and facilities in all settlements is neither necessary nor rational and logic (Rondinell,1998,115). Due to severe resource constraints and the need to determine investment priorities based on rational thinking and planning in these countries, it is attempted to invest and finance existing and available resources in the best location with the highest level of performance by adopt centralized policies such as creating and equipping such key or central settlements. The purpose of this policy which has been the focus of some development theories and came into force and was operated in the past decade especially since 1960 onwards in countries such as Brazil, Vietnam, Malaysia and Indonesia is to create a center or core which is prone to progressive growth and development and to prevent rural-urban immigrations by providing services (R. P. Mira, 1989, 46). However, there is a variety of quantitative methods and techniques for assessing and determining development which are used for organizing and assessing information depending on the degree of reliability and credibility of accessible information and the expertise and skills of

local planners. Among these methods are Taxonomy analysis, factor analysis, cluster analysis, social network analysis, hierarchical analysis of Morris's model, and neural network model (Badri, 1990, 53). Meanwhile, with advances in geographical information system it has become possible to make spatial models and analyze information spatially (Faraji Sabolbar, 2005, 125). It is obvious that each of these methods is based on different theoretical approaches and grounds and thus provides different classifications. However, there is a common theme and subject in all of these classifications and that is the difference and contrast which is usually between elements that constitute a region (Copus Crabtree, 1999, 42).

2. Theoretical Bases of the Research

With a brief review of the theories of development and underdevelopment, two general frameworks are proposed: the basic fundamental framework and the modern framework of development. The evolutionary school of development, modernization theory, the Marxist view of development, and dependency theory are within the fundamental framework (Azkia, 2002, 35).

These schools whose intellectual roots largely refer to and are based on Keynesian economics believe in expanding the intervening role of government in development with the contribution of foreign aids (DHV Engineering consultancy, 1992, 31). In all these schools, the dominance of top-down approach and the ruling role of government in pursuing development planning (Sarrafi, 1998, 158) and the analytic and detailed component-oriented view in analyzing issues of using quantitative methods and mathematical models by planners are inevitable for the ease of understanding and recognizing the complexities of issues and problems in different areas (Afrakhte, 1998, 11). In this framework, the usual conventional measurements and actions for development are done by preparing technical design and its executor implementation which is known as (Azalydy approach) during which everything, including human beings, is seen as a variable. On this basis, analytical techniques are used that help planners with understanding the structure and function and as a result make predicting and modeling possible (Sarrafi, 1998, 13, 164). In contrast, modern frameworks of development emphasize on bottom-up approaches of development by accepting views such as of local communities, the role of non-governmental organizations (NGTO), gender issues of equality, democracy of citizenship participation and most importantly environment and sustainable development (Hodder, 2000, 10).

From the latter view and framework, man and human society are employed not as (objects for modifications and adjustments) but (factors in changes) and individuals are considered as "subjects of research" not "objects of research". Therefore, the requirement for true realization of development is the acceptance of (participatory and cooperative approach) with bottom-up bilateral or reciprocal movement. This framework pursues systematic set of relationships to address issues of public interest due to holistic view to issues and regarding understanding cause and effect relationships. It relies on qualitative methods as well as quantitative methods in order to offer understandable and clear results in decision-making by the public and it considers planning not a proving science and not severely normalizing which follows universal laws, but a science looking for rules which are specific to each case and are compatible with the culture of the region, as a result, depending on the nature, it mostly benefits from process techniques (Sarrafi, 1998, 164).

Anyway, the emergence of a new model based on the fundamental principles of social sciences which supports a variety of development experiences at different times and in different places with emphasis on the foundations of people-centered approach in the theory of sustainable development shifts and changes the role of government from the main constructive, providing and regulating role to the role of establishing legal powerful frameworks, delegating power, and encouraging synergies and cooperation (Shepherd,1999 , 19). It looks for recognizing issues in a holistic framework and in this way it uses quantitative methods not as substitutes but as a means for facilitating the planning process and decision making.

3. Research Method

Regarding the aims of the research, descriptive applied and cross-sectional research method was used and the theoretical bases related to the subject were studied using attribute method. Then, in order to determine the levels of development in regions in Isfahan concerning the importance of indexes and access limitations to indexes, 30 variables were collected in the form of educational-cultural (the number of libraries, study halls, cultural centers), religious (the number of mosques), therapeutic (the number of health and therapeutic complexes), infrastructural (the number of beautification and ornamental elements, light stands, overpass bridges, underpass bridges, parking lots, in service parking lots), entertainment (the number of entertainment centers, bicycle stations, toys and amusement parks, safe playgrounds), green landscape (the number of city parks, local parks, green lands, neighborhood parks), sports (the

number of indoors and outdoors sports centers), population (the number of male literates, female literates, total number of literates, urban density, number of households/families), and construction (the number of constructional mechanized building permits, issued building permits, business building permits, offices, etc) indexes. This data is obtained from the results of the 2011 Population Housing. To analyze the data and determine the level of development, Morris's and Taxonomy's models and to determine the distribution of facilities and services, the coefficient of variation CV were used.

4. Recognizing the Study Area

Isfahan province with an area of over 1107090 square kilometers (about 35.6 of the total area of the country) is located in the center of Iran plateau. The geographical location or situation of this province is between 31 degrees, 26 minutes to 34 and 30 minutes of north latitude and 49 degrees and 34 minutes to 55 degrees and 50 minutes of east longitude of the Greenwich meridian. According to the latest country divisions in 2006, Isfahan County has 21 provinces, 92 cities, 44 sections, 122 villages and over 1934 inhabited hamlets.

Isfahan city is over 276/2 square kilometers. Isfahan city with the 5 degrees and 39 minutes and 40 seconds of east longitude, and 32 degrees and 38 minutes and 30 seconds of north latitude is located in the center of Isfahan province on the path of one of the vital arteries of the country (Isfahan Governship, 2008, 45).

Map 1: Isfahan Province, Iran

Table 1: The data and the variables in determining the development level in Isfahan province

Variable	Regions						
	1	2	3	4	5	6	7
1. Number of libraries and study halls	8	5	14	6	6	9	4
2. Number of cultural centers	10	2	10	5	3	7	5
3.Number of indoors sports centers	3	6	4	6	13	15	4
4.Number of outdoors sports centers	3	5	1	11	9	9	6
5. Number of entertainment centers	0	0	0	3	2	2	1
6.Number of beautification and ornamental elements	28	13	48	27	32	76	13
7.Number of light stands	38	0	26	0	46	35	37
8-Number of bicycle station	3	0	5	2	3	1	2
9-Number of toys and amusement parks	11	7	11	8	21	10	18
10-Number of safe playgrounds	10	5	10	6	19	8	16
11.Number of health and therapeutic centers	13	14	9	11	21	19	22
12.Number of overpass bridges	1	0	0	3	2	1	3

13.Number of underpass bridges	0	0	0	0	2	1	1
14.Number of parking lots	12	0	27	12	17	10	4
15.Number of in service parking lots	12	0	27	12	17	10	4
16-Number of mosques	76	54	210	51	38	88	88
17-Number of city parks	4	1	3	5	5	8	7
18-Number of local parks	0	4	7	11	2	12	9
19-Number of green landscapes	10	4	8	4	5	47	34
20-Number of neighborhood parks	0	4	7	11	2	12	9
21-Number of male literates	34068	27059	47860	55273	73169	49780	63865
22-Number of female literates	34406	24303	47067	53354	70009	48691	59948
23-Number of total literates	68474	51362	94927	108627	143178	98471	123813
24-Urban density	1105	493	1515	1868	1628	1192	1473
25-Number of households/families	25790	19787	26049	39868	48374	35803	35383
26-Number of constructional mechanized building permits	462	323	575	828	443	347	844
27-Number of issued building permits	1920	880	2033	3387	1898	0	2739
28-Number of business building permits	122	86	605	141	112	0	378
29-Number of business office permits	116	87	244	127	113	0	76
30-Others	276	942	2467	1684	465	0	1734

Table 2: The data and the variables in determining the development level in Isfahan province

Variable	Regions							
	8	9	10	11	12	13	14	15
1. Number of libraries and study halls	5	7	10	6	5	6	4	8
2. Number of cultural centers	5	3	6	5	3	5	0	6
3.Number of indoors sports centers	5	6	10	3	3	5	4	7
4.Number of outdoors sports centers	5	6	7	4	11	10	6	1
5. Number of entertainment centers	1	0	1	0	1	1	0	1
6.Number of beautification and ornamental elements	11	12	20	19	20	15	8	15
7.Number of light stands	107	0	0	36	29	0	0	0
8-Number of bicycle station	3	1	1	0	1	2	1	0
9-Number of toys and amusement parks	23	10	21	9	20	12	12	31
10-Number of safe playgrounds	23	9	20	8	16	11	12	4
11.Number of health and therapeutic centers	18	9	22	16	29	21	13	31
12.Number of overpass bridges	0	0	2	0	1	0	0	0
13.Number of underpass bridges	0	0	0	0	0	2	1	3
14.Number of parking lots	3	3	4	1	0	2	3	1
15.Number of in service parking lots	3	3	4	1	0	2	3	1
16-Number of mosques	63	70	93	45	32	35	76	100
17-Number of city parks	11	7	13	3	7	9	3	7
18-Number of local parks	23	5	46	2	24	14	38	13
19-Number of green landscapes	53	2	47	13	20	31	7	13
20-Number of neighborhood parks	28	3	2	4	10	9	0	13
21-Number of male literates	102843	31345	91354	2418	53549	5226	67415	47163
22-Number of female literates	98243	28895	83468	21484	50676	49697	59727	42003
23-Number of total literates	201086	60240	174822	45602	104225	101958	127143	89166
24-Urban density	1201	686	2042	3052	2075	4026	6876	4382
25-Number of households/families	71060	22573	63910	17005	3739	35696	46772	33896
26-Number of constructional mechanized building permits	1088	456	773	198	760	428	680	8205
27-Number of issued building permits	3824	1369	2820	519	3108	959	2515	27971
28-Number of business building permits	328	64	165	76	319	30	201	2627
29-Number of business office permits	260	40	91	8	81	9	106	1358
30-Others	119	699	2823	449	2951	209	1242	26060

5. The Structure of Methods for Measuring the Degree of Development

As mentioned in the theoretical foundations, programming techniques can be classified into two groups: analysis techniques and process techniques. In the present article, the method known as "a set of indexes' analysis" is used among different methods of analytical techniques which are mainly rooted in other sciences, especially natural sciences and physics. These kinds of methods are very common for measuring regional differences. However, special attention must be paid to standardization, and comparability of indexes, and non-repeating indexes. (Sarrafi, 1998, 167).

6. Morris's Method

Morris's method specifies the level of development by using descriptive data for each settlement unit compared to other units and the utilizing the following two parameters:

1-

$$Yij = \frac{xij - xij\min}{xiy\max - xij\min}$$

In this formula

Yij = uneven or imbalanced index for i[th] variable in j[th] unit

xij = i[th] variable in the jth unit

$xij\min$ = the minimum value of ith variable

$xij\max$ = the maximum value of the ith variable (Rezvani, 2004, 153).

The important point is that in this approach the used indexes must be aligned or in the same direction. To investigate the issue, all the considered indexes or parameters are used in the above formula (Ghadiri, 1998, 269).

2-The main index of development is calculated by the formula: $DI = \sum_{n=1}^{n} \frac{yij}{n}$

Where n is the number of studied indexes and DI is the main or key index of development. Morris's development index coefficient varies from zero to 100 , the closer it is to 100, the higher the level of development (Rezvani, 2004, 154).

7. Taxonomy's Model

Taxonomy's model is another method for assessing or measuring the degree of development in regions. It was first proposed by Anderson in 1763 and was introduced by Professor Heloving from the Higher School of Economics in UNESCO In 1968 as a means for classification of the degree of development among nations (Ziari, 2001, 137). This method is able to divide a set into a more or less homogenous subset to determine units or kinds of homogenous subjects in a three-dimensional vector space or environment without using variance regression and correlation analysis. Therefore, this method can be used as an appropriate framework or criterion for understanding the aspects and dimensions of social and economic growth and development in the region (Badri, 1990, 89).

8. Coefficient of Variation Method

In order to assess and measure how much or to what extent the value of an index is distributed in an unbalanced way among different regions, coefficient of variation method C.V is used. The coefficient of variation is calculated using the following formula: (Kalantari, 2001, 12).

$$C.V = \frac{\sqrt{\frac{\sum_{i=1}^{n} (x_1 - \bar{x})}{N}}}{\sum_{i=1}^{n} \frac{x_1}{N}}$$

$C.V$ = the value of the coefficient of the variations of an index

x_1 = the value of an index in a region

$\bar{x}$ = the means of an index

N = number of regions

In this method, a high CV value indicates greater inequality in the distribution of the considered index.

9. Research Results

Using the collected data in the form of 9 development indexes (30 variables) and according to Morris's and Taxonomy's model, the development coefficient is calculated for each region of the province. The results of the investigation show that the development coefficient varies from a minimum of 2.10 to a maximum of 10.08 so that Region 4 with the coefficient of 10.08 in Morris's model and 0.62 in Taxonomy's model has the highest development coefficient and Region 13 with the coefficient of 2.10 in the Morris's model and 0.977 in Taxonomy's model has the lowest development coefficient among the regions of the province.

Table 3: Development coefficient and the ranking of Isfahan regions

Region	Morris Model		Taxonomy Model	
	Coefficient	Ranking	Coefficient	Ranking
1	2.57	10	0.789	10
2	2.62	8	0.75	8
3	2.49	13	0.865	13
4	10.08	1	0.62	1
5	5.42	3	0.662	3
6	2.43	14	0.869	14
7	2.83	6	0.72	6
8	3.13	5	0.718	5
9	2.52	12	0.847	12
10	7.66	2	0.638	2
11	2.63	7	0.73	7
12	2.54	11	0.818	11
13	2.10	15	0.977	15
14	2.60	9	0.76	9
15	3.17	4	0.68	4

10. The Level of Development of Regions in Isfahan

Given the development coefficient, the regions were classified into four levels of developed (privileged), developing (semi-privileged), relatively developed and less developed (underprivileged or deprived) regions.

According to this classification, the development coefficient of building or construction indexes has the highest and the development coefficient of health and therapeutic indexes has the lowest rate of variation. By studying the coefficient of variation CV of the studied indexes, it is understood that health indexes and educational, cultural, and religious indexes have the lowest rate of imbalance in the distribution of facilities and services and infrastructural, entertainment, green landscapes, population, and sports indexes are in the next rankings.

Table 4: Development of Isfahan regions based on the applied methods

Region	Morris	Taxonomy
1	Less developed	Relatively developed
2	Less developed	Developed
3	Less developed	Developed
4	Developed	Developed
5	Developed	Relatively developed
6	Less developed	Relatively developed
7	Developing	Relatively developed
8	Developing	Relatively developed
9	Less developed	Relatively developed
10	Developed	Relatively developed
11	Developing	Less developed
12	Less developed	Less developed
13	Less developed	Less developed
14	Less developed	Relatively developed
15	Developed	Developed

Table 5: Development coefficient and ranking of Isfahan regions regarding the studied indexes

Rank Indexes	Educational-cultural	Religious	Health and Therapeutic	Sports	Green Landscape	Entertainment	Infrastructural	Population	Building or Structural
Coefficient of Variation	0.7	0.56	0.36	1.06	3.09	2.52	5.21	1.47	7.03

11. Conclusion

In the process of urban development planning, understanding and recognizing facilities' analysis and obstructs and blockages in urban areas, and grading these areas regarding the rate of privilege and deprivation are of great importance which must always be considered. Therefore, in the present article the development coefficient of urban regions and areas in Isfahan province is studied and determined using 30 variables of development indexes in Morris's and Taxonomy's models. Eventually, the regions of the province were classified into 4 levels of developed, developing, relatively developed, and less developed or underdeveloped regions. The results of study show that development coefficient in regions is different and unequal and some regions lack privileges regarding facilities and services. In addition, based on the calculation of coefficient of variation among the studied indexes, the health and therapeutic index suffers more imbalance and inequality in comparison to other indexes. The correlation coefficient and significance level of the studied factors show that the decrease in the distance from the city center has an effective role in the increase in development coefficient. According to the results, in order to achieve sustainable development, it is necessary to recognize potentials, capabilities and competences of the regions for fundamental purposeful planning and to design a hierarchical service system by organizing rural areas to minimize inequalities and restrictions on the way of urban sustainable development as far as possible.

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