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Hiranmoy Roy and Kaushik Bhattacharjee

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Convergence of Human Development Across Indian States*

Dr. Hiranmoy Roy[1]
Kaushik Bhattacharjee[2]

Abstract: This paper examines the issue of convergence of human development among major Indian States as there is high degree of inequality in human development across Indian States .We intend(attempt) to answer an important question that whether low HDI states will be able to catch up the high HDI states, using convergence analysis. State wise decennial data for HDI(1981-91 to1991-01) are used. From the perspective of evaluating welfare implications and redistributive policies of the policy makers and to achieve social equality, a question that naturally pops up is : **Will the poor HDI states will be able to catch up the high HDI states?** It is of importance to know whether distribution of income and output across states are increasingly becoming equal over time resulting in equality in Human development or the low human development index (HDI) states will remain lower for many generations and those states are having high HDI will be higher for ever. We propose to answer this question by using the convergence analysis which is well known in macro economic analysis. Economists employed convergence analysis to find answer of similar question of growth convergence between nations or regions within a country. Though economists were interested for these issues many decades, during 1980's only the convergence question attracted the attention of economists and econometrician. However for HDI, convergence analysis one has to consider the states as the relevant units of analysis. Our results of convergence analysis cast doubt on the hypothesis that low HDI states are actually growing at a faster rate than high HDI states leading to convergence in terms of HDI.

JEL Classification Code: O15, O47, C87

Keywords: Human Development, Convergence, Regional Disparity.

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1 Faculty Associate, Icfai Business School – Hyderabad, Dontanapally Village, Shankerapally Mandals, R. R. District-501203. Email: hroy_au@yahoo.com
2 Assistant Professor, Icfai Business School – Hyderabad, Dontanapally Village, Shankerapally Mandal, R. R. District-501203. Email: kabonline07@yahoo.com

Introduction: The degree of inequality in Human Development across Indian states is in sharp contrast to each other. "Regional disparity in human development is often a source of political tension and dissatisfaction in a federal system. Although theory and measurement of such disparities never received adequate attention in India, both the planning Commission and Finance Commissions have given very high weightage to this aspect for deciding allocation of resources among states. Every time such allocation is made to address the issue of regional disparity. What is disturbing is very often the choices are made without proper validation and verification of these theories in Indian context. Of late, the theory finding favour among policy makers is that human capital is the prime determinant of economic growth and disparity. The Kerala model of achieving a high level of human development without corresponding high achievement in economic font, by emphasizing the role of public investment in social sectors, has impressed policy makers at the centre and states" (Dholakia R. H, 2003). A major objective of planned economic development strategy in India since independence has been to accelerate economic and achieve a balanced regional spread. The planned allocation of resources in independent India was expected to rectify inter - regional disparities and imbalances in development (Rao, Govinda et al 1999). From the perspective of evaluating welfare implications and redistributive policies of the policy makers and to achieve social equality, a question that naturally pops up is : **Will the poor HDI states will be able to catch up the high HDI states?** It is of importance to know whether distribution of income and output across states are increasingly becoming equal over time resulting in equality in Human development or the low human development index (HDI) states will remain lower for many generations and those states are having high HDI will be higher for ever.

We propose to answer this question by using the convergence analysis which is well known in macro economic analysis. Economists employed convergence analysis to find answer of similar question of growth convergence between nations or regions within a country (Martin, Xavier-Sala-i 1995). Though economists were interested for these issues many decades, during 1980's only the convergence question attracted the attention of economists and econometrician. However for HDI, convergence analysis one has to consider the states as the relevant units of analysis.

It is imperative to discuss first the classical approach to convergence analysis. This methodology is classical in its approach because it uses the traditional techniques of classical econometrics, a characteristics shared by almost all the alternative approaches. Like other classical theories it is the basis of reference and target of criticism of other methodologies. It is also like classical theories has survived and will keep surviving the challenges of modern age.

Convergence Analysis: This idea of convergence nothing new as it was buried in the conventional treatment of growth model by Robert Solow. But the issues, those that have been made transparent through recent findings, seems to be quite interesting and have opened up avenues for further research in this area (Marjit, Suagata and Mitra, Sandip 1996) Two main concept of convergence appear in the classical literature. They are β convergence and σ

convergence.(Martin, Xavier-Sala-i 1995)[1]. If low HDI states (GDP is replaced by HDI) tend to grow faster than high ones we say there is absolute β convergence. Imagine that we have data on HDI for cross section of states between period t and t+T. If we estimate the following regression

$\gamma i, t, t+T = \alpha - \beta . \log (Y i, t) + \varepsilon i, t, (1)$

where $\gamma i, t, t+T \equiv \log (Y i, t+T/ Y i, T)/ T$ is growth rate of HDI between t and t+T, and log (Yi, t) is the logarithm of economy i‟s HDI at time t and if we find $\beta > 0$, so we say that the data set exhibit absolute beta convergence.

The concept of σ - convergence can be defined as a group of countries or states are converging in the sense of σ, if the dispersion of their HDI tends to decrease over time. That is if, $\sigma t+T < \sigma t$, Where σ t is the time t standard deviation of log (Yi, t) across „i‟ . The concept of σ convergence and absolute β convergence are of course related. If we take the sample variance of log (Yi, t) from (1) we will get a relation between σ t, and σ t +T which depends on β. If we see that HDI of two states become more similar over time, than low HDI state is developing faster.

If growth rate of HDI of any state is smaller than another state between time t and t+T, so, we can say there is β convergence. If , in addition to the β convergence, dispersion at t+T is smaller than at time t, we can say there is σ convergence. It is impossible for two

states to be closer at t+T without having the low HDI state growing faster. In other words a necessary condition for σ convergence is the absolute β convergence. Both Levene's Test and Bartlett's[2] Test will be applied to justify the convergence of HDI.

It is also natural to understand that when a low HDI state grows faster than high HDI states, two states will become similar over time. In other words the existence of β convergence will tend to generate σ convergence. Therefore it would appear that these two convergence are similar. However , it is possible for low HDI states to grow faster than high HDI states without observing cross-sectional disparity decrease over time. Thus we can find β convergence without having σ convergence. In certain cases there may be σ divergence though there is β convergence[3]. Not necessarily these two convergence always show up together because they imply two different things: σ convergence relates whether cross state distribution HDI falls over time or not. Where as β convergence refers to the mobility of different states within the given distribution of HDI.

Sample of States Chosen for HDI Analysis:

The reason for selecting fifteen major states for the purpose of our convergence analysis is non availability of state level HDI data for all the states. However we claim that these states are good representative of the population of Indian states. A cluster analysis[4] of our sample base on HDIs supports our claim. We found three clusters of states as per existing notion and belief as we can classify them as high HDI states, medium HDI states and low HDI states. This is shown in Table-1 below.

Table-1
Cluster of States

Cluster I	HighHuman	Andhra Pradesh, Gujrat,

	Development States	Haryana, Kerala, Punjab, Tamil Nadu
Cluster II	Medium Human Development States	Maharastra, Karnataka, West Bengal
Cluster III	Low Human Development States	Assam Bihar, UP, MP, Rajasthan, Orissa,

To apply the convergence theory empirically in case of the HDI analysis of the Indian States, we have used the following secondary data set in Table-2, collected from Planning Commission's Human Development Rport (2002)

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[3] Salai-i Martin(1995, pp-3)

[4] We have done a Hierarchical Cluster Analysis based on HDI values for the three decennial years (refer Table-2)

Table -2
Trends in Human Development Index in Selected States in India (1981-2001)

States	HDI	HDI	HDI
	1981	1991	2001
Andhra Pradesh	0.298	0.377	0.416
Assam	0.272	0.348	0.386
Bihar	0.237	0.308	0.367
Gujarat	0.360	0.431	0.479
Haryana	0.360	0.443	0.509
Karnataka	0.346	0.412	0.478
Kerala	0.500	0.591	0.638
Madhya Pradesh	0.245	0.328	0.394
Maharashtra	0.363	0.452	0.523
Orissa	0.267	0.345	0.404
Punjab	0.411	0.475	0.537
Rajasthan	0.256	0.347	0.424
Tamil Nadu	0.343	0.466	0.531
Uttar Pradesh	0.255	0.314	0.388
West Bengal	0.305	0.404	0.472

Source: Planning Commission (2002) National HumanDevelopment Report 2001, Government of India, New Delhi.

In Table 3 we provide some of the descriptive statistics for the data presented in Table2.

Table3: Descriptive Statics :

	N	Minimum	Maximum	Mean	Std. Deviation
HDI81	15	.237	.500	.32120	.072492
| HDI91	15	.308	.591	.40273	.076595
HDI01	15	.367	.638	.46307	.075472
| Valid N (listwise)	15				

We observe that both minimum and maximum values of HDI are increasing over time and so is mean. However standard deviation of HDI remains more or less at a same level signaling that the relative dispersion is not decreasing over time among the states with respect to HDI.

Methodology and Results of Convergence Analysis of HDI in case of Indian States:

We estimate the following regression equations [5]

$Growth8191_i = \alpha - \beta \cdot \log(HDI81_i) + \varepsilon_i$ (2)
$Growth9101_i = \alpha - \beta \cdot \log(HDI91_i) + u_i$ (3)

where log (HDI81i) and log(HDI91i) is the logarithm of state i" s HDI at time 1981 and 1991 respectively. And $Growth8191_i \equiv \log(HDI91_i / HDI81_i)/10$ is the growth rate of HDI of i-th state between 1981 and 1991. Similar interpretation is for Growth9101i. (i=1,2,…,15) And hence going by the classical convergence analysis as described earlier section, if we find $\beta > 0$, so we say that the data set exhibit absolute beta convergence.

It is observed that β is positive and significant for both the time periods considered for analysis (0.680;0.697) which support that there is β convergence.Thus the first condition for convergence (or σ convergence) i.e. β convergence is fulfilled in case of HDI for Indian states. However, investigating the second condition for convergence $\sigma_{t+T} < \sigma_t$, in Indian states it is found that though sample estimate of σ_{t+T} is less than sample estimate of σ_t (t=1981,1991;T=10 years) but they are not (statistically) significantly different. Both Levene" s test and Bartlett's test (used to test the equality of variances) fails to reject the null hypothesis of equality of variances (Ho: $\sigma_t = \sigma_{t+10} = \sigma_{t+20}$ t=1981,1991 against H1: at least one inequality).

5. We also regress Growth8101 on log(HDI81)and naturally find the results similar to equation (2)

Conclusion:

Thus it is observed that the low HDI states growing faster than the high HDI states. However at the same time dispersion of their cross-sectional HDI is not decreasing over time. This is a trend which implies (sigma) convergence in HDI may not be achieved over time among the Indian states and in our view this absence of convergence of human development across Indian states is a serious area of concern so far overall development of the states are concerned. Therefore the paper ends up with the observation that absence of convergence of human development across Indian States which is a serious area of concern. Further investigation can be worked out about the causes of this non-convergence of HDI among the different states in India and what are the important factors which influence Human Development in a significant manner, which remain to be future research agenda.

Model Summary:

Equation Number	R	R^2	Adjusted R^2	Standard Error of the Estimate
(2)	0.680	0.463	0.422	0.03941
(3)	0.697	0.486	0.447	0.028820

Coefficients For the first Regression equation (2)

Unstanderdized Coefficient		Standard Error	Standard Coefficient	t	significance
B			Beta		
Constant	.042	.058		.717	.486
Log81	-.165	.049	-.680	-3.347	.005

Coefficients For the second Regressionequation (3)

Unstanderdized Coefficient		Standard Error	Standard Coefficient	t	significance
B			Beta		
Constant	.007	0.040		0.170	0.867
	-.148	0.042	-0.697	-3.508	0.004

ANOVA for Regression (2)

Sum of Squares	df	Mean Square	F	Sig.
0.017	1	0.017	11.204	0.005
0.020	13	0.002		
0.038	14			

ANOVA for Regression (3)

Sum of Squares	df	Mean Square	F	Sig.
0.010	1	0.010	12.304	0.004
0.011	13	0.001		
0.021	14			

Levene's Test:

Group	Count	Mean	Standard Deviation
1	15	0.3212	0.07249
2	15	0.40273	0.07659
3	15	0.46333	0.0753
Levene's Static	0.01977		
Degrees of freedom	2,42		
P- Value	0.98043		

Bartlett's Test:

Group	Count	Mean	Standard Deviation
1	15	0.3212	0.07249
2	15	0.40273	0.07659
3	15	0.46333	0.0753
Pooled	45	0.39576	0.07482
Bartlett's Statistic	0.04283		
Degrees of freedom	2		
P- Value	0.97881		

Note:

1. See Martin, Xavier-Sala-i, 1995. We have replaced GDP by HDI as HDI has been accepted by economists as better indicator of economic well-being and welfare.

2. Bartlett's test assumes that the data come from k (here k=3) different normal distributions and tests if they are of equal variances where as Levene's test tests if the populations are of equal variances when distributions are not normal, and especially when they are prone to outliers.

References:

Bose, Ashish (2004): HDRs: Some Reflections, Economic and Political Weekly, January 24-30.

Centre for Economic and Social Studies (CESS) (2007): Human Development Report, Hyderabad.

Dholakia, R. H (2003): Regional Disparity in Economic and Human Development in India, Economic and Political Weekly, September27- October 3, Vol. 38, No. 39, pp-4166-4172.

Fukuda-Parr, Sakiko, Kate Raworth and A.K. Shiva Kumar (2002), 'Using the HDI for Policy Purposes', in Sakiko Fukuda-Parr and A.K. Shiva Kumar (eds.) Readings in Human Development, Oxford University Press.

Government of India (2002) , National Human Development Report,

Govt. Assam (2003), Human Development Report.

Govt. of Kerala (2005), Human Development Report.

Govt. of Madhya Pradesh (2007): Human Development Report.

Kumar, A.K. Shiva (1991): UNDP's Human Development Index: A Computation for Indian states, Economic and Political Weekly, Bombay, October 12.

Kumar, A.K. Shiva and Rohde, Jon (1995) : The Progress of Indian States, UNICEF New Delhi

Martin, Xavier-Sala-i (1995): Economics Working Paper 117, Yale University and Universitat Pompeu Fabra, June.

Marjit, Sugata and Mitra, Sandip (1996) : Convergence in Regional Growth Rates Indian Research Agenda, Economic and Political Weekly, Vol. 31, No. 33, pp. 2239-2242

National Council for Applied Economic Research (1996): Human Development Profile of India, New Delhi.

Planning Commission (2002): National Human Development Report 2001, Government of India, New Delhi

Prabhu, K. Seeta and S. Chatterjee (1993): 'Social Sector Expenditures and Human Development: A Study of Indian States,' Development Research Group Study No. 6, Reserve Bank of India, Mumbai.

Rao, Govinda M, Shand R T and Kalirajan, K P (1999): A Convergence of Income Across Indian States A Divergent Issue, Economic and Political Weekly, Vol. 34, No. 13, pp. 769-778

UNDP (1990): Human Development Report, Oxford Universty Press.

UNDP (1996): Human Development Report ,Oxford University Press

UNDP (2008): Human Development Report, Oxford University Press.

Vyashalu, Vinod (2004): Human Development in West Bengal, Economic and Political Weekly, January 24-30.