THE QUALITY OF LIFE AND REGIONAL CONVERGENCE IN IRANIAN PROVINCES

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Abstract

Regional disparities are one of the main problems in developing countries and Iranian provinces suffer from such disparities. Balanced growth of all provinces of the country has been considered essential for sustainable development. By constructing Human Development Index (HDI) over the period 1996, 2006 and 2011 and four indicators included access to clean water, employment rate, economic participation and average urban income, the main purpose of this paper is to investigate the situation and tendencies in the field of quality of life in Iran based on comparison, convergence and investigates whether there exits convergence in human development indicators.

The results of this study reveal that, within the analyzed period, generally the order of provinces in terms of quality of life has not changed, but HDI, access to clean water and average income levels have been increased and the relative convergence with both in unconditional β-convergence and σ-convergence analyses has been occurred. Moreover, the results of this study imply that the convergence of economic indicators is most important issue and economic indicators than other indicators is more consistent.

Keywords: Quality of life, Human Development Indices, Regional Convergence, Iran Provinces

JEL classification:

1. Introduction

The empirical literature on inequality among economies and its temporal evolution has mainly focused on the use of indicators such as per capita income. The global nature of an indicator like per capita income and its capacity to capture, in a simple but reasonably approximate manner, the relative standard of living of economies has made it the most widely used conventional variable in this type of studies. In addition, given that the theory of economic growth deals precisely with the long term evolution of this variable, this indicator has the added advantage of enabling us to analyze the sources of the inequality that we are measuring, as well as their possible future evolution. Furthermore, it helps us to propose economic policies to correct inequality (Pastor et al., 2008). Although this methodology provides useful information, this approach could be enriched with a methodology that also takes into account the whole life cycle dimension (Ibid, 2008).

The variations in regions' economic performance has fueled the debate on convergence in their growth rates to determine if initially disparate regions are converging to common steady-state levels. The literature on economic growth provides mixed evidence on this, and many studies point toward the widening income gap between rich

and poor. In the development literature, a broader range of national welfare indicators beyond income per capita—health and education in particular—are considered key instruments for measuring progress in human development index since it is pertinent to ask whether such divergence is also occurring in the different aspects of human development(Afzal, 2012).

In Iran such as many developing countries, regional disparities is one of major problems leading to serious problems including migration with its associated difficulties including provinces with lower HDI to the more developed ones (Noorbakhsh, 2002). The Human Development Report for Iran in 1999 reflects such disparities and reiterates. One of the goals Iran has set up in addition progress in human development, is convergence of regions that have been developed less if compared to the development level of the regions with more standard living. Hence the purpose of this paper is at first, if HDI and other indicators in Iranian provinces have been changed and been improved and then relationship convergence between provinces are investigated. Patterns of convergence in GDP per-capita and HDI are studied from a large cross-regional data set covering the period 1996, 2006 and 2011 and unconditional β-convergence patterns are consistent with σ-convergence scenarios.

2. Literature Review

The notion of wealth as the only indicator of welfare was contested centuries ago, and is still a matter of debate in some scopes. Over the years, development researchers produced studies exploring the importance of education and health in region development. For most of them, the quality of life is better determined by human and social capital rather than by simple measures such as per capita income/GDP. In studying this income–quality of life relationship, a number of researchers have found that conventional wisdom does not hold true. Some studies have shown that income can account for a very small percentage of increase in people's social wellbeing (see Easterly, 1999; Preston, 1975) and numerous studies also confirm the significance of education and health in the development process (Khan, 1991; Nordhaus, Tobin, 1972; Sen, 1985; Boldrin, Canova, 2001).

Ingram (1992) looks at a large sample of developed and developing countries and finds that the gaps in per capita GDP have increased among low, middle and high income countries. The author finds evidence of strong convergence across the sample for most social indicators in the analysis—life expectancy, caloric intake, primary enrolment ratio, and urbanization. Sab and Smith (2002) with using data from 84 countries for 1970–1990, ask whether health and education levels are converging across countries. They conclude that investments in education and health are closely linked, and that there is unconditional convergence for life expectancy, infant survival, and average levels of schooling in the adult population. Neumayer (2003) pointed out Hobijn and Franse's (2001) study that has provided an interesting discussion of many aspects related to convergence in living standards, tests convergence over the period 1960- 1999 in a wide range of fundamental aspects of living standards, including life expectancy, infant survival, educational enrolment, literacy as well as telephone and television availability and finally have found strong evidence for convergence in the aspects of living standards that stands in stark contrast to the conclusions of the article by Hobijn and Franses (2001). In line with these studies, Mazumdar (2002); Sutcliffe (2004) and Noorbakhsh (2006) study convergence by measuring standard of living with the human development index instead of per-capita GDP or labor productivity. Mrchante and Ortega (2006) in the work of quality of life and economic convergence across Spanish regions, attempts to refer again the regional welfare issue by using alternative composite indicators in the context and that to what extent such alternative measures of living standards are converging. Their empirical analysis suggest that whereas regional GVA per-capita disparities have remained constant, convergence was achieved in five quality of life indicators (AHDI, infant survival rate, adult literacy rate, mean schooling years, and 100 minus the rate of long-term unemployment) and in two alternative economic measures (total personal income less current grants and gross personal disposable income). Laszlo and Maria-Carmen (2008) seek to find out whether there existed an empirically discernable and robust tendency in the world for countries to converge in terms of human development over the last three decades. They perform similar analyses on those countries

that joined the European Union before its 2004 enlargement and on all current members of the EU too. Their results indicate convergence for all three groups of countries, they consider, that is relatively backward countries managed to increase their HDI more than developed countries. Pastor and others (2010) in order to analyze inequality and convergence among Spanish regions have suggested using a measure of permanent income that takes into account the entire life cycle dimension. The results indicate that inequality in permanent income is clearly lower than that observed when the full life cycle of individuals is not taken into account. Finally Afzal (2012) examines human capital convergence to determine if there has been unconditional and conditional convergence across the districts of Pakistani Punjab over the period 1961–2008. The results of his empirical analysis show that both unconditional and conditional convergence has taken place in literacy rates across Punjab and that this has been accompanied by increased gender parity in educational enrolment levels and improved housing conditions.

3. Materials And Method

The basic idea of this study is to examine human development indicators—GDP per-capita, education, health, access to clean water, employment rate, economic participation and average income in rural and urban regions — across the Iranian provinces over the periods 1996, 2006, 2011 and also focuses on convergence in HDI and GDP per-capita to determine if the gaps between poor and rich regions have changed over the last decades.

The timeframe covered starts with 1996 and due to the extremely poor quality of data only three periods was chosen: 1996, 2006 and 2011. Human development is measured by the Human Development Index after 2010 and using raw data employment, Status of activities, clean water and average urban income between provinces is examined other indicators. Convergence across provinces is tested by the conventional cross-regional methods of β- and σ-convergence.

Accordingly the paper is organized as following. The second section presents brief description of HDI and the method used to implement the Human Development Index (HDI) and then investigates regional inequality in Iran base on levels and trends for GDP per-capita and achievements and improvements for the HDI during the last 15 years. The third section puts forward a theoretical understanding of the concept and types of convergence and provides the empirical results obtained from β- and σ-convergences in Iran regions. Finally, some final considerations are presented in last section.

The primary data has been used the study collected from different resources. The primary data for related educational, clean water, employment and average income indicators used in the analysis was obtained from the province detail results of the population and housing censuses 1996, 2006 and 2011. For GDP per-capita, available data in regional accounts and the province public revenues in appendix 2 Provincial budgets were used and for life expectancy, indicators of health aspects in Islamic republic of Iran have been applied.

4. Human Development Index (Hdi)

Human development is an expansion of the real freedoms of people to pursue lives that they value and have reason to value. The Human Development Index (HDI), launched in 1990, was a pioneering measure that went beyond income to reflect health and education (UNDP, 2010). Its emergence, and that of other composite measures of human development, was motivated by the discontent with income as a single measure of well-being (Laszlo and Maria-Carmen, 2008. see e.g. Crafts, 1999). It has been since then the basis of UN Human Development Report. The primary goal of the Report and of the index is calling attention to dimensions such as health and education that may not be correctly appraised in the ranking of the countries by traditional production and income indices (Sant'Anna, 2011).

For the last 20 years, the HDI has been employed to monitor and demonstrate the multiple dimensions of human elements necessary for a dignified life attained through enlarging people's choices (Fukuda-Parr, 2001). This index aims to promote a summary measurement strategy in the analysis of human welfare. The most basic human elements are identified as adequate nutrition, clean water, housing, healthcare, and educational attainability (McGillivray and White, 1992). Advancement of these elements is recognized through three

fundamental dimensions: (1) access to knowledge, (2) longevity, and (3) a decent standard of living (Fukuda-Parr, 2001). The initial intention of the HDI evaluation was to indicate the average citizen's access to these dimensions, however, its impact has expanded to demonstrate that by ensuring such human elements, a nation-state provides opportunity and encourages the discussion of rights (Bloom and Cohen, 2002 see also Habashi et al., 2012). Although since its introduction in the first Human Development Report in 1990, the Human Development Index (HDI) has attracted great interest in policy and academic circles, as well as in the media and national audiences around the world. Its popularity can be attributed to the simplicity of its characterization of development - an average of achievements in health, education and income – and to its underlying message that development is much more than economic growth. Yet the HDI's very simplicity prompted critiques from the start, while others who accepted its self -imposed limitations still questioned its choice of indicators and its computational methodology. In 2010, for the twentieth anniversary edition of the Human Development Report, a comprehensive review of these critiques was undertaken and several major changes to the HDI were introduced. Though this is not the first time that the HDI has been modified, it is the first time that major changes have been simultaneously introduced to the indicators used to measure progress and the functional form used to convert them to a single measure of progress (Klugman, 2011).

According to this new method that allows a better depiction of the nature of the inequality, this paper has attempted to evaluate HDI at province level in Iran, which provides a fresh look at the existing regional development differences (For more information about the rationale the introduction of new indicators; see Klugman, 2011). The new formula is:

$$HDI = (H_{Health} * H_{Education} * H_{Living\ standard})^{1/3}$$

The indices H_i are still normalized indicators of achievements. Life expectancy (le) remains the indicator for the health dimension, while Gross National Income (GNI) replaces GDP as the measure for living standards (Unfortunately, instead of GNI data at the regional level in Iran which were unavailable, GDP per capita was used), and while mean years of schooling (mys) and expected years of schooling (eys) now make up the education dimension:

$$H_h = (le - le_{min}) / (le_{max} - le_{min}),$$

$$H_e = [((mys - mys_{min}) / (mys_{max} - mys_{min})) * ((eys - eys_{min}) / (eys_{max} - eys_{min}))]^{½} \quad 1$$

And

$$H_{ls} = (\ln(gni) - \ln(gni_{min})) / (\ln(gni_{max}) - \ln(gni_{min}))$$

As seen in above, the first step is to create sub-indices for each dimension that in sum, this form retains the same three-dimensional structure with equal weights and several key changes. It replaces the indicators for income and education. Minimum and maximum values (goalposts) need to be set in order to transform the indicators into indices between 0 and 1. Because the geometric mean is used for aggregation, the maximum value does not affect the relative comparison (in percentage terms) between any two regions or periods of time (HDR, 2010). In this research, following Mazumdar (1999), the maximum and minimum values (goalposts) selected from the observed values in the data-base being used; as seen in the following:

{LEmin,LEmax} = {62.8: Kurdestan, 1996, 76.5: Tehran, 2011}

{MYSmin, MYSmax} = {2.9: Sistan and Baluchistan, 1996, 9.9: Tehran, 2011}

{EYSmin, EYSmax} = {7.7: Kurdestan, 1996), 16.04: Qom, 2011}

{GDPmin, GDPmax((2000 constant $))}= {348: Sistan and Baluchistan, 1996, 9339.2: Tehran, 2011}

Table 1 shows the overall results of HDI and GDP per-capita in Iran where provinces have been sorted according to their rank in the HDI and GDP per-capita and in appendix 1 has been shown results of other indicators.

Table 1. The Human Development Index and GDP per-capita across Iran provinces

Provinces	GDP per-capita						HDI					
	1996	**R**	**2006**	**R**	**2011**	**R**	**1996**	**R**	**2006**	**R**	**2011**	**R**
Ardabil	62.2	22	191.0	23	261.5	25	76.4	24	173.3	23	210.9	23
Azerbaijan, East	94.3	14	217.1	14	286.0	13	97.2	17	193.1	13	236.8	13
Azerbaijan,West	60.5	23	180.4	28	242.2	29	69.4	25	166.4	27	203.9	27
Bushehr	107.0	11	307.7	3	364.4	4	114.0	12	214.2	8	260.7	7
Chahar Mahaal	50.3	26	184.9	26	264.2	24	86.2	20	178.6	20	218.0	20
Esfahan	120.6	7	249.7	8	320.8	9	143.0	3	230.9	2	271.9	4
Fars	81.8	16	216.1	15	280.8	15	120.7	9	199.6	12	245.3	11
Gilan	87.5	15	205.1	18	279.7	16	110.0	15	186.2	16	234.3	14
Golestan	74.7	19	189.3	25	259.0	26	122.8	8	184.2	18	223.2	17
Hamadan	62.2	21	196.6	21	270.0	21	85.4	21	173.5	22	211.3	22
Hormozgān	128.2	5	244.0	10	308.2	12	100.5	16	171.8	25	210.8	24
Ilam	100.4	13	296.8	4	359.0	5	89.1	18	191.4	14	224.3	15
Kerman	116.0	8	229.3	13	285.5	14	112.9	13	188.7	15	224.2	16
Kermanshah	50.8	25	190.1	24	276.1	20	82.9	23	175.1	21	212.7	21
Khorasan,Razvia	76.0	18	205.4	17	279.2	17	88.1	19	182.5	19	221.7	18
Khorasan, South[a]	-	-	193.1	22	267.5	22	-	-	166.3	28	198.8	28
Khorasan,North[a]	-	-	199.8	20	264.9	23	-	-	172.1	24	209.5	25
Khuzestan	216.5	2	356.5	2	406.1	2	143.2	2	225.6	4	263.6	6
Kohgiluyeh	158.4	3	286.1	5	365.3	3	133.9	6	227.3	3	265.7	5
Kurdistan	39.4	27	174.8	29	246.7	28	21.4	27	134.2	29	181.1	29
Lorestan	55.7	24	181.7	27	250.4	27	54.3	26	170.6	26	205.6	26
Markazi	136.7	4	265.8	6	323.1	8	120.5	10	210.2	9	244.2	12
Mazandaran	105.4	12	229.3	12	309.2	10	117.8	11	200.8	11	254.5	9
Qazvin	124.9	6	239.6	11	308.7	11	110.1	14	202.3	10	245.7	10
Qom	79.8	17	204.4	19	278.8	18	129.5	7	221.0	6	257.2	8
Semnan	114.7	9	250.8	7	325.9	6	141.4	4	219.7	7	275.5	3
Sistanbaluchistan	16.2	28	124.2	30	201.0	30	17.0	28	116.6	30	143.9	30
Tehran	311.6	1	410.4	1	429.1	1	146.4	1	248.7	1	301.8	1
Yazd	107.2	10	247.2	9	325.3	7	135.5	5	225.1	5	278.0	2
Zanjan	74.3	20	211.5	16	278.1	19	83.6	22	184.8	17	221.0	19
Iran	100	-	229	-	297	-	100	-	191	-	231	-

Notes: [a] South, North & Razavi Khorasan to 2006 was one province by name Khorasan that after 2006, were separated. After their separation, inequality among these regions obviously became apparent.
Source: Statistical Center of Iran & authors' own work.

Regional inequality in Iran

It is clear that during the study period as shown in Table 1, the average HDI across Iran provinces have increased, implying that although still inequality remains but the quality of life also has risen. To some extent it can be claimed that total order between provinces both in GDP per-capita and HDI has remained constant; in the considered years, among 30 provinces of Iran, in all periods Tehran has been found at a very high level of development; five provinces including Esfahan, Khuzestan, kohgiluyeh and Boyer Ahmad, Semnan and Yazd have presented levels above the Iran average both in GDP per- capita and the HDI, and provinces including Sistan and Baluchistan, Kurdestan, Lorestan, West Azerbaijan, Kermanshah, Ardabil, Illam, South and North Khorasan are very low level both in HDI and GDP per-capita and suffer from lower human development compared with other parts of Iran and all of them located in border parts of Iran. Other 15 provinces lie at the levels of medium-high, medium, low-medium, respectively.

Also it can be mentioned that the order between GDP per-capita and HDI to some degree is different although can be seen a direct relationship but having higher HDI does not necessarily imply upper GDP per-capita, there is some substitutability between provinces depending on the measure used to investigate quality of life; for example, the HDI values of Qom is higher than the values of many provinces such as Razavi Khorasan, Mazandaran, East Azerbaijan, Kerman, Semnan and Khuzestan but its GDP per-capita is lower. This province showed remarkable progress since 1996 especially in education and life expectancy indicators. After two decades of high and sustained development in education index, Qom graduated to highest level the index in 2011 and catching up with Tehran and other very high education regions.

Consequently since that in these years provinces achieved upper HDI and GDP per capita but have not changed totally ranks between provinces, the question arises that if during this period convergence between provinces have been occurred. The following section analyses the convergence process.

5. Regional Convergence Analyses

Ever since the emergence of the convergence debate in the late 1980s, a number of methods are discussed in the literature, which are used to test for the presence or absence of convergence (see, for example, Armstrong, 1995, Salai-Martin, 1996; O'leary, 2003) in the section with using cross-sectional analysis that concerning to β-convergence and σ -convergence, have been investigated regional convergence trend in Iran between 1996, 2006 and 2011.

Cross-Sectional Analysis

This approach posits that convergence exists if a poor economy tends to grow at a faster rate than a rich one such that the poor region tends to catch up in terms of per capita income or product. This property corresponds to the concepts known as β -convergence and σ-convergence (Barro and Sala-i-Martin, 1991, 1992; Boyle, McCarthy, 1997).

β-convergence to understanding whether the gap between the rich and poor regions is closing, implies that the variable increases at a slower rate in regionals with high values and at a higher rate in regionals with low values (Mohammadi, Ram, 2012); While σ-convergence relates to whether the cross- regional distribution of national income shrinks over time (see Lsazlo and Maria Carmen, 2008; Marchante, Ortega, 2006; Wu, 2008). The two concepts of convergence are related, but not identical. The former analyses intra-distributional movement, whereas the latter analyses changes in the distributional spread. Logically, β-convergence is a necessary, but not sufficient condition for σ -convergence. It is a necessary condition since without the catching up of the past poor performers the spread of the distribution cannot shrink, but it is not a sufficient condition since theoretically it is possible that the once poor performers overtake the once strong performers to an extent that the spread of the distribution increases (Neumayer, 2003; Kumar , Managi, 2009).

β-convergence

β-convergence has two forms: (i) conditional, and (ii) unconditional/absolute. A stronger kind of convergence takes place unconditionally or absolutely when initially poorer states grow faster, albeit under different initial conditions. The assumptions behind

unconditional convergence, however, might better fit regional datasets where different regions within a country are more similar than different countries with respect to technology and preferences (Barro , Sala-i-Martin, 1995). Accordingly due to the nature of our data, the study is limited to unconditional convergence and are followed methodology suggested by Marchante and Ortega (2006), Trivedi (2002), who essentially adapt the basic frameworks laid down by Baumol (1986), Mankiw et al. (1992) and Barro and Sala-i-Martin(1999):

$$\Delta \ln x_{it} = \gamma \ln x_{it-1} + \sum_{t=1}^{T-1} d_t + u_i + \varepsilon_{it} \qquad (1)$$

Where x_{it}, is the HDI or real per capita income and another economic, social or quality of life indicator in region i at time t. Parameter u_i is the specific fixed effect across regions; and ε_{it} is an error term for region i at time t, T is the length of the period analyzed and $\sum d_t$ is a set of dummy variables representing each year (i.e. 1, ..., T – 1 to avoid singularity) and and γ is the convergence effect.

A negative and significant value for γ implies unconditional β convergence (positive sign if there is divergence) to a common steady state. β-convergence requires that β<0(statistically significant). In other words the finding of β<0 means that poor regionals grew on average faster than rich regionals (Steger, 2009).

The speed of convergence, λ, of a given variable is calculated by taking the negative of the natural log of 1 plus the coefficient of the lagged dependent variable divided by the period under observation. Thus (Sab, Smith, 2002):

$$\lambda = -\ln (1 + b)/\tau$$

where τ is the period under analysis. The half-life, t, is the solution to:

$$e^{-\lambda t} = 0.5.$$

Taking logs of both sides,

$$t = -\ln (0.5)/\lambda$$

Table 2 presents the convergence coefficient and speed of convergence and p-value results about GDP per-capita, the HDI and education and health indicators.

Table 2. Analysis of the unconditional β-Convergence across the Iran provinces, 1996, 2006 & 2011

Dependent Variable: DLGDPP						
Method: Least Squares. Included observations: 90						
White Heteroskedasticity -Consistent Standard Errors & Covariance						
variables	Coefficient	Std. Error	t -Statistic	Prob.	half-life	ƛ
C LGDP(-1)	-0.355011 -0.295493	0.117745 0.078905	-.015072 -3.744937	0.0034 0.0003	29.7	 0.0233
C LGDPP (-1) LHDI	-0.139113 -0.811942 0.962849	0.084619 0.076546 0.099859	-1.643995 -10.60725 9.642057	0.1039 0.0000 0.0000	8.35	0.083
C LGDPP(-1) LEducation	-10.39769 -0.694612 0.403399	1.604962 0.106752 0.107360	-6.478468 -6.506775 3.757432	0.0000 0.0000 0.0003	11.66	0.0594
C LGDP(-1) LLife Expectancy	-8.284863 -0.543312 0.300361	1.514523 0.098771 0.138172	-5.470280 -5.500714 2.173820	0.0000 0.0000 0.0325	17.7	0.0391
C LGDPP (-1) Ltotal water	-6.581985 -0.393214 1.016853	1.856884 0.078141 0.412718	-3.54464 -5.03212 3.384523	0.0006 0.0000 0.0011	21	0.033
C LGDPP(-1) Lurban water	-5.620701 -0.331054 1.005477	2.987295 0.081818 0.660156	-1.88153 -4.04623 1.780604	0.0633 0.0001 0.0785	15	0.0446
C LGDP(-1) L rural water	-4.770790 -0.447035 1.006895	1.150364 0.079523 0.258627	-4.14720 -5.6215 3.89322	0.0001 0.0000 0.0002	17	0.0394
C LGDPP(-1) Lemployment rate	3.72014 -0.38609 -0.907978	3.32091 0.08574 0.749065	1.12022 -4.50289 -1.212147	0.2657 0.0000 0.2288	21.32	0.0325
C LGDPP (-1) LUrban income	-4.002808 -0.682489 0.200017	0.710094 0.095162 0.038163	-5.637012 -7.171871 5.241149	0.0000 0.0000 0.0000	9.1	0.0763
C LGDPP (-1) Leconomic participation	-4.42646 -0.41943 1.122167	2.38406 0.08925 0.648489	-1.85668 -4.69918 1.730433	0.0668 0.0000 0.0471	19	0.0363

Source: authors' own work

According to table 2, one finds statistically significant and negative values for parameter β. we can see that all the variables have significant negative coefficients and a negative coefficient on a lagged dependent variable infers that a province with initial lower level, will experience higher growth in that variable, and a negative coefficient between variables means that there is a negative correlation between the HDI and other considered indicator with the initial ratio of the regions' per capita GDP to the Iran level and its sub period average yearly growth rate.

Our approximations the HDI rate for the period 1996, 2006 and 2011 indicate very encouraging results. The backward provinces seem to close the gap between the more HDI provinces.

Meanwhile although the construction of a composite index of human development allows for direct comparison across regions, their use involves some drawbacks (for example, combining a wide variety of indicators, each one measured in different units, makes the composite index difficult to interpret.) (Saisana et al., 2005), hence some previous research like Hobjin and Franses (2001), Mazumdar(2003) and Marchante and Ortega(2006) has emphasized the need to analyses convergence for the raw data of each socio-economic indicator that was combined in the construction of the HDI. Hence we also consider other used indicators in human development index that giving in Table 2.

The results for the education index show high unconditional β-Convergence, the speed of convergence is -0.0594, which appear not only a positive impact on economic growth but strongly point toward a converging provinces in educational indicators where educational levels in lowly regions are catching up with the more developed and also implying that it would take 12 years for this variable to move halfway to the steady state. And similarly same finding obtained for life expectancy with the speed of convergence of -0.0391 and giving a half-life on the order of 15 years.

According to obtained results, economic indicators namely average income, economic participation and employment rate have a crucial role thus income increasing and economic participation could be lead both improvements in per-capita income and more convergence between provinces in terms of economic status. unconditional convergence rate in GDP per-capita, with an average speed of convergence of 0.0233 and moves halfway to the steady state in about 30 years, remains lower than other indicator that reveal that the convergence process, while gentle, has not stopped; employment rate variable shows an irregular trend and a negative effect in model estimation can be explained that because of no-increase in employment regularly between provinces(see appendix 1, Table A2), production level and economic growth have not been increased significantly while the trend is consistent with the economic participation. Therefore no growth suitable capacities and non-optimal use of labor capacity have been led to decrease production level and convergence across provinces.

In relation to clean water, results are statistically significant and obtained values for β stay negative. We can also observe that provinces in considered years move toward convergence and a negative coefficient on a GDP per-capita indicate that a province with initial lower level of GDP per-capita will experience higher growth in clean water. Convergence speed is satisfactory and also implying that it would take 15 to 17 years for this variable to move halfway to the steady state.

σ-convergence.

The σ -convergence occurs when the dispersion of real GDP per capita or other standard living indicators among different regions tend to decrease over time. The dispersion is typically measured through the standard deviation of the regional distribution of variables. Regions are said to be σ-converging if (Kumo, 2011):

$$Q_{t+T}<Q_t$$

Table 3 gives the results of the analysis of σ-convergence.

The computed standard deviations for indexes was clearly smaller than the dispersion in the initial level of them in 1996 excluding employment rates thus during the process of growth, the quality of life levels of the regions have become more equal and the variation between their quality of life levels have decreased (see Table 3).

With regard to social indicators, the high rates of σ -convergence of the HDI, education and life expectancy is noteworthy. The high rate of σ −convergence of the education index reveals a high degree of homogeneity reached in social performance across Iran regions but this increased has not been accompanied by increasing employment rate and economic participation.

Table 3. σ-convergence across Iran provinces, 1996, 2006 & 2011

σ −convergence			
indicators	**1996**	**2006**	**2011**
GDPP	0.5414	0.2430	0.1642
HDI	0.4925	0.1592	0.1476
Education	0.6104	0.1366	0.1594
Life expectancy	0.5312	0.2361	0.1982
total water	0.1395	0.1046	0.1032
urban water	0.0669	0.0770	0.0877
rural water	0.2416	0.1505	0.1287
Employment Rate	0.0440	0.0834	0.0677
Average Urban income	1.4978	0.1609	0.1485
Economic participation	0.077088	0.06288	0.072194

Source: authors' own work

Moreover, we observe a continuous decrease in standard deviation until 2011, from 0.5 to 0.15 for HDI, from 0.54 to 0.16 for GDP and from 1.5 to 0.14. This implies that the disparities in HDI, GDP per-capita and average income have decreased. This is a sign of σ – convergence and in line with that obtained above from the perspective of unconditional β-Convergence.

Finally, the empirical results can be summarized as follows:

1- We conclude that over the last two decades there has been unconditional convergence and the rates of convergence are acceptable although is very different with highest β-convergence belong to HDI= -0.811942 and least to GDP per-capita= -0.295493.

2- Both β-convergence and σ-convergence confirm the existence of process of convergence between 1996, 2006 and 2011.

3- Disparities in all indicators excluding employment rate and economic participation have indeed decreased during these periods.

6. Conclusions

In this study, we have adopted a complementary approach to the usual one to analyze the problem of inequality and convergence among Iran provinces.

The review of regional planning in Iranian economy shows that the regional planning in last decades based on the reduction of regional inequalities between provinces. The statistics of regional inequality indicate that before the 1990, the inequalities between provinces has not reduced significantly (see Amir Ahmadi, 1986; Noorbakhsh, 2002 and etc.).

Keeping in mind the common perception that provinces in Iran have undergone both inequitable growth and division of national resources and uneven development across different regions is observed, based on the results of this study, the average HDI across Iran provinces have increased but the order of provinces in terms of achievement has not changed, implying that although still inequality remains but the quality of life also has risen and Iran's regional policy based on reducing the development gap between different regions and creating a relative balance in regional development has been partially successful and the relative convergence has been observed. The results also show that although all indicators have a β-convergence but with different rates. Considering these factors and obtained results, it seems to reason that the speed of convergence is slower in the GDP per-capita regression than in the HDI regression; This might be explained by the fact that as early as 1990, most regions hadn't yet reached high values of HDI (as seen in table 1) and any investment could have a significant impact whereas the planning of the national economy still according to centralized nature is done.

β-convergence and σ-convergence also implies that the convergence of economic indicators is most important issue and β-convergence and σ-convergence in relation to economic indicators than other indicators is more consistent. Income increasing and production levels between provinces could be caused increasing production growth and finally a decrease in income dispersion across provinces. The paper is consistent with eric Hanushek (2013) that much of the motivation for human capital policies in developing

countries is the possibility of providing economic growth that will raise the levels of incomes in these countries. The focus on alleviating poverty in developing countries relates directly to economic growth because of the realization that simply redistributing incomes and resources will not lead to long run solutions to poverty.

Base on the results it can be suggested increasing labor participation rate and investments in manpower training could be lead increasing convergence between provinces because base on economic theories, human capital have crucial role in economic growth. Since planners can consider to role of labors and their active participation and devote part of the production capacity to boost labor productivity and empower them. Of course the focus on human capital as a driver of economic growth for provinces should not be led to undue attention on school attainment. According to eric Hanushek(2013) developing countries have made considerable progress in closing the gap with developed countries in terms of school attainment, but recent research has underscored the importance of cognitive skills for economic growth. Also the increase in income in urban areas could contribution in addition to decrease income inequality also increase economic growth and production level across provinces.

The most important policy recommendations of the study are that regional planners provide production growth across provinces with emphasis on economic indicators namely average urban income, economic participation and employment rates. Therefore, the policy makers should be adopting the best policies such as competitive policies along with regional development policies to improve the growth of GDP per capita and redistribution of income between provinces.

With respect to the results of this study and the importance of convergence in Iranian provinces, we can suggest that in the next empirical studies researches should be emphasis on the determinants of centralization policies and its nexus with convergence in Iran's provinces. And on the base of neoclassical growth model, if Differences in economic growth across provinces are closely related to cognitive skills as measured by achievement on international assessments of mathematics and science.

7. Notes

1. This index is then normalized using observed minimum and the maximum value of the composite education index.

2. In this paper, the moving average has been calculated by using of 3 provinces mean.

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Appendix A - Tables for the Regional rural and urban water, Employmet rate, Economic participation, average urban income across 1996, 2006, 2011.

Table A1 – provincial access to clean water (percent)

provinces	Total			Urban			Rural		
	1996	2006	2011	1996	2006	2011	1996	2006	2011
Ardabil	71.5	88.07	89.82	90	91.46	91.84	51.9	82.85	86.14
Azerbaijan, East	81.6	93.15	94.75	91.9	97.65	98.54	63.2	82.79	85.62
Azerbaijan,West	78.1	89.54	92.97	92.1	94.29	96.69	59.1	80.94	86.02
Bushehr	84.7	84.52	80.2	97.1	88.51	81.18	68.8	76.11	78.08
Chahar Mahaal	92.9	96	97.1	99.1	99.46	99.38	87.4	91.92	93.64
Esfahan	96.6	96.45	98.01	98.4	97.36	98.71	90.9	91.75	93.92
Fars	98.4	90	89.56	99	93.79	93.53	92.3	83.44	80.79
Gilan	52	62.34	65.25	73.9	76.19	71.2	31.2	45.41	56.11
Golestan		92.5	92.68		97.88	96.42		86.74	88.55
Hamadan	82.8	92.47	95.36	90	95.31	97.1	75	88.23	92.68
Hormozgān	78.8	73.88	71.24	95.2	83.52	77.75	64.8	64.47	64.31
Ilam	92.2	96.11	95.7	98.8	98.41	96.1	83.6	92.16	94.94
Kerman	86.8	86.21	88.03	98.4	97.77	98.19	72	68.98	74.28
Kermanshah	84.9	93.65	95.37	95.5	99.1	99.12	65	81.21	85.92
Khorasan, South	86.9	77.66	84.23	98.2	87.09	92.82	71.7	67.95	74.16
Khorasan,North	86.9	87.5	92.44	98.2	93.09	95.42	71.7	82.06	89.21
Khorasan,Razvi	86.9	92.64	95.84	98.2	95.25	97.31	71.7	86.8	92.01
Khuzestan	89.5	84.83	80.73	99	86.78	85.41	70.3	80.08	67.84
Kohgiluyeh	74	88.72	93.69	98.4	96.6	95.76	57.7	81.38	91.37
Kurdistan	81.9	88.22	92.23	88.2	91.76	95.25	73.9	82.42	85.98
Lorestan	84.2	92.8	94.16	97.7	99.39	99.3	66.2	82.05	85.32
Markazi	91.6	91.47	95.77	98.9	90.37	96.2	81.7	93.93	94.57
Mazandaran	82.5	89.61	92.58	97.1	96.64	96.32	69.9	81.3	88
Qazvin		96.47	97.94		98.98	99.4		90.86	94.03
Qom	94.5	89.2	94.27	98.9	89.06	94.81	87.8	91.46	83.51
Semnan	97.4	89.28	92.13	99.2	90.61	93.67	90.6	85.15	87.05
Sistanbaluchistan	58.9	65.97	70.48	81	71.87	75.11	38	60.47	65.96
Tehran	97.9	94.6	95.63	98.2	95.66	96.31	93.2	81.84	85.49
Yazd	94.6	94.07	96.83	99.1	96.01	98.68	81.6	86.26	87.85
Zanjan	86.2	93.03	92.25	99.4	98.5	98.79	73	84.64	81.08

Source: Statistical Center of Iran.

Table A2 –Participation Rates & Employment Rates across provinces in Iran(percent)

Provinces	Participation Rate			Employment Rates		
	1996	2006	2011	1996	2006	2011
Ardabil	35.08	39.27	39.39	89.37	88.73	85.36
Azerbaijan, East	37.72	41.44	39.59	93.85	90.38	90.04
Azerbaijan,West	38.14	39.33	37.48	90.63	91.17	87.85
Bushehr	30.95	39.95	43.65	92.9	90.88	89.2
Chahar Mahaal	36.23	39.89	38.62	92.5	81.82	84.1
Esfahan	36.73	39.98	38.45	92.03	89.48	86.68
Fars	34.55	37.25	37.85	89.73	88.7	83.11
Gilan	40.91	41.42	40.87	86.69	85.07	84.91
Golestan	-	41.19	38.65	#DIV/0!	87.59	87.11
Hamadan	35.67	38.46	38.09	91.05	87.74	86.59
Hormozgān	30.4	37.15	37.61	91.67	87.83	84.7
Ilam	32	39.14	40.11	83.04	72.53	77.25
Kerman	33.51	40.11	38.35	91.53	79	81.86
Kermanshah	35.95	38.23	37.51	81.55	76.82	75.4
Khorasan, South	37.11	44.34	41.66	93.07	83.55	93.29
Khorasan,North	37.11	41.77	40.32	93.07	91.76	89.96
Khorasan,Razvi	37.11	40.91	38.62	93.07	91.77	90.59
Khuzestan	32.48	34.82	34.64	83.81	80.72	74.3
Kohgiluyeh	30.5	33.33	35.09	85.22	80	78.71
Kurdistan	36.96	40.33	39.43	90.83	79.88	84.62
Lorestan	32.84	40.19	37.86	81.48	70.89	76.08
Markazi	35.88	37.98	38.38	92.6	89.57	88.1
Mazandaran	35.6	40.01	40.01	90.28	89.16	88.59
Qazvin	#DIV/0!	37.47	38.27	#DIV/0!	89.32	87.18
Qom	32.45	36.44	33.71	94.2	92.11	88.4
Semnan	35.03	38.22	37.29	94.93	91.71	90.08
Sistanbaluchistan	29.91	34.98	29.33	90.78	68.54	70.83
Tehran	34.38	40.5	38.23	93.98	91.6	86.89
Yazd	39.03	43.39	40.67	94.69	92.24	89.47
Zanjan	35.08	40.73	40.11	93.28	90.72	89.11

Source: Statistical Center of Iran & authors' own work.

Table A3 – Average Urban & Rural Income across provinces in Iran between 1996, 2006, 2011.

Provinces	Average Urban Income			Average Rural Income		
	1996	2006	2011	1996	2006	2011
Ardabil	307.0722	2981.823	3809.766	325.4815	2028.655	2530.785
Azerbaijan, East	350.9428	2072.819	3411.854	271.5098	1556.934	2261.486
Azerbaijan,West	310.7256	2626.774	3474.689	252.9493	2098.864	2710.898
Bushehr	290.8024	2442.039	3211.947	221.9379	2287.876	2935.235
Chahar Mahaal	271.6157	2273.859	3421.046	179.0657	1429.554	2039.655
Esfahan	320.4557	2202.14	3726.497	259.7472	1741.142	2555.602
Fars	384.955	2947.489	4367.774	279.1397	2274.64	2845.334
Gilan	0.4707	2196.235	4346.512	194.5103	1391.442	2279.011
Golestan	0	2356.656	3962.876	0	1678.015	2041.509
Hamadan	317.8386	2239.587	3730.503	242.1134	1775.189	2192.375
Hormozgān	388.2576	3243.548	4260.534	191.0218	1910.843	1769.903
Ilam	258.5165	2578.072	3778.614	212.5164	1775.735	2610.705
Kerman	297.48	2565.274	3482.814	246.0436	1513.499	1936.514
Kermanshah	247.096	2237.873	3551.482	122.9045	1615.691	2203.739
Khorasan, South	290.669	1814.47	2924.659	163.6913	1015.783	1260.005
Khorasan,North	290.669	1857.053	3752.121	163.6913	1211.16	1907.57
Khorasan,Razvi	290.669	2257.541	4149.047	163.6913	1128.532	1847.122
Khuzestan	418.5245	2777.349	4690.156	329.2069	2098.836	2939.36
Kohgiluyeh	364.8815	2864.459	3818.566	175.0864	1612.772	1807.51
Kurdistan	265.3206	2386.885	3526.035	176.2796	1862.806	2385.197
Lorestan	255.6955	2182.498	3432.825	242.6471	1657.184	2355.593
Markazi	7.0828	2236.288	3396.38	195.1447	1354.978	1809.873
Mazandaran	322.6343	3329.119	5068.295	239.1276	2570.476	3825.704
Qazvin	0	2768.953	4421.559	0	1786.412	2823.288
Qom	0	2239.425	3242.16	0	1644.137	2183.47
Semnan	271.7208	2177.66	3413.424	153.5289	1225.631	1859.535
Sistan & baluchistan	386.5004	2138.61	3136.675	145.3005	1216.429	1562.519
Tehran	462.8204	3332.036	5796.636	276.659	1879.115	3384.635
Yazd	314.5424	2026.282	3450.767	186.791	1681.954	2628.997
Zanjan	287.9224	2319.053	3738.84	180.5097	1391.2	2088.349

Source: Statistical Center of Iran & authors' own work.