

# AN INTER-STATE ANALYSIS OF ECONOMIC DEVELOPMENT IN INDIA

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*The present paper analyzes and compares the position of Indian states for the year 1981, 1991, 2001 and 2011 by identifying the education, health, nutrition, sanitation and economic indicators responsible for the diversity in development, for which the Composite development index has been constructed. It has been analyzed that not much change has occurred in the ranks of the states, as the best performing states (like Goa, Kerala, Maharashtra, Himachal Pradesh and Tamil Nadu) remains the best and the worst performing states (like Bihar, Madhya Pradesh, Orissa, Rajasthan and Uttar Pradesh) remains the worst. Further, study reveals a clear evidence of an increasing trend in the regional disparity in per capita net state domestic product. This suggests that poor states have failed to catch up with rich ones in terms of per capita income. Thus there is a need for policy measures on the part of the poor states to improve their per capita income as other issues will be addressed automatically in order to catch up with rich ones.*

**Keywords:** Convergence, Education, Health, Per Capita Net State Domestic Product.

## INTRODUCTION

Economic Development is a multidimensional process involving development of human capital, raising living standards, improving education, infrastructure, improvement of health, level of nutrition, quality of housing, distribution of goods and services and other areas that leads to increase in general welfare of the society. According to the World Bank Report (1992), "Development is about improving the well being of people. Raising living standards and improving education, health and equality of opportunity are all essential components of development." Economic development leads to improvement in all sectors of the economy. The indicators such as poverty ratio, literacy rates, infant mortality, per capita income and industrial and agriculture share can be used to measure the level of economic development in a country.

Economic development has become a matter of primary concern for almost every nation of the world including India. Since independence, policymakers and planners in India have been concentrating on achieving balanced regional development in the country, but still the progress of states is not uniform in terms of economic development, as some states like Gujarat, Kerala and Maharashtra are experiencing fast progress, whereas others like that of Bihar, Uttar Pradesh and Madhya Pradesh are lagging behind. In this paper, an effort has been made to analyze and compare the position of Indian states by identifying the education, health, nutrition, sanitation and economic indicators responsible for the diversity in development.

For this purpose the whole study has been divided into 5 sections. Data base and methodology has been discussed in Section-II. In Section-III analysis of 22 states has been undertaken and composite development index has been developed. Convergence and divergence in terms of indicators and composite development index has been presented in Section-IV. The whole discussion has been concluded in Section-V.

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## DATA SOURCE AND METHODOLOGY

The data used in the study were collected from Central Statistical Organisation, National Human Development Report 2001, Census of India, Data book for the use of Deputy Chairman (Planning Commission 2012), Economic Survey (various issues), Economic and Political Weekly Research Foundation 2011. In order to analyze and compare the position of Indian states by identifying the education, health, nutrition, sanitation and economic indicators responsible for the diversity in development, composite development index has been constructed. 'Factor Analysis' has been employed to determine the relative weight of the selected indicators. The relative weights to various indicators have been assigned on the basis of all the principal components. Eighteen indicators have been used for developing composite development index.

Per Capita Net State Domestic Product at 2004-05 Prices, Adult Literacy Rate, Female Literacy Rate, Primary Pupil Teacher Ratio, Upper Primary Pupil Teacher Ratio, Secondary Pupil Teacher Ratio, Primary Gross Enrolment Ratio, Upper Primary Gross Enrolment Ratio, Primary Drop-out Rate, Percentage of Population below Poverty Line, Percentage of Households with Access to Safe Drinking Water, Percentage of Households with Access to Electricity, Infant Mortality Rate per Thousand Live Births, Crude Death Rate per Thousand Population, Urban Population as percentage of Total Population, Per Capita Consumption of Electricity, Percentage Share of Industry in NSDP at 2004-05 Prices, and Percentage Share of Services in NSDP at 2004-05 Prices

### Factor Analysis

According to Harman (1967), "Some of the variables selected for the construction of composite development index are input and output variables. These variables technically associated with particular phenomenon are highly correlated among themselves. This causes the problem of multicollinearity and the consequences of this problem are inaccurate and unreliable results. The statistical technique that can be more usefully applied in such a situation is 'Factor Analysis'. Factor Analysis attempts to estimate the value for the coefficients of regression where the variables are regressed up on the factors".

### Normalization of Data

The selected variables were first normalized and the best and worst values in an indicator were computed. The indicators used in the study were of two types i.e. either having positive or negative impact on the index. In case of a positive indicator, the highest value will be considered as the best value and the lowest has been treated as the worst value. On the other hand, in case of a negative indicator, the lowest value will be treated as the best value and the highest will be the worst value. After that the following formula has been used to compute normalized values:

$$Z_{ij} = 1 - \left[ \frac{\{\text{Best } x_i - \text{Observed } x_{ij}\}}{\{\text{Best } x_i - \text{Worst } x_i\}} \right]$$

"Normalized values always lie between 0 and 1" (Mehta & Siddiqui, 2008).

After computing the normalized values, the relative weights of selected indicators have been obtained by applying the scientific technique i.e. 'principal component analysis' also called 'Factor Analysis'. The relative weights of selected indicators have been used for constructing Composite Development Index.

According to Harman (1967), “In Factor Analysis, a given set of ‘n’ variables are grouped into ‘P’ number of groups called ‘Factors’ which are less in number than the set of original variables. The variables within a group (Factor) are of same nature or are complementary with respect to the phenomenon under study but between two groups ‘Factors’ variables are independent. Thus factors  $F_i$  and  $F_j$  are orthogonal”.

The Factor Analysis used in the present study:

$$X = LF + U$$

Where X is vector of all the original variables.

$$X' = [X_1, X_2, X_3, \dots, X_n]$$

F is vector of ‘Factors’ derived

$$F' = [F_1, F_2, F_3, \dots, F_p]$$

U is vector of error terms

$$U' = [E_1, E_2, E_3, \dots, E_n]$$

L is matrix of Factor Loadings (Loading Coefficient Matrix)

$$L = \begin{pmatrix} a_{11} & a_{12} & a_{13} & \dots & a_{1p} \\ a_{21} & a_{22} & a_{23} & \dots & a_{2p} \\ a_{31} & a_{32} & a_{33} & \dots & a_{3p} \\ \dots & \dots & \dots & \dots & \dots \\ a_{n1} & a_{n2} & a_{n3} & \dots & a_{np} \end{pmatrix}$$

The coefficient (Factor loading)  $a_{ij}$  belongs to  $i^{\text{th}}$  variable and  $j^{\text{th}}$  Factor and shows the extent to which variable  $X_i$  is related to  $F_j$  Factor. “A salient loading is one which is sufficiently high to assume that a relationship exists between the variable and the factor. In addition, it usually means that relationship is high enough so that the variable can aid in interpreting the factor and vice-versa” (Gorsuch, 1974).

The sum of the square of factor loadings of  $X_i$  original variables under the derived p Factors is called the communalities for  $X_i$  variables.

$$(a_{i1})^2 + (a_{i2})^2 + (a_{i3})^2 + \dots + (a_{ip})^2 = (C_i)^2$$

Communality in Factor Analysis is something like  $R^2$  in the Regression Analysis and it shows the extent to which the derived factors explain the  $i^{\text{th}}$  variable.

The method for determining the relative weights for the variables is explained below:

$$W_i : F_{ik} \lambda_k$$

$W_i$  : is weight of  $i^{\text{th}}$  variable

$F_{ik}$  : is factor loading of  $i^{\text{th}}$  variable and  $k^{\text{th}}$  factor which shows the highest correlation between variable ( $X_i$ ) and factor ( $F_k$ )

$\lambda_k$  : is the variation explained by  $k^{\text{th}}$  factor

Index has been calculated by using following formula:

$$I_j = \frac{\sum_{i=1}^n w_i Z_{ij}}{\sum_{i=1}^n w_i}$$

$I_j$  : is the composite development Index of  $j^{\text{th}}$  state

$Z_{ij}$  : is normalized value of  $i^{\text{th}}$  variable for  $j^{\text{th}}$  state

$W_i$  : is the weight of  $i^{\text{th}}$  variable.

$\Sigma w_i$  : is sum of the weights (Harman, 1967)

### Coefficient of Variation

In order to examine the trend of inequality across states in the selected indicators as well as the indices over the period of time, 'coefficient of variation (C.V.)' as a measure of convergence/divergence has been applied:

$$\text{Coefficient of Variation (C.V.)} = \frac{\sigma}{\bar{X}} \cdot 100$$

Where  $\sigma$  and  $\bar{X}$  are the mean and standard deviation respectively of given variable.

### INTER-STATE ANALYSIS

Composite development index has been developed by using the weights obtained from all principal components for the states. The analysis has been undertaken for 22 states namely Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Goa, Gujarat, Himachal Pradesh, Haryana, Karnataka, Kerala, Manipur, Madhya Pradesh, Meghalaya, Maharashtra, Orissa, Punjab, Sikkim, Rajasthan, Tripura, Tamil Nadu, Uttar Pradesh and West Bengal for the year 1981, 1991, 2001 and 2011.

The results of factor analysis for the year 1981 are presented in the table 1. Table 1 shows the factor loadings with three factors derived from the selected indicators. The three factors ( $F_1$ ,  $F_2$  &  $F_3$ ) explain 72.56 per cent inter-state variations in development indicators. Communalities for all the indicators varied between 46.1 to 96.5 per cent, indicating that these three factors account for most of the variations in the selected indicators. The first factor ( $F_1$ ) explains 41.6 per cent variations in the variable set. The most important indicators in the first factor are primary gross enrolment ratio, female literacy rate, followed by upper primary gross enrolment ratio, adult literacy rate, per capita net state domestic product and households with access to electricity. The other indicators included in this set are crude death rate, percentage share of industry in NSDP, infant mortality rate, per capita consumption of electricity, primary drop-out rate, urban population as percentage of total population and percentage share of services in NSDP. Most of these indicators are related to education and health.

**Table 1 - Results of Factor Analysis for the Year 1981**

	Variables	Factor Loadings			Communi- calities	weights	Wt in %
		Factor-1 F1	Factor-2 F2	Factor-3 F3			
		1	2	3			
1.	PCNSDP	<b>.798</b>	-.135	.480	.885	0.3320	7.41
2.	Adult Literacy Rate	<b>.850</b>	.107	-.470	.957	0.3536	7.89
3.	Female Literacy Rate	<b>.883</b>	.208	-.273	.914	0.3674	8.20
4.	Primary Gross Enrolment Ratio	<b>.925</b>	.110	-.060	.909	0.3848	8.59
5.	Upper Primary Gross Enrolment Ratio	<b>.861</b>	.395	-.003	.922	0.3582	8.00
6.	Primary Drop-out Rate	<b>.613</b>	-.293	-.003	.890	0.2550	5.69
7.	Households with Access to Electricity	<b>.783</b>	-.240	.542	.965	0.3258	7.27
8.	Infant Mortality Rate	<b>.652</b>	.561	-.064	.762	0.2713	6.06
9.	Crude Death Rate	<b>.726</b>	.458	-.153	.794	0.3021	6.74
10.	Urban Population	<b>.584</b>	-.426	-.195	.870	0.2430	5.42
11.	Per Capita Consumption of Electricity	<b>.621</b>	-.620	.199	.862	0.2584	5.77
12.	Share of Industry	<b>.662</b>	-.082	-.048	.461	0.2754	6.15
13.	Share of Services	<b>.484</b>	-.220	-.515	.637	0.2014	4.50
14.	Primary Pupil Teacher Ratio	.167	<b>.834</b>	.024	.788	0.1549	3.46
15.	Upper Primary Pupil Teacher Ratio	-.100	<b>.698</b>	.498	.747	0.1297	2.89
16.	Secondary Pupil Teacher Ratio	-.244	<b>.654</b>	.285	.664	0.1215	2.71
17.	Population Below Poverty Line	.541	.018	<b>.667</b>	.748	0.0826	1.84
18.	Households with Access to Safe Drinking Water	.142	-.450	<b>.507</b>	.631	0.0628	1.40
	Eigen Values	7.489	3.344	2.229		4.4798	
	% age Variance Explained	41.605	18.579	12.381			
	Cum % age Variance Explained	41.605	60.184	72.565			

Source: Author's calculations.

The second factor ( $F_2$ ), which explains 18.57 per cent of variations, includes indicators like primary pupil teacher ratio, upper primary pupil teacher ratio and secondary pupil teacher ratio.

Population below poverty line and households with access to safe drinking water constitutes the third factor ( $F_3$ ), explaining 12.38 per cent variations in the variable set.

## COMPOSITE DEVELOPMENT INDEX AND FACTOR ANALYSIS

The weights calculated for the selected 18 indicators from 'Principal Component' for 22 Indian states have been used to develop the Composite Development Index and is presented in the table 2 along with ranking of the different states.

Table 2 shows that the value of index varies within the range of 0.1439 to 0.8493. Goa was at the top with highest value (0.8493) of composite development index among 22 states during 1981 followed by Kerala (0.7488), Punjab (0.6319), Maharashtra (0.6022), Tamil Nadu (0.5608) and Himachal Pradesh (0.5210). These are developed states as per composite development index.

**Table 2 - Composite Development Index for the Year 1981**

States	Composite Development Index	Ranks
Andhra Pradesh	0.3053	15
Arunachal Pradesh	0.1757	21
Assam	0.2496	18
Bihar	0.1439	22
Goa	0.8493	01
Gujarat	0.4897	08
Himachal Pradesh	0.5210	06
Haryana	0.4763	09
Karnataka	0.4210	10
Kerala	0.7488	02
Manipur	0.4974	07
Madhya Pradesh	0.2222	19
Meghalaya	0.3927	13
Maharashtra	0.6022	04
Orissa	0.2569	17
Punjab	0.6319	03
Sikkim	0.4158	11
Rajasthan	0.2583	16
Tripura	0.3744	14
Tamil Nadu	0.5608	05
Uttar Pradesh	0.2016	20
West Bengal	0.3993	12

Source: Author's calculations.

Table further shows that Bihar has the lowest composite development index (0.1439). Other states having low value of index, (but more than Bihar) were Arunachal Pradesh (0.1757), Uttar Pradesh (0.2016), Madhya Pradesh (0.2222), Assam (0.2496) and Orissa (0.2569). These states are less developed as per this composite index.

The results of factor analysis of selected variables for 22 states for the year 1991 are presented in the table 3. Table shows that five factors derived from 18 indicators under consideration explain 84.50 per cent inter-state variations. The communalities for these factors vary between 72.8 per cent and 95.6 per cent. The first factor ( $F_1$ ) explains 43.41 per cent of variations in the variable set. Upper primary gross enrolment ratio, adult literacy rate, primary gross enrolment ratio, female literacy rate, households with access to electricity, per capita net state domestic product, infant mortality rate, population below poverty line, crude death rate, primary drop-out rate, urban population as percentage of total population and per capita consumption of electricity are the important indicators of first factor.

The second factor ( $F_2$ ) explains 17.31 per cent of variations in the variable set, having primary pupil teacher ratio, upper primary pupil teacher ratio and secondary pupil teacher ratio as important indicators.

Households with access to safe drinking water constitute the third factor ( $F_3$ ), which explains 11.42 per cent of variation. The fourth factor ( $F_4$ ) explains 6.69 per cent of the variations with percentage share of services in NSDP as an important factor. The fifth factor ( $F_5$ ) explains 5.67 per cent of the variations in the variable set which is based on percentage share of industry in NSDP.

**Table 3 - Results of Factor Analysis for the Year 1991**

S. No	Variables	Factor Loadings					Communalities	Weights	Wt in %
		Factor-1 F1	Factor-2 F2	Factor-3 F3	Factor-4 F4	Factor-5 F5			
		1	2	3	4	5			
1.	PCNSDP	<b>.793</b>	-.159	.389	-.106	.147	.839	0.3443	7.61
2.	Adult Literacy Rate	<b>.903</b>	.200	-.226	-.114	-.094	.929	0.3920	8.66
3.	Female Literacy Rate	<b>.884</b>	.254	-.257	-.110	-.119	.938	0.3838	8.48
4.	Primary Gross Enrolment Ratio	<b>.888</b>	-.118	-.055	-.246	-.160	.891	0.3855	8.52
5.	Upper Primary Gross Enrolment Ratio	<b>.916</b>	.238	.066	-.201	-.124	.956	0.3977	8.79
6.	Primary Drop-out Rate	<b>.683</b>	-.245	-.253	-.512	.020	.853	0.2965	6.55
7.	Population Below Poverty Line	<b>.730</b>	-.306	.230	.243	.055	.742	0.3169	7.00
8.	Households with Access to Electricity	<b>.815</b>	-.217	.447	.001	-.027	.911	0.3538	7.82
9.	Infant Mortality Rate	<b>.768</b>	.219	-.172	.302	-.306	.852	0.3334	7.37
10.	Crude Death Rate	<b>.716</b>	.230	-.202	.407	-.236	.828	0.3108	6.87
11.	Urban Population	<b>.594</b>	-.503	-.257	.405	.203	.877	0.2579	5.70
12.	Per Capita Consumption of Electricity	<b>.563</b>	-.671	.208	.086	.155	.842	0.2444	5.40
13.	Primary Pupil Teacher Ratio	.464	<b>.763</b>	.250	-.056	.147	.885	0.1321	2.92
14.	Upper Primary Pupil Teacher Ratio	.208	<b>.768</b>	.309	-.028	.175	.760	0.1329	2.94
15.	Secondary Pupil Teacher Ratio	.059	<b>.660</b>	.266	.459	.089	.728	0.1143	2.52
16.	Households with Access to Safe Drinking Water	-.028	-.536	<b>.626</b>	.200	-.339	.835	0.0715	1.58
17.	Share of Services	.183	-.106	-.811	<b>.252</b>	.172	.796	0.0169	0.37
18.	Share of Industry	.477	-.060	.072	.020	<b>.716</b>	.749	0.0406	0.90
	Eigen Values	7.814	3.116	2.056	1.204	1.021		4.5253	
	% age Variance Explained	43.413	17.311	11.4211	6.691	5.672			
	Cum % age Variance Explained	43.413	60.723	72.144	78.835	84.508			

Source: Author's calculations.

## COMPOSITE DEVELOPMENT INDEX (1991)

Composite development index has been developed on the basis of the 18 selected indicators by using weights calculated from all the 'principal components' for 22 states for the year 1991 and resulting ranks of states are presented in the table 4.

Table 4 shows that the value of index varies within the range of 0.1326 to 0.8441. Goa was at the top with highest value (0.8441) of composite development index among 22 states for which analysis has been undertaken. Other states which followed Goa were Kerala (0.7599), Punjab (0.6536), Maharashtra (0.5943), Himachal Pradesh (0.5671) and Haryana (0.5452).

Table further shows that Bihar has the lowest index of (0.1326). The states for which value of index was very low but more than Bihar were Uttar Pradesh (0.1917), Orissa (0.2362), Madhya Pradesh (0.2487), Rajasthan (0.2491) and Arunachal Pradesh (0.2582).

**Table 4 - Composite Development Index for the Year 1991**

States	Composite Development Index	Ranks
Andhra Pradesh	0.3503	13
Arunachal Pradesh	0.2582	17
Assam	0.2757	15
Bihar	0.1326	22
Goa	0.8441	01
Gujarat	0.5337	08
Himachal Pradesh	0.5671	05
Haryana	0.5452	06
Karnataka	0.4344	11
Kerala	0.7599	02
Manipur	0.4879	09
Madhya Pradesh	0.2487	19
Meghalaya	0.3485	14
Maharashtra	0.5943	04
Orissa	0.2362	20
Punjab	0.6536	03
Sikkim	0.4793	10
Rajasthan	0.2491	18
Tripura	0.3887	12
Tamil Nadu	0.5399	07
Uttar Pradesh	0.1917	21
West Bengal	0.2707	16

Source: Author's calculations.

The results of factor analysis for the year 2001 are presented in the table 5. The table shows that the five factors taken together explain 83.28 per cent of variations in the variable set. The communalities for all indicators varied between 53 per cent and 94.9 per cent. The first factor ( $F_1$ ) based on variables per capita net state domestic product, adult literacy rate, female literacy rate, primary pupil teacher ratio, upper primary pupil teacher ratio, secondary pupil teacher ratio, upper primary gross enrolment ratio, primary drop-out rate, population below poverty line, households with access to electricity, infant mortality rate and percentage share of industry in NSDP explains 41.19 per cent variations.



**Table 5 - Factor Analysis for year 2001**

S. No.	Variables	Factor Loadings					Communalities	weights	Wt in %
		Factor-1 F1	Factor-2 F2	Factor-3 F3	Factor-4 F4	Factor-5 F5			
		1	2	3	4	5			
1.	PCNSDP	<b>.847</b>	.281	-.227	-.132	-.048	.868	0.3489	8.51
2.	Adult Literacy Rate	<b>.881</b>	-.008	.335	.108	-.158	.925	0.3629	8.86
3.	Female Literacy Rate	<b>.873</b>	-.105	.362	.051	-.181	.940	0.3596	8.78
4.	Primary Pupil Teacher Ratio	<b>.647</b>	-.557	-.109	-.037	-.104	.752	0.2665	6.50
5.	Upper Primary Pupil Teacher Ratio	<b>.613</b>	-.517	-.385	-.111	-.213	.848	0.2525	6.16
6.	Secondary Pupil Teacher Ratio	<b>.268</b>	-.679	-.441	.243	-.045	.788	0.1104	2.69
7.	Upper Primary Gross Enrolment Ratio	<b>.760</b>	-.148	.208	.352	.214	.812	0.3131	7.64
8.	Primary Drop-out Rate	<b>.765</b>	.370	.151	.109	-.210	.801	0.3152	7.69
9.	Population Below Poverty Line	<b>.691</b>	-.090	-.085	-.118	.149	.530	0.2847	6.95
10.	Households with Access to Electricity	<b>.824</b>	.250	-.255	.084	.253	.877	0.3395	8.28
11.	Infant Mortality Rate	<b>.708</b>	-.226	.399	-.399	.168	.899	0.2917	7.12
12.	Share of Industry	<b>.746</b>	.034	-.452	.160	-.008	.788	0.3073	7.50
13.	Households with Access to Safe Drinking Water	-.196	<b>.700</b>	-.395	-.192	.346	.841	0.1204	2.94
14.	Urban Population	.567	<b>.665</b>	.052	.135	.020	.785	0.1144	2.79
15.	Per Capita Consumption of Electricity	.530	<b>.708</b>	-.227	.162	.017	.861	0.1218	2.97
16.	Share of Services	.005	.243	<b>.846</b>	.076	-.109	.792	0.1012	2.47
17.	Primary Gross Enrolment Ratio	-.253	-.291	.157	<b>.726</b>	.483	.935	0.0499	1.22
18.	Crude Death Rate	.459	-.328	.228	-.420	<b>.634</b>	.949	0.0384	0.94
	Eigen Values	7.415	3.095	2.153	1.238	1.090		4.0984	
	% age Variance Explained	41.197	17.197	11.963	6.876	6.055			
	Cum % age Variance Explained	41.197	58.394	70.356	77.232	83.287			

Results of Factor Analysis for the Year 2001

Source: Author's calculations.

Households with access to safe drinking water, urban population as percentage of total population and per capita consumption of electricity constitutes the second factor ( $F_2$ ), which explains 17.19 per cent of variations in the variable set.

The third factor ( $F_3$ ) based on percentage share of services in NSDP explains 11.96 per cent of variations in the variable set. The fourth factor ( $F_4$ ) explains 6.87 per cent variations with primary gross enrolment ratio. The fifth factor ( $F_5$ ) which explains 6 per cent variations in the variable set is based on crude death rate.

### Composite Development Index (2001)

Composite development index based on the weights derived from the factor analysis and the resulting ranks of 22 states for the year 2001 are presented in the table 6. The table shows that Goa (0.8476) was at the top position followed by Kerala (0.7422), Himachal Pradesh (0.6876), Maharashtra (0.6404), Punjab (0.6272) and Tamil Nadu (0.6233). The table further shows that Bihar (0.0944) was at the bottom, while Uttar Pradesh (0.2683), Orissa (0.3109), Rajasthan (0.3644), West Bengal (0.3812), Assam (0.3887) and Madhya Pradesh (0.4055) slightly better placed than Bihar.

**Table 6- Composite Development Index for the Year 2001**

States	Composite Development Index	Ranks
Andhra Pradesh	0.4292	15
Arunachal Pradesh	0.4398	14
Assam	0.3887	17
Bihar	0.0944	22
Goa	0.8476	01
Gujarat	0.5361	11
Himachal Pradesh	0.6876	03
Haryana	0.5676	07
Karnataka	0.5473	10
Kerala	0.7422	02
Manipur	0.5657	08
Madhya Pradesh	0.4055	16
Meghalaya	0.4767	13
Maharashtra	0.6404	04
Orissa	0.3109	20
Punjab	0.6272	05
Sikkim	0.5519	09
Rajasthan	0.3644	19
Tripura	0.4911	12
Tamil Nadu	0.6233	06
Uttar Pradesh	0.2683	21
West Bengal	0.3812	18

Source: Author's calculations.

**Table 7 - Results of Factor Analysis for the Year 2011**

S. No.	Variables	Factor Loadings				Communalities	weights	Wt in %
		Factor-1 F1	Factor-2 F2	Factor-3 F3	Factor-4 F4			
		1	2	3	4			
1.	PCNSDP	<b>.847</b>	-.206	.215	.150	.829	0.3530	8.06
2.	Adult Literacy Rate	<b>.804</b>	-.039	-.451	.063	.855	0.3350	7.65
3.	Female Literacy Rate	<b>.767</b>	-.139	-.340	-.195	.761	0.3196	7.30
4.	Primary Pupil Teacher Ratio	<b>.762</b>	.282	-.061	-.219	.712	0.3175	7.25
5.	Secondary Pupil Teacher Ratio	<b>.652</b>	.456	.056	-.463	.851	0.2717	6.21
6.	Upper Primary Gross Enrolment Ratio	<b>.589</b>	.203	-.197	.129	.444	0.2454	5.61
7.	Primary Drop-out Rate	<b>.740</b>	-.473	.018	.007	.772	0.3084	7.04
8.	Population Below Poverty Line	<b>.847</b>	-.103	.106	-.248	.800	0.3530	8.06
9.	Households with Access to Electricity	<b>.908</b>	-.059	.192	-.014	.864	0.3784	8.64
10.	Infant Mortality Rate	<b>.715</b>	.084	-.345	.523	.911	0.2980	6.81
11.	Urban Population	<b>.669</b>	-.421	-.071	.330	.738	0.2788	6.37
12.	Per Capita Consumption of Electricity	<b>.655</b>	-.369	.572	-.008	.892	0.2730	6.24
13.	Share of Industry	<b>.567</b>	.478	.503	.178	.835	0.2363	5.40
14.	Share of Services	<b>-.017</b>	-.772	-.536	-.156	.908	0.0071	0.16
15.	Upper Primary Pupil Teacher Ratio	.521	<b>.578</b>	.034	-.490	.847	0.1065	2.43
16.	Primary Gross Enrolment Ratio	-.163	<b>.857</b>	.000	.201	.801	0.1580	3.61
17.	Households with Access to Safe Drinking Water	-.076	-.470	<b>.736</b>	.196	.807	0.0825	1.88
18.	Crude Death Rate	.305	.505	-.151	<b>.634</b>	.772	0.0551	
	Eigen Values	7.501	3.318	2.017	1.565		4.3772	
	% age Variance Explained	41.672	18.432	11.203	8.694			
	Cum % age Variance Explained	41.672	60.104	71.307	80.001			

Source: Author's calculations.

Table 7 reveals the results of factor analysis for the year 2011 for 22 states. The table shows that the four factors under consideration explain 80 per cent variations in the variable set. The

communalities for all factors varied between 44.4 and 91.1percent in the variable set.

The first factor ( $F_1$ ) explains 41.67 per cent variations in the variable set. The most important indicators in this factor are households with access to electricity followed by per capita net state domestic product, population below poverty line, adult literacy rate, female literacy rate, primary pupil teacher ratio, primary drop-out rate, infant mortality rate, urban population as percentage of total population, per capita consumption of electricity and secondary pupil teacher ratio. The other important indicators are upper primary gross enrolment ratio, percentage share of industry in NSDP and percentage share of services in NSDP.

The second factor ( $F_2$ ) which explains 18.43 per cent variations includes indicators like upper primary pupil teacher ratio and primary gross enrolment ratio.

Households with access to safe drinking water constitute the third factor ( $F_3$ ) which explains 11.20 per cent variations in the variable set. The fourth factor ( $F_4$ ) explains 8.69 per cent variations in the variable set. The only important indicator in this set is crude death rate.

## Composite Development Index (2011)

**Table 8 - Composite Development Index for the Year 2011**

States	Composite Development Index	Ranks
Andhra Pradesh	0.4713	14
Arunachal Pradesh	0.4776	13
Assam	0.2882	20
Bihar	0.0913	22
Goa	0.8446	01
Gujarat	0.5255	11
Himachal Pradesh	0.6899	04
Haryana	0.5420	10
Karnataka	0.5586	09
Kerala	0.7153	02
Manipur	0.4791	12
Madhya Pradesh	0.3749	17
Meghalaya	0.4369	15
Maharashtra	0.6015	07
Orissa	0.3476	19
Punjab	0.6574	06
Sikkim	0.6929	03
Rajasthan	0.3528	18
Tripura	0.5777	08
Tamil Nadu	0.6619	05
Uttar Pradesh	0.1840	21
West Bengal	0.4027	16

Source: Author's calculations.

Composite development index has been developed on the basis of 18 indicators by using weights calculated on the basis of factor analysis for 22 states and the resulting rank of states for the year 2011 are presented in the table 8.

The table shows that the index varies between 0.0913 and 0.8446. Goa occupies the top position

with highest value (0.8446), followed by Kerala (0.7153), Sikkim (0.6929), Himachal Pradesh (0.6899), Tamil Nadu (0.6619) and Punjab (0.6574). Bihar with index value (0.0913) lies at the bottom with Uttar Pradesh (0.1840), Assam (0.2882), Orissa (0.3476), Rajasthan (0.3528) and Madhya Pradesh (0.3749) slightly better placed.

## Convergence-Divergence

This section examines the trend of inequality in various indicators across states over the period of time, for which coefficient of variation as a measure of convergence has been applied.

**Table 9- Convergence/Divergence in Various Indicators for 22 states**

S. No.	Variables	1981			1991			2001			2011		
		Mean	S.D.	C.V. (%)	Mean	S.D.	C.V. (%)	Mean	S.D.	C.V. (%)	Mean	S.D.	C.V. (%)
1.	PCNSDP	11775.32	3623.77	30.77	16128.41	5972.18	37.03	23231.65	10734.84	46.21	43567.76	22090.81	50.70
2.	Adult Literacy Rate	43.76	12.76	29.16	55.52	12.42	22.37	67.51	9.53	14.12	76.88	7.65	9.95
3.	Female Literacy Rate	33.17	14.34	43.24	43.90	14.85	33.83	58.02	11.73	20.21	69.34	10.94	15.78
4.	Primary Pupil Teacher Ratio	37.00	8.12	21.96	38.45	11.92	30.99	38.50	14.30	37.13	34.62	18.49	53.41
5.	Upper Primary Pupil Teacher Ratio	29.32	8.77	29.91	32.43	12.26	37.80	29.41	11.25	38.25	30.59	15.92	52.06
6.	Secondary Pupil Teacher Ratio	26.38	4.41	16.72	29.14	9.73	33.40	29.77	9.88	33.17	29.14	14.97	51.37
7.	Primary Gross Enrolment Ratio	52.10	15.58	29.91	56.20	16.17	28.77	99.56	17.81	17.89	123.60	31.55	25.52
8.	Upper Primary Gross Enrolment Ratio	54.74	12.93	23.61	67.20	12.08	17.97	68.01	16.94	24.91	90.39	13.01	14.39
9.	Primary Drop-out Rate	52.85	18.51	35.02	40.16	21.08	52.49	35.35	18.84	53.29	20.58	20.77	100.93
10.	Percentage of Population Below Poverty Line	39.04	13.39	34.29	33.61	10.40	30.96	33.39	10.56	31.64	25.02	12.03	48.09
11.	Households with Access to Safe Drinking Water	36.46	18.03	49.45	58.85	18.09	30.74	71.78	19.32	26.91	79.66	17.80	22.35
12.	Households With Access to Electricity	30.00	15.92	53.06	48.55	21.70	44.70	61.29	24.49	39.96	72.89	23.62	32.40
13.	Infant Mortality Rate	89.68	31.43	35.05	70.45	24.40	34.64	54.68	21.44	39.20	36.68	15.18	41.39
14.	Crude Death Rate	11.09	3.07	27.73	9.23	2.21	23.94	7.67	1.52	19.85	6.78	1.05	15.50
15.	Urban Population	20.79	8.59	41.34	23.13	9.57	41.40	25.56	11.20	43.83	30.61	13.28	43.38
16.	Per Capita Consumption of Electricity	127.08	88.88	69.94	254.41	160.53	63.10	369.91	245.35	66.33	838.16	516.40	61.61
17.	Share of Industry	21.03	6.75	32.10	23.09	7.23	31.32	24.97	6.85	27.45	28.01	8.23	29.40
18.	Share of Services	34.49	5.63	16.33	40.63	5.61	13.80	48.36	6.90	14.27	53.97	8.59	15.92

Source: Author's calculations.

Coefficients of variation of indicators have been worked out across states at four points of time 1981, 1991, 2001 and 2011 and are presented in the table 9. Table reveals that the coefficients of variation of indicators like per capita net state domestic product, primary pupil teacher ratio, upper primary pupil teacher ratio, secondary pupil teacher ratio, primary drop-out rate, percentage of population below poverty line, infant mortality rate and urban population as percentage of total population is increasing over the period 1981 to 2011, which indicates that the gap between the states has been widening in respect of these indicators. Whereas, the coefficients of variation in respect of adult literacy rate, female literacy rate, primary gross enrolment ratio, upper primary gross enrolment ratio, household with access to safe drinking water, household with access to electricity, crude death rate, per capita consumption of electricity, percentage share of industry in NSDP and percentage share of services in NSDP has declined over the period, revealing convergence across states from 1981 to 2011 in respect of these indicators.

**Table 10 - Convergence/Divergence in Composite Development Index**

Variables	1981			1991			2001			2011		
	Mean	S.D.	C.V. (%)	Mean	S.D.	C.V. (%)	Mean	S.D.	C.V. (%)	Mean	S.D.	C.V. (%)
<b>22 States</b>	0.4179	0.1871	44.7749	0.4268	0.1902	44.5613	0.4994	0.1687	33.7846	0.4988	0.1824	36.5766

Source: Author's calculations.

The extent of convergence or divergence in respect of composite development index has been worked out and results are presented in the table 10. Table shows that the coefficient of variation remains more or less same from 1981 to 1991, but decreased to 33.78 per cent in 2001 from 44.56 per cent in 1991 indicating that the poor states are catching up with rich ones in terms of composite development index during this time period. However, study shows diverging tendencies across Indian states in terms of composite development index from 2001 to 2011.

## CONCLUSION

The study analyzes and compares the position of 22 Indian states for the year 1981, 1991, 2001 and 2011 by constructing composite development index on the basis of education, health, nutrition, sanitation and economic indicators. The results of the study shows that Goa was at the top during the year 1981 among 22 states followed by Kerala, Punjab, Maharashtra, Tamil Nadu and Himachal Pradesh. Bihar remained at the last position. In the year 1991, Goa again occupied the top position, followed by Kerala, Punjab, Maharashtra, Himachal Pradesh and Haryana. Bihar again remained at its lowest position. It is noted that the four states namely Goa, Kerala, Punjab and Maharashtra remained stick to its position by occupying 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> positions respectively during the year 1981 and 1991.

For the year 2001, Goa again was at the top most position followed by Kerala, Himachal Pradesh, Maharashtra, Punjab and Tamil Nadu. However, Punjab drifted from third position in 1991 to fifth in 2001. Bihar remained at the last position, while Uttar Pradesh, Orissa, Rajasthan, West Bengal, Assam and Madhya Pradesh slightly better placed than Bihar. The analysis for the year 2011 also found Goa at the first position, followed by Kerala, Sikkim, Himachal Pradesh, Tamil Nadu and Punjab. Bihar has the lowest index during 2011 also. It is also notable that Goa and Kerala were the only states which remained at 1<sup>st</sup> and 2<sup>nd</sup> positions respectively at four points of time. Punjab further drifted to 6<sup>th</sup> position in 2011 from 5<sup>th</sup> in 2001. Overall, the study concludes that not

much change has occurred in the ranks of the states, as the best performing states (like Goa, Kerala Maharashtra, Himachal Pradesh and Tamil Nadu) remains the best and the worst performing states (like Bihar, Madhya Pradesh, Orissa, Rajasthan and Uttar Pradesh) remains the worst. Furthermore, study reveals a clear evidence of an increasing trend in the regional disparity in per capita net state domestic product. This suggests that poor states have failed to catch up with rich ones in terms of per capita income. Thus there is a need for policy measures on the part of the poor states to improve their per capita income as other issues will be addressed automatically in order to catch up with rich ones.

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A Bi-annual Research Journal of Economics

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### ACKNOWLEDGEMENT

The journal acknowledges the financial assistance given by Indian Council of Social Science Research (ICSSR) New Delhi for publication of this journal.