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Original Article

Provincial Human Development Index, a Guide for Efficiency Level Analysis: The Case of Iran

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Abstract

Background: Human Development Index (HDI) is a composite indicator that can show the impact of economic strategies on human life standards. The index is calculated by three main factors of income, education and health. This research studies the status of HDI across the Iranian provinces, its changes over time and the efficiency of provinces in using resources.

Methods: The data for 2001 and 2009 was obtained from the Iranian Center of Statistics. Data envelopment analysis technique was used to analyze the data. To calculate the efficiency, Banker, Charnes and Cooper's model was used.

Results: The national mean for the HDI in 2001 was 0.717 while it grew to 0.747 in 2009. Except for one province, all others had an improved human development index. Low ranked provinces such as Sistan & Baluchistan and Kurdistan stayed at the bottom in 2009 as well. Some provinces such as Bushehr with developing oil industries, or those purposively benefited from national oil income showed good growth. In some provinces, such as Hormozgan, out-migration of manpower to its neighboring province, Bushehr, was associated with decrease of the provincial income level. The number of efficient provinces increased from 5 to 13 in 2009.

Conclusion: Iran falls among countries with high human development index based on the 2009 data. However, the distribution of HDI status across provinces was highly varied and the difference between high- and low-developed provinces increased in 2009. The government needs to revise policies concerning distribution of resources among the provinces.

Keywords: Human development index, Efficiency, Data envelopment analysis, BCC model, Resource allocation, Iran

Introduction

In the late 1950s and early 1960s social indicators were basic elements for decision and policy making and planning in various areas (1). Through 1970s the indicators were used to evaluate and compare the development status of different countries. In 1990, Human Development Index (HDI) was defined by a Pakistani economist, Mahbub ul Haq, in order to set the focus of development from national level, generally measured by national income, to individual development aspects (2). Thereafter, the United Nations Development Program (UNDP) used this in its

annual human development reports. The index is a composite indicator of three factors: life expectancy, education and adjusted Gross Domestic Product (GDP) per capita (3). Although HDI encompasses per capita GDP in itself, some studies have shown correlation between the whole HDI and GDP per capita as well (4).

According to the Human Development Report (HDR) in 1994, human development means the population of communities increase their skills and abilities and use them in economic, social, cultural and political fields to improve the community (5). The report in 1995 defines human development as a process to expand the individual's choices in the society and in terms of opportunities (6). People's choices are unlimited and varied over time, but three necessary opportunities should be met through choices are to have a healthy long life, acquire knowledge, and access resources for creating a standard level of life. If these essential choices are not met, other opportunities will be unattainable (6).

Human Development Index has been criticized for various reasons such as neglecting ecological aspects in comparisons (7); causing ceiling effect on rich nations' growth due to limiting the scores between zero and one (8); low quality of data retrieved that result in unreal HDI (7); and finally "reinventing the wheel" or adding no new knowledge about countries' development status, because all HDI elements were defined and used even before HDI was introduced (9-11). Nevertheless, the validity and reliability of HDI has generally been approved by the specialists and experts, especially where 105 researchers from 60 different countries approved the existing method of HDI calculation and agreed on putting equal weight on each of HDI's three domains (12).

The United Nations (UN) calculates the HDI for different countries and reports it every year. Although this index is useful at national level, it is suggested for regional and state level or population subgroups (5), as is calculated in some countries such as Canada (13), Turkey (14) and India (15). In Iran, where HDI is reported 0.707 for 2011 by UNDP (16), only a few studies reports HDI by province and no study has measured efficiency in improving HDI across the provinces. Sadeghi et al. (17) reported HDI for all Iranian provinces in 1996, 2001 and 2005 according to which Tehran held the lead in all three points of time (0.780, 0.778, and 0.796 respectively) while Sistan & Baluchistan (0.567, 0.582 and 0.652) was at the bottom of the list . Another work conducted by Bakhtiari et al. (18) based on 2001 data put Tehran, Kohgiluyeh & Buyer Ahmad and Khuzestan at the top of the list.

Importance of HDI improvement across Iranian provinces has its roots in one of Iranian presidents' slogans in elections; equity. Through his presidency he has made many governmental trips to all 31 Iranian provinces and even small towns to fulfill his goals of attaining high level of equity.

This article examines the status of development for different provinces of Iran in 2001 and 2009. We also tried to measure the efficiency of provinces in improving human development index by using Data Envelopment Analysis (DEA) technique. In this study we also examined whether we could use provincial HDI level as a criterion for resource allocation decisions.

Materials and Methods

We conducted our study through two steps. Firstly, HDI for each province was calculated and the index was compared among them and secondly we estimated the efficiency of each province in using its resources for HDI in 2001 and 2009. Indeed similar approach has been followed by Despotis (19) for Asian and Pacific nations and some others have recommended this approach (20) and some used it for similar conditions around the word (21-23).

As data collection was conducted through 2010, while the last version of available data was related to 2009. Nevertheless some data were related to 2006 national census and we adjusted them for 2009. We also set 2001 data as the base year for comparison due to two reasons: first, 2001 situated in the middle of two national censuses of 1996 and 2006, so some data are estimated by averaging the census data; second, 2009 was a year through which the Iranian presidency elections

was run and so 2001 is chosen to have the same event in, in order to neutralize the potential influence of some factors such as improvement of economic situation which is generally possible through election years.

To calculate HDI, the United Nation's method which uses three variables of life expectancy, education and GDP per capita was employed (24). The minimum and maximum range of variables, by which the score of each dimension was calculated, is shown in Table 1.

Table 1: Minimum and maximum of variables used in the calculation of HDI (24)

Variable	Minimum	Maximum
Life expectancy at birth	25 years	85 years
Enrollment rates and literacy rates	0%	100
GDP per capita	$100	$40,000

In the education dimension, one third of total achievable score was assigned to the enrollment rates and two third to the adult literacy rate (Table 1). Indicators were calculated according to the following equation (16):

$$Indicator = \frac{Real\ amount - Minimum\ amount}{Maximum\ amount - Minimum\ amount}$$

Of course GDP per capita indicator was calculated differently and logarithm of amounts is used. Deap2 software was used to measure the efficiency of each province. Human Development Index was considered as an output and the number of physicians per 1000 people (as an input for life expectancy), the rate of education staff to students (as an input for education) and the rate of employed people with at least 10 years record to the whole population (as an input for welfare or GDP) were analyzed by the software (13). Therefore the ratio of output to input was calculated; the greater the ratio was, the greater the efficiency score between zero and one was.

To measure relative efficiency of provinces in achieving human development index, Data Envelopment Analysis (DEA) was used in which the linear programming technique used by a series of separately optimisation for each province.

General linear programme model of DEA is as follows (25):

$$Max\ E_o = \frac{\sum_{r=1}^{s} W_r O_{ro}}{\sum_{r=1}^{s} V_i I_{io}}$$

Subject to:

$= \frac{\sum W_r O_{rj}}{\sum V_i I_{ij}} \leq 1$ *(j = 1, 2, 3, …, n), (r = 1, 2, 3, …, s), (i = 1, 2, 3, …, m)*

$W_r \geq 0$

$V \geq 0$

I and *O* are used for input and output respectively and *W* and *V* are their weights. Multiple input oriented BCC model - abbreviated from its inventors' name Banker, Charnes and Cooper- is as follows (26):

$$Min\ E_0 = \frac{\sum W_r O_w + \mu}{\sum V_i I_w}$$

Subject to:

$$\sum W_r O_{rj} - \sum V_i I_{rj} + \mu \leq 0$$

$W_r, V_i \geq 0$

This model is originated from the underneath relative BCC model (27):

$$Min\ E_0 = \sum_{i=1}^{M} V_i I_{io} + \mu$$

Subject to:

$$\sum W_r O_{ro} = 1$$

$$\sum W_r O_{ro} - \sum V_i I_{ij} + \mu \leq 0$$

$W_r, V_i \geq 0$

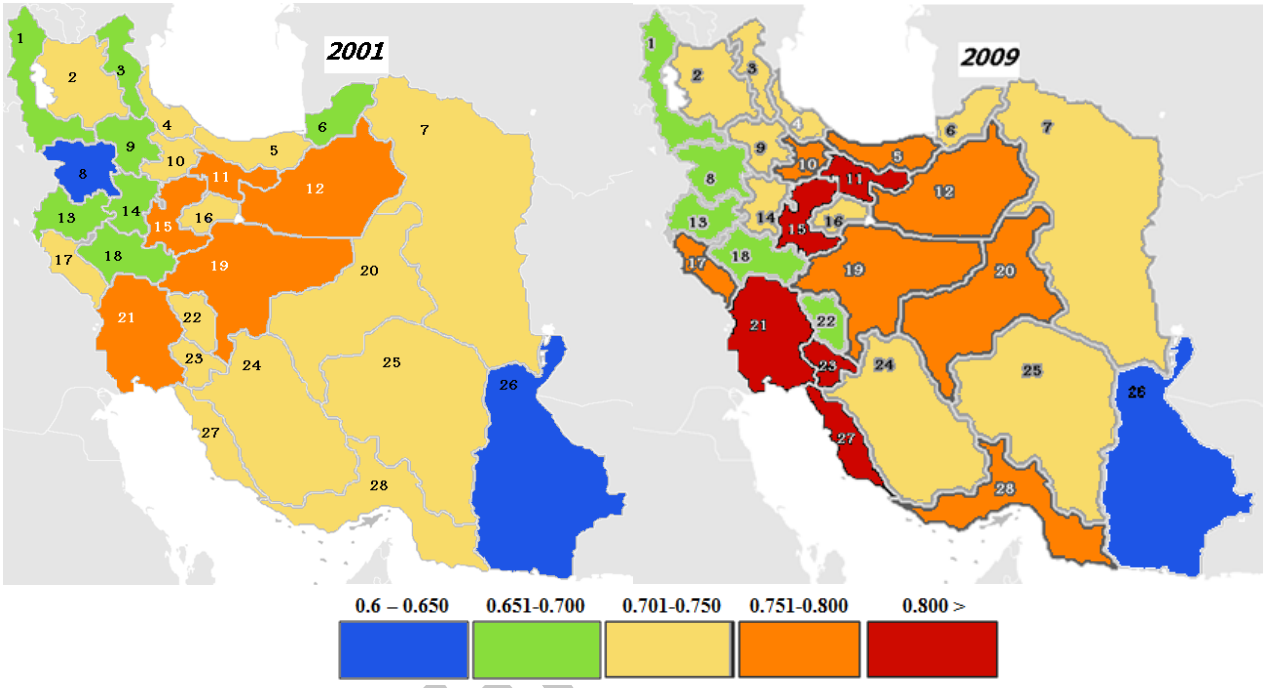
The aim of this model is to produce the observed output with the minimum level of inputs. Optimisation was conducted in two stages of maximum reduction in inputs and then moving towards the efficiency frontier.

All data needed for calculation of HDI, including life expectancy years, income, number of students and population of provinces and also the needed data for calculation of efficiency in using resources for HDI, including number of physicians in each province, employed population and number of staff working at education field were collected from Iranian Center of Statistics, through personal attendance of two researchers (AS and MB) at the Center and also through the Center's website (http://www.amar.org.ir/).

This research was approved by the Ethics Committee, Tehran University of Medical Sciences.

Results

This study was conducted based on 2001 and 2009 data. In 2001 Iran included 28 provinces but in 2009 two more had been added, because of division of Khorasan (province no. 7 in Fig. 1) into three provinces. However, for the ease of comparison we based all our data and comparison on 2001 divisions (Fig. 1). Figure 1 shows the range of HDI for Iranian provinces in 2001 and 2009.



Provinces: **1**.West Azerbaijan, **2**.East Azerbaijan, **3**.Ardabil, **4**.Gilan, **5**. Mazandaran, **6**.Golestan, **7**.Khorasan, **8**.Kurdistan, **9**.Zanjan, **10**.Qazvin, **11**.Tehran, **12**.Semnan, **13**.Kermanshah, **14**.Hamadan, **15**. Markazi, **16**.Qom, **17**.Ilam, **18**.Lorestan, **19**.Isfahan, **20**.Yazd, **21**.Khuzestan, **22**.Chaharmahal & Bakhtiari, **23**.Kohgiluyeh & Boyer-Ahmad, **24**.Fars, **25**.Kerman, **26**.Sistan & Baluchistan, **27**. Bushehr, **28**.Hormozgan

Fig. 1: HDI across Iranian provinces in 2001 and 2009

In 2009, Tehran (province no. 11) held the lead with 0.791 while Sistan & Baluchistan (province no. 26) was at the bottom of the list with 0.601. In 2009 the first rank belonged to Khuzestan (province no. 21) with a HDI of 0.891 while Tehran dropped to the third rank (HDI = 0.831) below Kohgiluyeh & Boyer-Ahmad (province no. 23, HDI = 0.846). Sistan & Baluchistan again was at the bottom of the list (HDI = 0.608). Except for Chaharmahal & Bakhtirari (Province no. 22), HDI had improved in all provinces in 2009. The best gross HDI improvement was in Khuzestan with an improvement of 0.108 or about 14%. The national average, assuming the same weight for all provinces, improved from 0.717 to 0.747 (*P*-value < 0.001, paired samples t-test) which equals to an improvement of about 4%. Figure 2 compares distribution of HDI levels in 2001 and 2009 and shows that 2009 HDI followed more normal distribution than that of 2001. However, in 2009 distribution was wider, as standard deviation of HDI distribution increased from 0.041 to 0.060 (Fig. 2, Table 2).

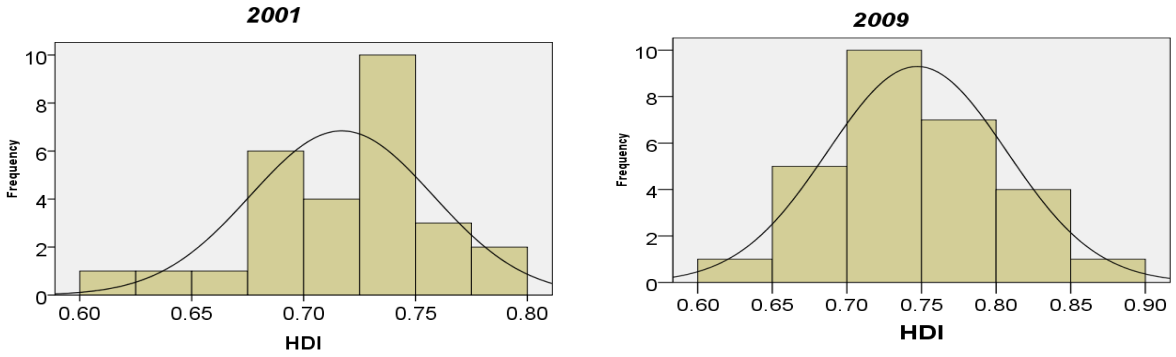


Fig. 2: Distribution of HDI among Iranian provinces in 2001 and 2009

Table 2: The ranking of provinces in HDI domains and the efficiency in reaching HDI

Province No.	Province name	Income Index ranking		Education index ranking		Health index ranking		Efficiency score	
		2001	2009	2001	2009	2001	2009	2001	2009
1	West Azerbaijan	25	26	27	27	22	25	0.921	0.994
2	East Azerbaijan	14	14	24	25	12	12	0.996	0.994
3	Ardabil	22	22	23	22	17	21	0.965	0.996
4	Gilan	17	17	22	24	3	2	0.735	1
5	Mazandaran	12	12	17	7	8	10	0.827	1
6	Golestan	19	23	25	20	20	15	1	0.998
7	Khorasan	13	18	1	1	24	20	0.801	1
8	Kurdistan	27	27	26	26	27	26	0.816	0.994
9	Zanjan	21	15	21	23	16	19	0.824	0.997
10	Qazvin	6	8	11	9	13	9	0.875	1
11	Tehran	2	5	3	4	2	1	0.814	1
12	Semnan	10	9	4	3	5	4	0.790	0.998
13	Kermanshah	26	21	19	21	21	14	0.921	0.998
14	Hamadan	20	20	18	19	19	13	0.987	0.998
15	Markazi	3	6	15	14	11	8	0.811	1
16	Qom	16	19	9	12	6	7	0.959	1
17	Ilam	8	4	10	16	25	23	0.995	0.987
18	Lorestan	23	25	16	18	23	24	0.988	0.995
19	Isfahan	9	7	7	13	1	3	0.932	0.999
20	Yazd	11	10	8	2	4	5	0.716	0.999
21	Khuzestan	1	2	13	11	10	16	1	1
22	Chaharmahal & Bakhtiari	24	24	12	15	14	22	0.816	0.998
23	Kohgiluyeh & Boyer-Ahmad	4	1	2	8	26	27	1	0.994
24	Fars	18	16	6	10	7	6	0.913	1
25	Kerman	15	13	14	17	18	11	1	0.999
26	Sistan & Balu-chistan	28	28	28	28	28	28	0.856	1
27	Bushehr	7	3	5	6	9	17	0.937	1
28	Hormozgan	5	11	20	5	15	18	1	1

Details of HDI score in the provinces, including the rank of each province in three domains of income; education and life expectancy are summarized in Table 2. In 2001 the oil-rich province of Khuzestan had the best income rank, while Tehran stayed at the second and one of its neighbors, Markazi (Province no. 15), at the third. However, in 2009 Kohgiluyeh & Boyer-Ahmad achieved the first rank and Khuzestan dropped to the second, above Bushehr (Province no. 27), a province with growing natural gas extraction plans, especially at Asaluyeh region. Tehran dropped to the fifth, below Ilam (Province no 17), a province that most benefitted from improving trade relation between Iran and its Western neighbor, Iraq. The Best income index ranking improvement belonged to Zanjan (Province no. 9) and the worst drop to Hormozgan (Province no. 28) which had the most rate of manpower shift to Bushehr. In terms of education Khorasan, with its big universities, stayed at the top of the table both in 2001 and 2009 and the best improvement belonged to Mazandaran (Province no. 5) who jumped from 7th to17th. In terms of health or life expectancy there was not much change at the top of the table. Sistan & Baluchestan held the worst rank both in 2001 and 2009 in all three HDI domains.

Table 2 also shows the efficiency index of provinces in using their resources for HDI in 2001 and 2009. In 2001 only 5 provinces (18%) were considered as efficient, while in 2009 all provinces reached an efficiency of about 1. Even some provinces such as Yazd (Province no. 20) had their efficiency improved from 0.716 to about 1. The improvement between 2001 and 2009 (from about 0.9 to about 1) was statistically significant (Paired samples *t*-test, $P < 0.001$).

Discussion

HDI across Iranian provinces ranged broadly from about 0.6 to 0.8 in 2001 and from about 0.6 to 0.9 in 2009, a range which includes categories of medium to high according to UN's HDI classification (24). Although all Iranian provinces had an improved HDI through 2001-2009, the difference among poor and well provinces increased. In other words some low scored provinces, such as Sistan & Baluchistan, stayed at the same HDI range while ones at the top of the table generally had fast improved HDI.

We cannot attribute these results to any presidency rounds (2001-2005 or 2005-2009) and distinguish between the impacts of these two rounds on HDI, firstly because of the time lag between governments' performance and its potential effect on HDI, and second, due to having both presidency rounds through 2001 and 2009. Narrowed research is required to examine and answer this inquiry. However it is clear that some provinces, such as Bushehr, Kohgiluyeh & Boyer-Ahmad and Ilam, with traditionally low status, had gained fast improvement in their HDI. The case of Bushehr probably could be result of new gas field, Asaluyeh. This new field encompassed more than 70 percent of natural gas extraction capacity (28) and attracted vast manpower from all over the country. However we only added this as a hypothesis which may be examined through future studies.

Furthermore the oil-rich provinces in one hand and the traditionally deprived provinces also were benefited from a rule established in 2006 according to which one percent of gas income would be distributed to the inhabitant of these provinces (29). Bushehr and Khuzestan were among such oil-rich provinces and Ilam and Kohgiluyeh & Boyer-Ahmad were among the deprived ones benefited from the rule (30). As a dysfunctional consequence, we believe, the migration of manpower to these provinces probably could have negative consequence on neighbor provinces' income and HDI, especially considerable at Hormozgan and Chaharmahal & Bakhtiari. Nevertheless, more comprehensive research is needed to examine the impact of this rule on income and human development index. Sistan & Baluchistan was not included among the deprived provinces to be benefited from distribution of gas extraction income.

In terms of efficiency and its fast and generally similar improvement across provinces through 2001-2009 some hypotheses are raised. First, the provinces had improved their output much faster

than their input increased, and so could improve the efficiency. Second, the provinces had encountered a decreasing or non-growing input and still could improve their output slightly or save its level. Examining these questions also requires a separate and more in-depth research.

In others' studies Sistan & Baluchistan always had had one of the lowest levels of HDI (17). Even other development indicators have shown this fact. For example, Rezvani (31) in an article by using taxonomy method had measured 24 indicators on education, housing, health and communication status of Iranian provinces in order to determine the amount and degree of development. The results indicated great differences across regions in terms of degree of development. In the four above domains provinces Gilan, Tehran, Semnan and Yazd were the highest and the lowest scores were achieved by Sistan & Baluchistan (education and housing), Ardabil (Health) and West Azerbaijan (communication). Fatros and Beheshtifar's (32) study, using 90 economic and social indicators analyzed by factor analysis and numerical taxonomy, also showed that Sistan & Baluchistan stood at the last rank of Iranian provinces with huge difference with its above province in the table, Lorestan. Tehran topped the table.

This study showed that while socioeconomic indicators improved, inequality among provinces increased through 1994-2004 which is consistent with our findings that HDI average improved but its distribution across provinces got wider between 2001 and 2009.

Efficiency level had no association with HDI, as in some provinces such as Sistan & Baluchistan with low HDI, efficiency was perfect. Some studies have also reported similar results; Azar and Gholamrezaei (33) have suggested that disadvantaged provinces were more efficient. This conveys that more attention is necessary to the provinces that have enough capacity to optimal use of resources and can provide better results.

Based on our findings we strongly suggest the government and policy makers to include two provinces of Sistan & Baluchistan and Kurdistan among deprived provinces to be benefitted from gas extraction and sale income. Nevertheless, migration of young manpower to oil-rich provinces from neighbor ones, as an unintended dysfunctional consequence of distribution of gas extraction income among the oil-rich provinces, should be taken serious. Finally, it is recommended that policy makers pay more attention to the provinces with low human development index and try to remove or minimize the gap between resources and facilities available to the provinces.

At the end of this paper we recommend provincial HDI as a tool for resource allocation policies. As we saw, allocation of resources such as oil income to the inhabitants improved their HDI, while provinces such as Sistan & Baluchistan and Kurdistan stayed at the bottom of the HDI HDI rank because they did not enjoy any extra resource.

As a technical implication, we recommend the Inequality-adjusted Human Development Index (IHDI), first calculated in 2010 Human Development Report, rather than the regular HDI, to be used for nations' ranking. As we showed, deprived and poor provinces may remain poor and less developed while the national HDI improves.

Our study was the first in Iran to report and analyze both HDI and efficiency of provinces. However, some limitations and weaknesses may be considered. We compared 2001 and 2009 data, while some part of our 2009 data were estimated by adjusting 2006 national census data. Consequently some data used for 2009 HDI and efficiency might be less valid than those of 2001, reported based on 2001 census. Selection of 2001 and 2009 was in order to having similar political and probably economic situation, as explained through Methods.

Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc) have been completely observed by the authors.

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References

1. Land KC (1983). Social indicators. *Annu Rev Sociol*, 9: 1-26.
2. Fukuda-Parr S (2003). The human development paradigm: operationalizing Sen's ideas on capabilities. *Fem Econ*, 9 (2-3):301-17.
3. Anand S, Sen A (1994). Human Development Index: methodology and measurement. *Hum Dev,* Occasional Paper No. 12.
4. Islam S (1995). The human development index and per capita GDP. *App Econ Lett*, 2 (5):166-7.
5. UNDP (1994). *Human development report 1994*. Oxford, UK, pp. 14-6.
6. UNDP. *Human development report*. Oxford, UK. 1995. pp. 24-9.
7. Wolff H, Chong H, Auffhammer M (2011). Classification, detection and consequences of data error: evidence from the human development index. *Econ J*, 151 (553): 843-70.
8. Caplan B. Against the Human Development Index. *Library of Economics and Liberty*; 2009 [cited 2011 31 Dec]; Available from: http://econlog.econlib.org/archives/2009/05/against_the_hum.html.
9. Bhanojirao V (1991). Human development report 1990: review and assessment. *World Dev*, 19(10):1451-60.
10. Mc Gillivray M (1991). The Human Development Index: yet another redundant composite development indicator? *World Dev*, 19(10): 1461-8.
11. Hopkins M (1991). Human development revisited: A new UNDP report. *World Dev*, 19 (10): 1469-73.
12. Chowdhury S, Squire L (2006). Setting weights for aggregate indices: An application to the commitment to development index and human development index. *J Dev Stud*, 42 (5): 761-71.
13. Justus M (1995). Towards a provincial human development index. *Mon Econ Rev*, 14 (9): 5-8.
14. UNDP (1997). *Human development report* 1996. Oxford, UK, p. 114.
15. Indrayan A, Kumar R (1996). Statistical choropleth cartography in epidemiology. *Intl J Epid*, 25 (1): 181.
16. UNDP (2011). International human development indicators. [cited 2011 31 Dec]; Available from: http://hdrstats.undp.org/en/countries/profiles/IRN.html.
17. Sadeghi H, Masaeli A, Basakha M, Kouhian M (2010). Estimation of human development index for provinces. *Soc Wel Quart*, 10 (37): 129-53.
18. Bakhtiari S, Dehghanizadeh M, Hosseinpour M (2006). Examination of Iranian provinces' status in terms of Human Development Index. *Danesh & Tosee*, (19): 11-40 [in Persian].
19. Despotis D (2005). Measuring human development via data envelopment analysis: the case of Asia and the Pacific. *Omega*, 33 (5): 385-90.
20. Moreno-Serraa R, Smith P, Savedoff DF, Jamison D (2012). An exploratory application of data envelopment analysis to the efficiency of health service coverage and access, *Results for Development Institute*, Working paper, May 2012.
21. Zavras AI, Tsakos G, Economou C, Kyriopoulos J (2002). Using DEA to evaluate efficiency and formulate policy within a Greek national primary health care network. *J Med Syst*, 26 (4): 285-92.
22. Du J, Wang J, Chen Y, Chou SY, Zhu J (2011). Incorporating health outcomes in Pennsylvania hospital efficiency: an

additive super-efficiency DEA approach. *Ann Oper Res*, 1-12, DOI 10.1007/s10479-011-0838-y.
23. Ghaderi H, Hadean M, Moradi S (2012). Efficiency of Spending in Health Sector: A Comparison between Iran and Selected Countries by Data Envelopment Analysis (1998-2008). *J Health Admin*, 15 (49): 14-26 [in Persia].
24. UNDP (2012). *Human development report 2011* - Human development statistical annex, Oxford, UK, pp. 127-30.
25. Johnes J (2006). Measuring teaching efficiency in higher education: An application of data envelopment analysis to economics graduates from UK Universities 1993. *Eur J Oper Res*, 174 (1): 443-56.
26. Banker RD, Charnes A, Cooper WW (1984). Some models for estimating technical and scale inefficiencies in data envelopment analysis. *Manage Sci*, 1078-92.
27. Bal H, Orkcu HH (2007). Data envelopment analysis approach to two-group classification problems and an experimental comparison with some classification models. *Hacet J Math Stat*, 36 (2): 169-80.
28. Bushehr News. 70 Percent of Iranian natural gas resources are located at Bushehr Province. [cited 31 Dec 2011]; Available from: http://www.bushehrnews.com/fa/news.
29. Fars News. 2 percent of oil income is introduced among oil-rich and deprived provinces. 2006 [cited 15 Feb 2012]; Available from: http://www.farsnews.com/newstext.php?nn=8505010284.
30. Aftab Kazeroun. Distribution of two percet of oil and gas income among oil producing and deprived provinces, owing to the fourth development programme. 2008 [cited 15 Feb 2012]; Available: http://kazerundoshmanziari.blogfa.com/post-149.aspx.
31. Rezvani M (2004). Measuring development level of Sanandaj rural area with GIS. *J Geog Reg Dev*, 3: 149-63 [in Persian].
32. Fatros MH, Beheshtyfar M (2006). Determining development level of Iranian provinces and inequity among them in 1994 and 2004. *Econ Res Rev*, 2 (2): 101-22.
33. Azar A, Gholamrezaee D (2004). Ranking of Iran provinces via data envelopment analysis (by using human development index). *Iran J Econ Res,* 27: 153-73.