Constructing Indicator System and Evaluating Regional Development in Iran by Analytic Hierarchy Process

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Abstract

One of the most fundamental executive policies of governments during development programs is creating balanced regional development. Regional inequalities are cited as reasons for growing social unrests, political instabilities, and disintegration. In Iran, these inequalities have been growing at an alarming rate leading to serious problems. So, analysis of development level of regions and consequently, identifying interregional and intraregional inequalities is of great importance in the way of adopting appropriate development policies. The aim of this study is evaluating development level of sub-provinces of Iran and exploring existent inequalities. A system of 54 indicators of different dimensions of regional development was constructed and submitted to Analytic Hierarchy Process (AHP) for this purpose. Analysis of Coefficient of Variation (CV) was also applied to reveal regional inequalities about different dimensions of development. The results of this research showed that there are obvious differentiations among sub-provinces in development level. In addition, spatial distribution of sub-provinces with regards development level indicates that an intensive system of core and periphery exists in the country. So, it is necessary to reduce regional inequalities in Iran to pave way for greater national integration, increase in economic growth and more political stability.

Keywords: Development, regional inequalities, Sub-provinces of Iran, National integration, Analytic Hierarchy Process (AHP), Coefficient of Variation (CV).

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1.Introduction

Inequality and its different dimensions are the significant signs of undeveloped countries. Beside low level of development indicators, these countries suffer from regional inequality and unfair distribution of facilities. Regional inequality is a direct consequence of the pole growth process, as some areas grow faster and achieve greater income and economic development levels than other areas (Song ,et al. ,2000). Along with new opportunities in economic growth, the problem of increasing regional disparity has come in a growing number of developing countries (Hu ,2002). Of course, this problem is quite common to all large and diverse countries where unequal economic conditions in different regions lead to a buildup of social tensions (Fedorov ,2002). Regional inequalities represent a continuing development challenge in most countries, especially those with large geographic areas under their jurisdictions. Large regional disparities represent serious threats as the inability of the state to deal with such inequities creates potential for disunity and, in extreme cases, for disintegration (Shankar & Shah ,2003).

The study of inequality and its aspects in different geographical limits has received the attention of planners and politicians in recent years (Yasouri ,2010). There has been considerable empirical research on the nature and causes of differences in regional output and growth (Chen & Groenewold, 2010). A number of these studies have, while discussing disparity, inequality, convergence and divergence, focused on correlations as well as causation between socio-economic variables and human development (Gylfason,1999) .Some other studies have focused on intraregional disparities and regional development (Song ,et al. ,2000). The common understanding in these studies is that intraregional disparities make a large proportion of total regional disparities. Therefore, a careful analysis of regional differences in sources of inequality could be of much help in devising policies for improving income distribution (Yasouri ,2010).

Lack of political access and influence, as well as the absence of economic clout, often leave marginalized populations excluded when important development and investment decisions are made, thus worsening their relative economic position in society (Dawson, 2001). Basically, the regional inequities are caused by two basic fields: (1) natural, cultural, social and economical conditions of each geographical region (Natural specifications of regions), and (2) Decisions of policy makers and economical planners (Higniz & Savi ,1997). As typically rich regions have better educated and better skilled labor, the gulf between rich and poor regions widens (Shankar & Shah ,2003). If poorer regions tend to grow faster than their counterparts to bring about reduced regional differentials, it is termed as convergence. Theoretically this may be possible through adoption of proper production technology and dynamics of technological progress which benefit poorer regions. By contrast, phenomenon of divergence is said to occur when richer regions grow faster to further their lead (Purohit ,2008). Regional development policies play an important role as a means of encouraging economic activities in depressed regions and reducing regional disparity (Matsumoto,2008).

The reduction in regional differences to stop the movement and displacement of human forces and capital in the direction of preparing the ground for development is very effective.

Immigration, poverty, low production and efficiency, unemployment etc. in some areas are the results of inefficient performance of economical, social and cultural foundations, agricultural depression, disorganized growth of population and discriminatory policies. Therefore, the study of economical and social indicators and the determination of the benefit areas are very urgent in the direction of finalizing development guidelines. Developmental programs must follow the improvement and promotion of the level of life. This not only helps the increase of purchase ability, but also provides some facilities in education, health, welfare and other fundamental facilities. Decreasing regional differences, particularly between cities and villages for preventing human

and funds movement and migration are very effective in providing the development (Yasouri ,2010). It may be argued that the policy of regional development will never be effective, unless the following is provided:

• Clear delimitation of powers and responsibilities between regions and the capital, as well as among intra-regional levels of power;

• Financial independence or sufficiency of local budgets for local self-government bodies to discharge their powers;

• Promotion of development of backward regions by fiscal and investment support (Fedyuk & Bychenko ,2009).

Today, from the social justice point of view, development is no longer means growth, but means the existence of facilities and fair distribution. Recognizing inequity and unbalancing within the framework of different geographical limits is under consideration and the necessities of working in this direction are recognizing the existing condition of every parts of the planning collections such as country, province, city and district and consequently, finding out the existing differences and distinctions and policy making for removing and decreasing the inequities in all parts of the collection. In this field, paying attention to regional inequities in the form of indices is considered as the most important tools of planning that through this, planners will be able to edit and evaluate the procedures and results of their planning in the frame and structure of geographical space (Ziari ,2004). Yet, it should be reminded that analysis of inequality at a very aggregate level might lead to bad conclusions (Cameron ,2002).

The main goal of this research is to identify and explore the major inequalities among all sub-provinces of Iran (336 sub-provinces) which is prerequisite for adopting convenient policies for achieving balanced regional development. Other goal was to develop a set of common indicators of regional development. The concept of a region in this research corresponds to the second subdivision level of Iran named sub-province or Shahrestan. Until the point of finalization of this research, the existence of any other research that dealt with the similar problem (monitoring, setting, comparison and evaluating the indicators of regional development in this scale) in Iran has not been determined.

The rest of this paper is organized as follows. Section 2 gives an overview of regional inequalities and regional planning in Iran. Section 3 presents the evaluation framework and methodology for assessment of development level and brief description of AHP and CV methods. . Weighting indicators, assessment of development level of sub-provinces of Iran and regional inequalities are discussed in section 4. Finally, conclusions and remarks are provided in last section.

2. An Overview of Regional Inequalities and Regional Planning in Iran

2.1. Regional inequalities in Iran

Regions within a country may be behind other regions in terms of income arising from economic activities. When this is combined with social poverty due to less access to goods and services provided by the public sector, it results in the region being seriously left behind the rest of the country. Inevitably, there is the perpetual effect of the latter on the former type of poverty. Iran is no exception to this process. Regional disparities in Iran have been growing at an alarming rate leading to serious problems including migration with its associated problems from backward provinces to the more affluent ones (Noorbakhsh,2002). The Human Development Report of Iran in 1999 reflects such disparities and reiterates that one of the major human development policies in the country's Third Plan is to "pay attention to the spatial planning as a long-term framework for social justice and regional balance". This report observes wide regional disparities within 26 provinces of Iran in terms of Human Development Index (HDI) and Human Poverty Index (HPI). After dividing provinces into higher, medium and lower groups according to the value of their HDI, the report highlights the extent of regional disparities and the need to deal

with them: “The level of deprivation seen in the third group and the vast areas covered by the provinces in the second group suggest that special disparity-reducing measures need to be taken”. The report concludes the analysis of regional disparities in human development by stating that “An improvement in human development in the I.R. of Iran as a whole requires not only a higher rate of economic growth but also a more equitable distribution of health and education facilities” (Plan and Budget Organization of the Islamic Republic of Iran and United Nations). In justifying regional inequality in Iran, some pinpoint the lack of natural resources in various areas. It is clear that natural resources are an important factor; however, in the absence of a clear and specific policy, they cannot account entirely for a region’s development status. Some other commentators attribute the regional inequalities in Iran to ethnic and cultural differences and identify a significant relationship between those and the development of the nation’s regions. In response to this, it can be said that while ethnic and cultural differences are not a new issue, regional inequality in its contemporary acute form is a new phenomenon. Another approach holds that the country’s regional inequalities are related to the limitations of regional markets and the market-oriented nature of Iranian industries. It is clear that such an analysis is addressing the effects rather than the causes of the problem (Afrakhteh , 2006). However, two factors are accounted as main causes of spatial inequality in Iran: (1) The centralized and sectoral nature of the political, administrative and social structure of Iran, which began in the mid-19th century with the entry of capitalism and which was institutionalized during the 1920s; and (2) The planning of the national economy according to principles of regional efficiency based on natural resources, along with the capital-oriented policy which expanded via organizational planning from 1949 onwards (Amir Ahmadi , 1986).

2.2. Regional Planning in Iran

Regional planning in Iran during the first decade following the Revolution (the 1980s) was based on reducing the development gap between different regions and creating a relative balance in regional development, special attention to the backward areas, control of urban and rural system, preparing the foundation for hierarchical distribution of services and infrastructure in the entire territory (Sheikhi , 1998).

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• Change of the direction of regional planning from national and interregional levels to intra-regional, regional and sub-regional levels.

• Increased attention to organizing plans for rural areas.

• Attention to identifying potential and capacities of regions for development (Sheikhi , 2001).

Law of the Fourth Economic, Social and Cultural Development Plan of the Islamic Republic of Iran (2005-2009) states that “In order to establish justice and social stability, to reduce social and economic disparities, to reduce the gap between income deciles and to secure fair distribution of income in the country, as well as to alleviate poverty and deprivation, enabling the poor, via allocation of effective and targeted allocation of the social security resources and payment of subsidy, government is bound to prepare and implement comprehensive plans for eradicating poverty and promoting social justice on the basis of the …” (Management and Planning Organization of Iran ,2005).

Conceptually, two approaches have been manifested in Iranian regional planning. One holds regional planning to be a kind of continuation of architec-

ture and the other believes regional planning to be a policy for economic development or an expansion of social justice. Following these two approaches, the regional planning process has been in practice unable to identify the real needs and priorities at different regional levels and consequently their application in responding the needs of the region have been hampered. On the other hand, the weakness of traditional methods of planning and the ambiguous legal position, responsibility and manner of providing regional plans, and lack of a clear task division among the relevant departments have, in practice, resulted in inter-departmental rivalries and caused parallel movements in compiling regional plans and programs which in the end has hampered their success (Afrakhteh , 2006).

3. Materials and methods

For evaluating regional development and regional inequalities in Iran, first, the aspects and attributes of regional development for which reliable data exists were identified. After establishing the set of indicators, the weights of indicators was calculated by Analytic Hierarchy Process (AHP) using Expert Choice software. Then these weights were submitted to rating scale AHP for calculating composite score of regional development and ranking sub-provinces. Analysis of Coefficient of Variation (CV) was also applied to reveal regional inequalities about different dimensions of development. The detailed descriptions of each step are elaborated in the following sub-sections.

3.1. Assessment of the level of Regional development

In order to provide a scientific basis for decision-makers, it is very necessary to comprehensively assess the status of regional development with regard to economy, resources and environment (Yu ,et al. , 2010). Assessment of the level of development of territorial units is crucial for regional planning and development policy and is a key criterion for allocation of various structural funds and national subsidies (Czira´ky , 2006). Determining the degree of development and ranking of economic areas is a problem that has been frequently studied in the past two decades. In earlier papers, economic systems of countries were considered as economic areas (Korhonen & Soismaa ,1980). Recently, regions have been considered as economic areas owing to the fact that their harmonious development is a very important prerequisite for economic stability and the progress of the country on the whole (Martic & Savic ,2001).

The human development index (HDI) as a measure of human well-being became popular with the publication of the first report on human development in 1990 by the United Nations Development Program (United Nations Development Program ,1990). Not only has the index been accepted by academics, policy makers, governments and development agencies, it has become a means of ranking countries annually. While the HDI offers a composite index that summarizes basic choices available to people, it has been criticized on many grounds. For example, it is argued that it does not capture the totality of issues that affect human wellbeing. Hence, efforts are being made to widen the scope of issues covered by the index (Sanusi , 2008). Because, society is a complex and dynamic state resulting from a number of interconnected and evolving, dynamic systems or domains (Dopfer ,1979). These systems may include the social, economic, political, environmental and spiritual, which can be represented by an integrated social-ecological and economic system. The concentration on only one of these systems to assess, measure or plan development is inadequate (Clarke & Islam ,2003).

The ranking of regions according to degree of social-economic development is often treated in the literature as the problem of the multi-criteria classification of elements of one set (Martic & Savic ,2001). Multi-criteria decision-making (MCDM) is one of the most widely used decision methodologies in the sciences, business, government and engineering worlds. MCDM methods can help to improve the quality of decisions by making the decision-making process more explicit, rational, and efficient. The typical MCDM problem is concerned with the

task of ranking a finite number of decision alternatives, each of which is explicitly described in terms of different characteristics (also often called attributes, decision criteria, or objectives) which have to be taken into account simultaneously (Wang & Triantaphyllou , 2008). A vast number of multi-criteria models and approaches are available in the literature, including among many others, some very well-established methods like multi-attribute utility theory, analytic hierarchy process, weighted sum and many more (Papadopoulosv & Karagiannidis ,2008). A prominent role in MCDM methods is played by the analytic hierarchy process (AHP) method which is based on pairwise comparisons. According to this method the decision maker compares two decision entities (pair of alternatives considered in terms of a single criterion or a pair of criteria) at a time and elicits his/her judgment with the help of a scale (Wang & Triantaphyllou , 2008). One of the most important advantages of the AHP is to be based on pairwise comparison. Besides, the AHP calculates the inconsistency index which is the ratio of the decision maker's inconsistency (Önüt , et al. 2010). The rationale for selection of AHP method for evaluating regional development in this study, beside these advantages, has been that this method is one of the more popular and widely used MCDM methods.

3.2. Indicators for Evaluating Development Level

The basis for decisions by public and private institutions usually comes from information that is available to the decision maker, and it is widely accepted today that the information is mostly provided in the form of indicators. Developing, calculating and disseminating indicators and their related data is also an important step in building an information system that will allow progress towards better transparency, accountability and good governance in public affairs (Önüt , et al. 2010). The purpose of indicators is to provide a tool for guidance in sustainability policies, including monitoring of measures and their results, and communication to the public at large (Spangenberg , et al. ,2002).

The most important step in studying regional development is determining development indices or indicators. Development indices are in fact the statistical expression of existing phenomena in the region. So, different economical and social variables must be converted to indices within a specific and logical theoretical framework. Different ratios, percents, rates of growth, per capita amounts and etc. are matters that are used logically as development indices within a special theoretical framework. Indices can be used for measuring the existing condition or historical process of economical and social changes, policy making, determining the rate of progress, evaluating the exploration of undeveloped regions and measuring regional disparities in different spatial and geographical levels (Yasouri ,2010). The history of the use of socioeconomic indicators and the composite measures of development based on these indicators has shown that if such measures are not geared to policy making their effects are limited and at best they can have a limited consequence for the way we consider them (Noorbakhsh,2002).

Aspects of well-being, inequality, deprivation or polarization, are intrinsically many-dimensioned things (Atkinson , 2003). So, the conventional way of assessing development by economic indicators only has been challenged many times (Noorbakhsh,2002). Policies and investments that are directly aimed at reducing non-income dimensions of poverty may be more important in increasing the welfare of the poor than economic growth (World Bank , 2001). "If we want a particularly satisfactory measure of inequality or poverty, we cannot define it over the income space alone and have to supplement the income data by information about the social relations between people and about comparison groups...Economic data cannot be interpreted without the necessary sociological understanding... There is a long way to go still to make adequate social sense of economic measures" (Sen ,2006).

For evaluating regional development and regional inequalities in Iran, a national survey involving all sub-provinces (336 sub-provinces) was conducted to

obtain data. The required data was collected mainly from detailed results of the last Population and Housing Census (2006) published by Statistical Centre of Iran, and statistical yearbooks of provinces of Iran. By using the all sub-provinces of Iran as case study, it was developed a system of 54 indicators of regional development that address economic development, agriculture, education, health, housing, infrastructure, and socio-cultural attributes, the details of which can be found in Table 1.

3.3. Analytic Hierarchy Process (AHP)

Dimension	Indicator	Unit	Desired direction
Agriculture	X1. Per capita arable land	Hectare	+
	X2. The yield of grains cultivation	kg/hectare	+
	X3. Proportion of farmers owning farm machinery	%	+
	X4. Per capita light livestock (sheep & goat)	number	+
	X5. Per capita heavy livestock (cow, camel & buffalo)	number	+
	X6. Per capita milk production	liter	+
	X7. Per capita honey production	kg	+
Social-Cultural	X8. Average household population	number	-
	X9. Proportion of inhabited villages	%	+
	X10. Literacy	%	+
	X11. Seating capacity of cinemas per 10,000 population	number	+
	X12. Number of public libraries per 100,000 population	number	+
	X13. Number of books in public libraries per 1000 population	number	+
	X14. Number of printing-offices per 100,000 literate population	number	+
	X15. Seating capacity of theaters per 10,000 population	number	+

Health	X16. Hospital beds per 10,000 population	number	+
	X17. Hospitals per 100,000 population	number	+
	X18. Rural health homes per 10,000 rural population	number	+
	X19. Number of medical diagnosis laboratories per 100,000 population	number	+
	X20. Number of pharmacies per 100,000 population	number	+
	X21. Number of radiography centers per 100,000 population	number	+
	X22. Number of rehabilitation centers per 100,000 population	number	+
	X23. General physicians per 10,000 population	number	+
	X24. Specialist physicians per 10,000 population	number	+
Education	X25. Teacher/student ratio in elementary schools	none	+
	X26. Number of classrooms per 100 students of elementary schools	number	+
	X27. Teacher/student ratio in middle schools	none	+
	X28. Number of classrooms per 100 students of middle schools	number	+
	X29. Teacher/student ratio in high schools	none	+
	X30. Number of classrooms per 100 students of high schools	number	+
	X31. proportion of the +20 years old population studying at universities	%	+
	X32. proportion of the +20 years old population graduated from universities	%	+

Housing	X33. House/family ratio	none	+
	X34. Proportion of houses that have electricity	%	+
	X35. Proportion of houses that use piped drinking water	%	+
	X36. Proportion of houses that use piped natural gas	%	+
	X37. Proportion of houses that have kitchen	%	+
	X38. Proportion of houses that have bathroom	%	+
	X39. Proportion of houses with Metal skeleton or Reinforced concrete skeleton	%	+
Economic	X40. Number of cooperative companies per 10,000 working people	number	+
	X41. Number of industrial factories per 100,000 population	number	+
	X42. Number of banks per 100,000 population	number	+
	X43. Employment	%	+
	X44. Proportion of employment in agriculture	%	+
	X45. Proportion of employment in industry	%	+
	X46. Per capita bank deposits	1,000,000 Rials(The currency of Iran)	+
Infrastructure	X47. Number of gas stations per 100,000 population	number	+

	X48. Proportion of villages that have electricity	%	+
	X49. Length of highways per 1000 km2 area	km	+
	X50. Length of rural asphalted roads per 1000 km2 area	km	+
	X51. Number of rural post offices per 10,000 rural population	number	+
	X52. Diffusion rate of telephone	%	+
	X53. Diffusion rate of mobile phone	%	+
	X54. Proportion of villages that have telephone communications	%	+

Table 1. Indicator system constructed to evaluate regional development of sub-provinces of Iran

The Analytic Hierarchy Process is a systematic method widely used for decision problems with many criteria and alternatives first developed by Saaty (Saaty ,1980). It is a tool used for solving complex decision problems that may have correlations among decision criteria based on three principles: decomposition, comparative judgments and synthesis of priorities. The AHP divides the decision problem into three main steps: (1) Problem structuring, (2) Assessment of local priorities, and (3) Calculation of global priorities. First, the problem is structured hierarchically, i.e. the decision maker constructs the hierarchies of factors for solving the decision problem. The overall goal is represented by the upper level of the hierarchy; one or more intermediate levels correspond to the hierarchy of the decision criteria, while the lower level consists of all considered alternatives (Chamodrakas ,et al. , 2010).

Decomposition of decisional process into a hierarchy of criteria, sub-criteria, and alternatives is done using

Importance intensity	Definition
1	Equal importance
3	Moderate importance of one over another
5	Strong importance of one over another
7	Very strong importance of one over another
9	Extreme importance of one over another
2, 4, 6, 8	Intermediate values
Reciprocals	Reciprocals for inverse comparison

Table 2. The 1-9 scales for pairwise comparisons in the AHP

a set of weights that reflect the relative importance of alternatives (Berrittella, et al. ,2008). In fact, this method systematizes the problem by employing the subsystem perspective endowed in the system (Tsaur ,et al., 2002).

The AHP method provides a structured framework for setting priorities on each level of the hierarchy using pairwise comparisons that are quantified using 1–9 scales in Table 2. The pairwise comparisons between the decision criteria can be conducted by asking the decision maker (DM) or expert questions such as which criterion is more important with regards to the decision goal and by what scale (1–9). The answers to these questions form an m × m pairwise comparison matrix which is defined as follows:

$$A=(a_{ij})_{m\times m}=\begin{bmatrix} a_{11} & a_{12} & \dots & a_{1m} \\ a_{21} & a_{22} & \dots & a_{2m} \\ \vdots & \vdots & \dots & \vdots \\ a_{m1} & a_{m2} & \dots & a_{mm} \end{bmatrix}$$

where represents a quantified judgment on with for i,j = 1, 2, . . . ,m. If the pairwise comparison matrix satisfies for any i,j,k = 1, 2, . . . ,m, then A is said to be perfectly consistent; otherwise it is said to be inconsistent. From the pairwise comparison matrix A, the weight vector W can be determined by solving Eq. (1):

$$AW=\lambda_{\max}W \quad (1)$$

where is the maximum eigenvalue of A. Such a method for determining the weight vector of a pairwise comparison matrix is referred to as the principal right eigenvector method (Saaty ,1980). Since the DM may be unable to provide perfectly consistent pairwise comparisons, it is demanded that the pairwise comparison matrix A should have an acceptable inconsistency ratio (I.R.) which can be calculated by Eq. (2):

$$I.R.=\frac{(\lambda_{\max}-n)/(n-1)}{R.I.I.} \quad (2)$$

where R.I.I. is a random inconsistency index, whose value varies with the order of pairwise comparison matrix. If I.R. ≤ 0.1, the pairwise comparison matrix is thought to have an acceptable consistency; otherwise, it need to be revised.

The traditional analytic hierarchy process (AHP) method can only compare a very limited number of decision alternatives, which is usually not more than 15. When there are hundreds or thousands of alternatives to be compared, the pairwise comparison manner provided by the traditional AHP is obviously infeasible (Wang, et al., 2008). This limitation can be removed by the rating scale AHP in which a rating scale is assigned to each sub-criterion related to every alternative. Thus, the comparison matrices are constructed through pairwise comparisons among the rating levels for each sub-criterion. The use of a rating scale instead of direct comparisons among the alternatives was introduced by Liberatore and can be found in various studies (Lee,et al., 2005). The major advantage of Liberatore's rating scale method is that it overcomes the explosion in the number of pairwise comparisons when the number of alternatives and/or the number of sub-criteria is large (Chamodrakas ,et al. , 2010).

3.4. Coefficient of variation (CV)

The coefficient of variation (CV) is one of the most widely used measures of regional inequality in the literature. The CV is a measure of dispersion around the mean (Shankar & Shah ,2003). This method is used for measuring how much an index has been distributed unequally between regions. The coefficient of variation is calculated by Eq. (3):

$$C.V.=\frac{\sqrt{\frac{\sum_{i=1}^{n}(x_i-\bar{x}_i)^2}{n}}}{\frac{\sum_{i=1}^{n}x_i}{n}} \quad (3)$$

Where is the amount of one indicator in the region i, is the mean of , and represents the number of regions.

The coefficient of variation has been used for

examining the procedure of existing disparities in development indexes between regions in large level, which the high amount of CV, indicates more disparity in distributing the index (Memar Zadeh ,1995).

4. Results and discussion

This study applied AHP method for evaluating development level of sub-provinces of Iran. First, the hierarchy frame for 54 development indicators was established (Figure 1), where the preliminary classification of indicators consists of seven dimensions involving economic development,

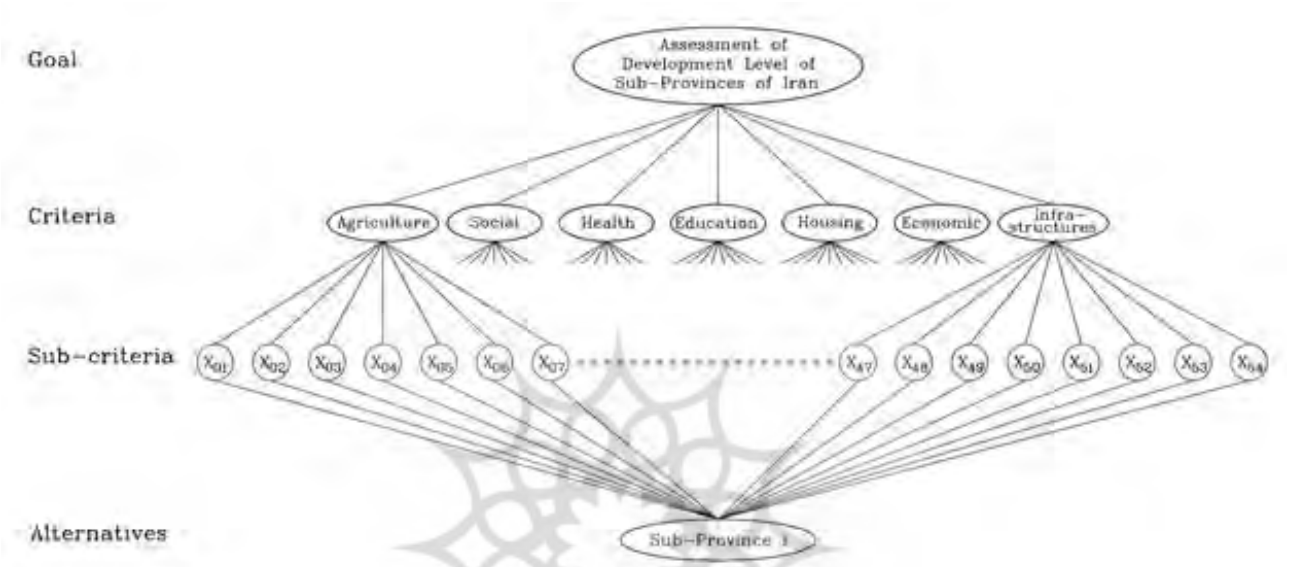

Figure 1. Hierarchy structure of evaluating regional development in Iran

Dimension	Indicator	Relative weight	Final weight
Agriculture 0.044	X1	0.181	0.008
	X2	0.280	0.012
	X3	0.083	0.004
	X4	0.122	0.005
	X5	0.280	0.012
	X6	0.034	0.001
	X7	0.020	0.001
Socio-Cultural 0.056	X8	0.023	0.001
	X9	0.231	0.013
	X10	0.406	0.023
	X11	0.048	0.003
	X12	0.118	0.007
	X13	0.048	0.003
	X14	0.078	0.004
	X15	0.048	0.003
Health 0.272	X16	0.057	0.016
	X17	0.216	0.059
	X18	0.216	0.059
	X19	0.092	0.025
	X20	0.057	0.016
	X21	0.027	0.007
	X22	0.027	0.007
	X23	0.092	0.025
	X24	0.216	0.059
Education 0.142	X25	0.106	0.015
	X26	0.106	0.015
	X27	0.041	0.006
	X28	0.041	0.006
	X29	0.041	0.006
	X30	0.041	0.006
	X31	0.222	0.032
	X32	0.402	0.057

Housing 0.217	X33	0.027	0.006
	X34	0.252	0.055
	X35	0.252	0.055
	X36	0.113	0.025
	X37	0.052	0.011
	X38	0.052	0.011
	X39	0.252	0.055
Economic 0.130	X40	0.060	0.008
	X41	0.131	0.017
	X42	0.021	0.003
	X43	0.320	0.042
	X44	0.204	0.027
	X45	0.204	0.027
	X46	0.060	0.008
Infrastructure 0.139	X47	0.026	0.004
	X48	0.175	0.024
	X49	0.263	0.037
	X50	0.263	0.037
	X51	0.026	0.004
	X52	0.078	0.011
	X53	0.053	0.007
	X54	0.116	0.016
Sum			1.000

Table 3. Weights of indicators in AHP method

agriculture, education, health, housing, infrastructure, and socio-cultural attributes. Pair-wise comparisons of were carried out in order to determine the importance (weights) of different dimensions of development and respective indicators. The relative and final weights of indicators were estimated using the AHP model whose results are presented in Table 3. Because of aforementioned limitation of traditional AHP for comparison of large number of alternatives, weighting results was submitted to rating scale AHP to calculate the composite score of development of each sub-province. In this stage, each indicator (sub-criterion) was normalized through scaling. This is important because, first, the indicators do not have the same units of measurements and second, to allow for comparison. So, different scales and units among various indicators were transformed into common measurable units by Eq. (4) and Eq. (5) for positive and negative indicators respectively.

$$r_{ij} = \frac{x_j - \min(x_j)}{\max(x_j) - \min(x_j)} \quad (4)$$

$$r_{ij} = \frac{\max(x_j) - x_j}{\max(x_j) - \min(x_j)} \quad (5)$$

Then, normalized appraisal matrix was constructed. In this matrix, minimum and maximum values for every indicator are 0 and 1 respectively. Based on normalized values of indicators, it was defined 5 rating levels. The comparison matrices were constructed through pairwise comparisons among the rating levels for each sub-criterion. The weight of rating levels can be seen in Table 4.

Rating Level	Weight
0.00-0.19	0.033
0.20-0.39	0.063
0.40-0.59	0.129
0.60-0.79	0.261
0.80-1.00	0.513

Table 4. The weights of rating levels

Maximum inconsistency ratio in all comparisons was 0.05 which is acceptable value. The rating scale was assigned to each sub-criterion related to every

Sub-province	Score	Rank	Sub-province	Score	Rank	Sub-province	Score	Rank	Sub-province	Score	Rank
Shemiranat	0.511	1	Azarshahr	0.329	85	Takab	0.295	169	Sirjan	0.266	253
Tehran	0.457	2	Ferdows	0.329	86	Kashmar	0.295	170	Kaleibar	0.265	254
Ramsar	0.453	3	Hendijan	0.329	87	Esfarayen	0.295	171	Andimeshk	0.265	255
Gorgan	0.427	4	Zanjan	0.328	88	Gonabad	0.294	172	Ramshir	0.265	256

Sari	0.422	5	Boyerah-mad	0.328	89	Aq Qala	0.294	173	Sumaehsara	0.265	257
Karaj	0.407	6	Jam	0.327	90	Khoy	0.293	174	Mohr	0.264	258
Esfahan	0.396	7	Behshahr	0.327	91	Dashtestan	0.293	175	Mamasani	0.264	259
Golpayegan	0.396	8	Noshahr	0.327	92	Ilam	0.292	176	Meshkin-shahr	0.263	260
Tabriz	0.392	9	Saveh	0.327	93	Sonqor	0.292	177	Namin	0.262	261
Ardestan	0.391	10	Ardakan	0.327	94	Fariman	0.291	178	Torbat-e-Heydariyeh	0.262	262
Qaemshahr	0.390	11	Haris	0.325	95	Ramhormoz	0.291	179	Kalat	0.261	263
Mahmoudabad	0.387	12	Tiran & Karvan	0.325	96	Oshnaviyeh	0.290	180	Baneh	0.261	264
Eslamshahr	0.385	13	Abhar	0.322	97	Fereydun-shahr	0.290	181	Qirokarzin	0.260	265
Kashan	0.383	14	Lahijan	0.322	98	Dayyer	0.290	182	Rudan	0.260	266
Damghan	0.382	15	Arak	0.322	99	Khorram-shahr	0.290	183	Piranshahr	0.259	267
Bijar	0.381	16	Borkhar & Meymeh	0.321	100	Estahban	0.290	184	Dehloran	0.259	268
Rey	0.377	17	Abyek	0.321	101	Garmi	0.289	185	Qeshm	0.259	269
Damavand	0.376	18	Sahneh	0.321	102	Rasht	0.289	186	Minab	0.258	270
Taft	0.376	19	Babol	0.319	103	Bandar Lengeh	0.289	187	Farashband	0.257	271
Bushehr	0.374	20	Orumiyeh	0.318	104	Torbat-e-Jam	0.288	188	Dalahu	0.257	272
Pakdasht	0.373	21	Langrud	0.318	105	Shirvan	0.287	189	Dezful	0.256	273
Ashtian	0.373	22	Borujerd	0.318	106	Rafsanjan	0.287	190	Fasa	0.256	274
Falavarjan	0.372	23	Semirom-e-Sofla	0.317	107	Nahavand	0.286	191	Khalil Abad	0.255	275
Aran & Bidgol	0.367	24	Behbahan	0.316	108	Quchan	0.285	192	Maneh and Samalqan	0.255	276
Sadugh	0.367	25	Arsanjan	0.316	109	Qorveh	0.285	193	Shahr-e-Babak	0.255	277
Ardebil	0.365	26	Bandar Abbas	0.316	110	Khorrama-bad	0.285	194	Khamir	0.255	278
Yazd	0.365	27	Neka	0.315	111	Bandar-e-Mahshahr	0.284	195	Ivan	0.252	279
Juybar	0.364	28	Khomein	0.315	112	Dasht-e-Azadegan	0.284	196	Zarrindasht	0.252	280
Qazvin	0.363	29	Tabas	0.314	113	Shush	0.284	197	Poldokhtar	0.252	281
Chalus	0.363	30	Najafabad	0.312	114	Astane-ye-Ashrafiyeh	0.284	198	Shadegan	0.251	282
Savadkuh	0.363	31	Khorram-darreh	0.312	115	Sar-e-pol-e-Zahab	0.283	199	Zarand	0.251	283
Nir	0.362	32	Pasargad	0.312	116	Sabzevar	0.282	200	Kalaleh	0.251	284

Bafgh	0.362	33	Gachsaran	0.312	117	Abadan	0.282	201	Kuhdasht	0.251	285
Semnan	0.361	34	Khalkhal	0.311	118	Shazand	0.282	202	Sarakhs	0.250	286
Khomeinishahr	0.360	35	Shahrud	0.311	119	Charoimaq	0.281	203	Fuman	0.250	287
Shabestar	0.359	36	Kerman-shah	0.311	120	Maku	0.281	204	Harsin	0.249	288
Natanz	0.359	37	Malekan	0.310	121	Kohbonan	0.281	205	Siahkal	0.249	289
Shahriar	0.359	38	Farsan	0.310	122	Komeijan	0.281	206	Lordegan	0.248	290
Delijan	0.359	39	Astara	0.310	123	Chadegan	0.280	207	Shaft	0.246	291
Garmsar	0.358	40	Bojnurd	0.309	124	Kabudara-hang	0.280	208	Aligudarz	0.246	292
Amol	0.357	41	Kordkuy	0.308	125	Bavanat	0.279	209	Zabol	0.243	293
Osku	0.353	42	Abarkuh	0.308	126	Varzaqan	0.278	210	Bam	0.242	294
Miyaneh	0.353	43	Khatam	0.308	127	Mah-Velat	0.278	211	Gilan-e-Gharb	0.242	295
Naeen	0.353	44	Khorrambid	0.307	128	Neyshabur	0.278	212	Kohgiluyeh	0.242	296
Kowsar	0.352	45	Gavbandi	0.307	129	Marivan	0.278	213	Chaldoran	0.241	297
Alborz	0.351	46	Bahar	0.307	130	Zarandiyeh	0.278	214	Masal	0.241	298
Deylam	0.349	47	Ahvaz	0.306	131	Asadabad	0.278	215	Dena	0.240	299
Ajabshir	0.348	48	Minudasht	0.306	132	Salmas	0.277	216	Bilehsavar	0.237	300
Khansar	0.348	49	Tuyserkan	0.306	133	Javanrud	0.277	217	Sardasht	0.236	301
Abumusa	0.348	50	Boyinzahra	0.305	134	Semirom	0.276	218	Hajiabad	0.234	302
Hashtrud	0.347	51	Takestan	0.305	135	Bardeskan	0.276	219	Mehran	0.233	303
Lenjan	0.347	52	Azadshahr	0.305	136	Chenaran	0.276	220	Kuhrang	0.232	304
Meybod	0.347	53	Omidiyeh	0.304	137	Selseleh	0.276	221	Sarayan	0.232	305
Mobarakeh	0.346	54	Firuzabad	0.304	138	Darrehshahr	0.275	222	Zahak	0.228	306
Jolfa	0.345	55	Qasr-e-Shirin	0.304	139	Khonj	0.275	223	Darab	0.228	307
Firuzkuh	0.345	56	Kangavar	0.304	140	Larestan	0.275	224	Baghmalek	0.222	308
Shahr-e-Kord	0.345	57	Mahneshan	0.303	141	Kamyaran	0.275	225	Darmiyan	0.214	309
Bonab	0.344	58	Faridan	0.302	142	Abdanan	0.274	226	Izeh	0.213	310
Shiraz	0.344	59	Genaveh	0.302	143	Tangestan	0.273	227	Jiroft	0.212	311
Mehriz	0.344	60	Kerman	0.302	144	Dashti	0.273	228	Delfan	0.211	312
Bandar Anzali	0.343	61	Rudsar	0.302	145	Kangan	0.273	229	Masjed Soleyman	0.205	313
Babolsar	0.343	62	Razan	0.302	146	Jajarm	0.273	230	Manujan	0.199	314
Borujen	0.342	63	Ahar	0.300	147	Divandarreh	0.273	231	Bahmaee	0.199	315
Shahreza	0.341	64	Parsabad	0.300	148	Mahabad	0.272	232	Rezvan-shahr	0.194	316
Tonkabon	0.341	65	Tarom	0.300	149	Qayenat	0.272	233	Zahedan	0.193	317
Gonbad-e-Kavus	0.340	66	Abadeh	0.300	150	Ijerud	0.272	234	Rudbar-e-Jonub	0.193	318
Qom	0.339	67	Kazerun	0.300	151	Eslamabad-e-Gharb	0.272	235	Baft	0.191	319
Maragheh	0.338	68	Miandoab	0.299	152	Bastak	0.272	236	Tavalesh	0.190	320
Mahallat	0.338	69	Nazarabad	0.299	153	Eqlid	0.271	237	Konarak	0.187	321

Marand	0.337	70	Faruj	0.299	154	Ravansar	0.271	238	Salas-e-Babajani	0.187	322
Robatkarim	0.337	71	Aliabad	0.299	155	Shahindezh	0.270	239	Kahnuj	0.186	323
Varamin	0.337	72	Galugah	0.299	156	Taybad	0.270	240	Lali	0.171	324
Hamedan	0.337	73	Bostanabad	0.298	157	Rashtkhar	0.270	241	Sarbisheh	0.169	325
Bandar Gaz	0.336	74	Naqadeh	0.298	158	Ravar	0.270	242	Chabahar	0.168	326
Mashhad	0.335	75	Jahrom	0.298	159	Shirvan & Chardavel	0.269	243	Bardsir	0.163	327
Rudbar	0.335	76	Saqqez	0.298	160	Ardal	0.268	244	Anbarabad	0.158	328
Nur	0.335	77	Dorud	0.298	161	Khaf	0.268	245	Ghaleh-Ganj	0.149	329
Tafresh	0.335	78	Bukan	0.297	162	Khodaban-deh	0.268	246	Iranshahr	0.142	330
Malayer	0.335	79	Shushtar	0.297	163	Neyriz	0.268	247	Nahbandan	0.139	331
Sanandaj	0.333	80	Lamerd	0.297	164	Paveh	0.268	248	Neekshahr	0.139	332
Amlash	0.333	81	Marvdasht	0.297	165	Birjand	0.267	249	Jask	0.129	333
Sarab	0.332	82	Torkaman	0.296	166	Gotvand	0.267	250	Saravan	0.126	334
Savojbolagh	0.332	83	Ramyan	0.296	167	Sepidan	0.266	251	Khash	0.122	335
Varamin	0.337	72	Galugah	0.299	156	Taybad	0.270	240	Lali	0.171	324
Hamedan	0.337	73	Bostanabad	0.298	157	Rashtkhar	0.270	241	Sarbisheh	0.169	325
Bandar Gaz	0.336	74	Naqadeh	0.298	158	Ravar	0.270	242	Chabahar	0.168	326
Mashhad	0.335	75	Jahrom	0.298	159	Shirvan & Chardavel	0.269	243	Bardsir	0.163	327
Rudbar	0.335	76	Saqqez	0.298	160	Ardal	0.268	244	Anbarabad	0.158	328
Nur	0.335	77	Dorud	0.298	161	Khaf	0.268	245	Ghaleh-Ganj	0.149	329
Tafresh	0.335	78	Bukan	0.297	162	Khodaban-deh	0.268	246	Iranshahr	0.142	330
Malayer	0.335	79	Shushtar	0.297	163	Neyriz	0.268	247	Nahbandan	0.139	331
Sanandaj	0.333	80	Lamerd	0.297	164	Paveh	0.268	248	Neekshahr	0.139	332
Amlash	0.333	81	Marvdasht	0.297	165	Birjand	0.267	249	Jask	0.129	333
Sarab	0.332	82	Torkaman	0.296	166	Gotvand	0.267	250	Saravan	0.126	334
Savojbolagh	0.332	83	Ramyan	0.296	167	Sepidan	0.266	251	Khash	0.122	335
Dargaz	0.332	84	Azna	0.296	168	Sarvabad	0.266	252	Sarbaz	0.119	336

Table 5. Ranking of sub-provinces of Iran based on composite score of development (global priorities)

alternative. In the last step, composite scores of development (global priorities) of the sub-provinces were calculated by a weighted sum of the type using the Expert Choice software. The sub-provinces of Iran were ranked based on these scores which are shown in Table 5.

It was also arbitrarily defined 6 classes for summarizing development level of sub-provinces according to their composite score of development as presented in Table 6.

Composite score	Development level	
<0.200	Very Low	

Table 6. Development classes of sub-provinces of Iran

0.200-0.249	Low	
0.250-0.299	Low- Medium	
0.300-0.349	Medium-High	
0.350-0.399		High
> 0.4000	Very High	

Based on this classification, from 336 sub-provinces of Iran, the development level of only 6 sub-provinces including Shemiranat, Tehran, Ramsar, Gorgan, Sari and Karaj is very high; 40 sub-provinces are in high level of development; 105, 136, 26 and 23 sub-provinces stilt in the levels of medium-high, low- medium, low and very low, respectively. The numbers of indicators whose values are below national average in very low level sub-provinces including Manujan, Bahmaee, Rezvanshahr, Zahedan, Rudbar-e-Jonub, Baft, Tavalesh, Konarak, Salas-e-Babajani, Kahnuj, Lali, Sarbisheh, Chabahar, Bardsir, Anbarabad, Ghaleh-Ganj, Iranshahr, Nahbandan, Neekshahr, Jask, Saravan, Khash and Sarbaz are 48, 40, 32, 41, 49, 34, 38, 49, 44, 46, 40, 38, 50, 39, 47, 48, 49, 42, 50, 48, 53, 51 and 52, respectively. This calls for adopting proper strategies for the overall development in these regions.

Figure 2 presents the spatial distribution of development classes. Spatial distribution of sub-provinces illustrates that becoming distant from the center of country, development level gets worse. It is noteworthy that most of the highly backward sub-provinces are concentrated in the southeast of Iran, (provinces of Kerman, South Khorasan and especially Sistan & Baluchestan).

Coefficient of Variation calculated for each group of indicators is as follows: agriculture: 0.531, health: 0.500, education: 0.438, Infrastructures: 0.387, economic: 0.359, social-cultural attributes: 0.294, and housing: 0.226. Therefore, inequalities in the indicators of agriculture, health and education are more critical in comparison to other dimensions of development. We may attribute the high amount of CV in agriculture, to some extent, to natural resources and climatic diversity of regions. So, in the regions with low agricultural potentials, other capabilities should be developed. However, reduction in disparities is crucial to accelerate the integrated regional and national development in Iran. Highly backward and backward sub-provinces have to be assisted so

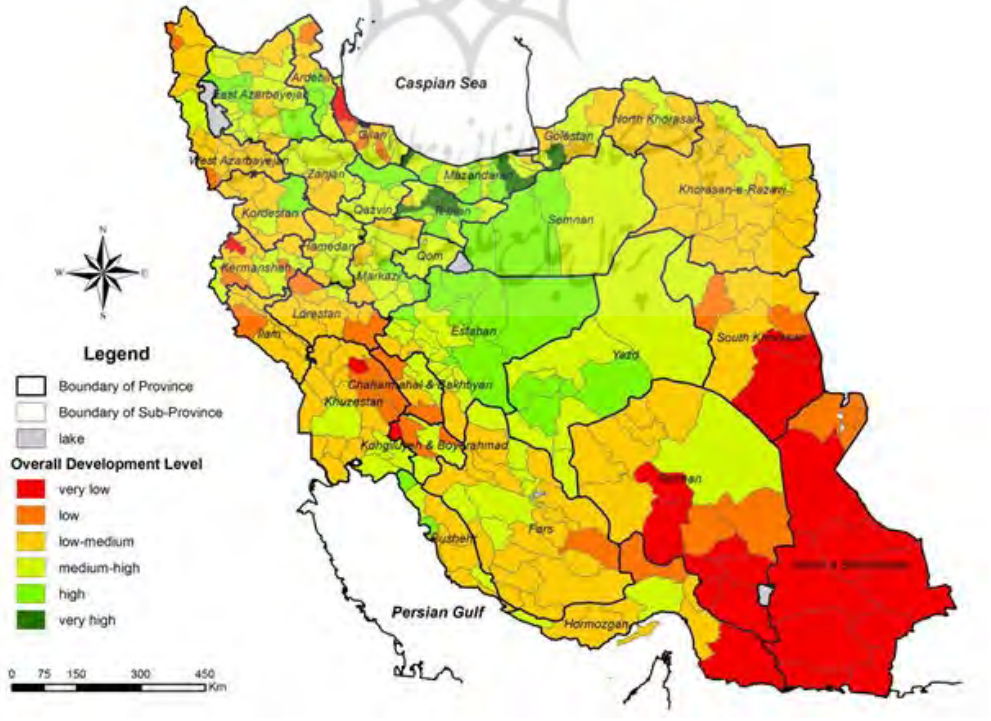

Figure 2. Classification of sub-provinces of Iran based on overall development level

that their potential is properly tapped enabling them to attain higher level of development. These regions require concerted planned efforts to overcome obstacles to growth and also to reduce some of the disadvantages of adverse natural factors.

5. Conclusions

Regional inequalities represent a continuing development challenge in most countries. So, proper identification of backward regions is crucial for forming the reliable basis of national and regional development strategies to increase the overall growth rate and decrease intra- regional and inter-regional disparities; therefore, it is very necessary to comprehensively assess the status of regional development with regard to different dimensions of development.

Regarding strong evidences about regional inequalities in Iran, the aim of this study was evaluating regional development and regional inequalities in Iran. The evaluation procedure consists of the following steps: determining indicators of regional development, weighting indicators, evaluating development level of sub-provinces of Iran by rating scale AHP, and calculating coefficient of variation for different dimensions of development. This study proposed possible indicators which might be effective in measuring development level in Iran. In order to determine these indicators, relevant regional and national literature was reviewed and a list of possible indicators was drawn up. This list comprised those indicators which are most commonly mentioned in different regional indicator systems published in Iran. Fifty-four indicators were identified which were organized into the dimensions of economic development, agriculture, education, health, housing, infrastructure, and socio-cultural attributes.

The multi-criteria analysis approach was applied to evaluate regional development and rank sub-provinces of Iran in respect of different dimensions of development. Among various MCDM methods, AHP was selected; but, because of some limitations of traditional AHP for comparison of large number of alternatives, rating scale AHP was applied to calculate the composite score of regional development. Based on the composite scores (global priorities), the development level of sub-provinces was classified into six categories: very high, high, medium-high, low-medium, low, and very low, so that 6, 40, 105, 136, 26 and 23 sub-provinces stilt in these categories, respectively. Analysis of Coefficient of Variation (CV) was also applied to reveal regional inequalities about different dimensions of development. It shows that inequalities in the indicators of agriculture, health and education are more critical in comparison to other dimensions of development. Overall, Results show a clear uneven development among sub-provinces. It is rather disturbing to a see large number of sub-provinces stilt in below medium categories.

The present analysis highlights the fact that in spite of Iran's regional policy based on reducing the development gap between different regions and creating a relative balance in regional development, yet this country witnesses uneven development across different regions, so that some regions suffer from lack of basic services and facilities. Spatial distribution of sub-provinces with regards development level shows that an intensive system of core and periphery exists in the country. So, it is necessary to reduce regional disparities in Iran to pave way for greater national integration, increase in economic growth and political stability. Backward sub-provinces require considerable attention and efforts to enable them to come out of their chronic backwardness. These sub-provinces should be given high priority for regional planning and there should be an in-depth study of their problems both natural and man-made; their growth potential should be identified and appropriate strategies evolved. In this way, the factors hindering growth should be removed paving way for fuller utilization of potentiality of a region for future development. It should be stressed that most of the low-level sub-provinces are located in the southeastern region of Iran; so, extraordinary focus ought to be on this region to improve development level in both qualitative and quantitative aspects.

For future work we recommend a time-series analysis of the data that could be the basis for the evalua-

tion of the process dynamics towards or away from balanced regional development. Currently, due to a lack of data, a reliable time-series analysis is impossible.

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