DYNAMIC LINKS BETWEEN ECONOMY AND HUMAN DEVELOPMENT:

A STUDY OF INDIAN STATES

Abstract

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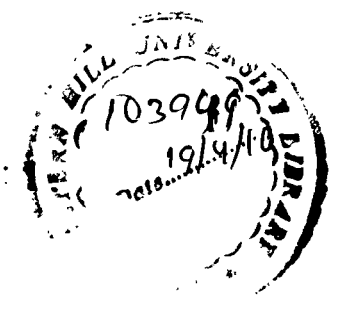

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Dynamic Links between Economy and Human Development: A Study of Indian States

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Abstract

Background: Economic growth, in recent development paradigm, has been identified as the necessary but not sufficient condition for the expansion of human capabilities. The new development paradigm has significantly advanced the thinking on development by focusing attention away from per capita income towards what people really value. Several attempts have been made so far to transfer the focus from economic indicator to human, social and political indicators. However, income and income growth over time still plays a crucial role in determining the levels of other attainments of human well-being. The relation between human development and growth is highly controversial. Although in cross-country scenario we find a positive relation between them there are evidences of exceptions in both directions. The academic literature hypothesises that there exists a two-way relationship between growth and human development. There are overwhelming empirical evidences which establish strongly that economic progress, if accomplished with appropriate public policy and strong social will, raises incomes of the poor which in turn reduces poverty; lowers down unemployment; reduces infant mortality; pulls up life expectancy which are taken as key issues of HD. On the other end, decent level of human development enriches the economy directly by expanding people's capacities, which in turn enhances efficiency and productivity of the individual as well as of the society as a whole. It is quite possible for the absence of income growth to steadily erode standards of HD; and without parallel expansion of HD, growth is not sustainable – offers only temporary gains.

Attempts have been made to explore the links between investment in human development and sustained economic growth. Strong complementarities between them emerge in advance studies. Two theoretical strands are often regarded in this context. First is the neoliberal approach of so-called *Washington Consensus* which has been encouraging economic growth as a prerequisite for investment in human development. They view that human development may be postponed until economic resource expansion makes it affordable. The other strand, developed under the leadership of Gustav Ranis of Yale University and Frances Stewart of Oxford University, view that a virtuous cycle can only be achieved through a consistent strategy of promoting both objectives simultaneously and supporting key issues such as female literacy, equity in income distribution and investment are taken care. The latter strand identifies a fundamental two-way links between economic growth and human development, suggesting that human development can be promoted directly or indirectly via policies and programmes which promote income growth. An economy may be on a mutually reinforcing upward spiral with high income levels leading to decent level of HD (Chain-A) and enhanced human capability in turn promoting further income growth (Chain-B).

Indian Perspective: Turning to the national context the Indian economy as a whole has been especially strong in the last two decades, with average national per capita income growing as rapidly as ever before. Although there has been mention worthy improvements in life expectancy, literacy rate, and other broad measures of well-being in the last few decades; they remains always unimpressive as compared to other developing nations. Moreover, it is commonly observed that Indian experiences imply a great deal of uneven expansion in both fields of development. One group of Indian states has been at the forefront of national growth; their economies are growing faster than national average. These forward states, on an average, are also performing better in noneconomic aspects of human well-being. On the contrary, other group of states, representing a significant share of national population, has grown at a slower rate. As a result, they are being continually left behind, and moving further away economically

from the former group of forward states in the country. Moreover, as a general trend the improvements in noneconomic aspects of human well-being in this economically backward group of states have been less impressive. For long-term sustainable development of a nation it is arguably important that all regions should grow at reasonably similar speed.

To address certain unavoidable questions with regard to Indian developmental pattern a disaggregated study is undertaken where achievements of the states in expanding economic opportunities as well as in enhancing human capabilities are documented empirically; the existing disparities in both these aspects are measured quantitatively. Further, the dynamic links between economic progress and HD are examined under the framework of new development paradigm. This study would be helpful not only to explore the national and state-wise failures in translating the achieved economic prosperity into parallel expansion of HD but also would be helpful in prioritizing the policies to achieve a balanced level of sustainable development. Further, the study of dynamic links between them across the states would motivate the policy-makers to draw long-term strategy to strengthen the links.

Structure of the Thesis: The thesis comprises of nine chapters. The first chapter being an introductory one introduces the research problem, and indicates the relevance and importance of the present work. Chapter II reviews the existing literature and identifies the gap areas in the relevant field. Chapter III set objectives, outlines the focused area and period of the study, sets hypotheses, identifies the indicators that are able to capture the explanatory variables and discusses their data sources. Chapter IV draws an illustrative description of three-decade trend of economic performance of the included states. Chapter V evaluates the levels of HD and examines the trend over the decades. Chapter VI enumerates the regional inequality and polarization for different years. It also presents a critical analysis of the evolution of inequality levels over the decades. Chapter VII captures the econometric relationship between economic prosperity and human development across included states over three decades. It classifies the states on

the basis of their performances in these two aspects. Chapter VIII tests the causality between economy and human development. Chapter IX contains a summary conclusion of the thesis and policy recommendations derived from the findings, and a discussion of some future research directions.

Objectives: The main objective of this study is to examine the strength of the links between economic performance and HD in Indian states for a reasonably long period. Specifically, the study seeks to

identify the trends in economic performance of Indian states over a reasonably long period of time;

identify the trends in human development across the states for the same period;

explore the causal relationship between economic prosperity and human development across Indian States; and

make policy recommendations based on the findings.

Focused Area and Period: Using disaggregated state-level data over a reasonably long period (1970-71 to 2000-01), this study intends to examine the interaction between economic performance and human development in Indian sub-national context. It narrows down the focus on those particular states of the country for which consistent time series data are available, and for which state boundaries remained unaltered during the study period. Considering these two important constraints the present study focuses its attention on 16 most populous states of the country which are commonly referred as *major Indian states*. The older boundaries of the States of Bihar, Madhya Pradesh and Uttar Pradesh are considered for the entire period of three decades i.e. three new states – Jharkhand, Chhattisgarh and Uttaranchal are taken in the study as part of Bihar, Madhya Pradesh and Uttar Pradesh respectively. Accordingly, the data of these newly created states are merged with their parent states to construct a comparable series for all the variables/indicators for the study period. The included states in the present study have a

combined population of 987.92 million, accounting for over 96 per cent of India's total population (Census 2001); and 2.87 million square kilometers, accounting for 87 per cent of India's total geographical area. The period of this study, however, covers three decades from 1970-71 to 2000-01which have been eventful in many ways. The decade of 1970s is in fact the final decade of the period known in the literature as the period of *Hindu Rate of Growth*. This decade was characterised by restrictions and commonly known as policy regime. The decade of 1980s witnessed a real economic acceleration for the first time in independent India and is known as the beginning of a new economic regime with a number of policies towards openness. Finally, in the decade of 1990s, the economy received a significant acceleration after wide-ranging reforms of economic policies. This decade is often accused of growing inequalities across the regions.

Hypothesis: To fulfill the study objectives we set the following hypotheses:

H_{01}: Real per capita income across included states diverges over time;

H_{02}: Levels of HD across included states diverge over time;

H_{03}: Levels of per capita income and HD are two independent events.

Data Sources and Methods: To explore the dynamic links between economy and HD a reliable dataset is our primary concern for a number of socio-economic indicators at sub-national levels. In this study we depend on secondary data, obtained from various national publications: Census of India, Central Statistical Organization (CSO), Ministry of Human Resources Development (MHRD), Planning Commission of India, Registrar General of India and others.

The effort in the study has been to address the intriguing questions: whether the economic growth, achieved by the states in the last three decades, has any significant influence to determine the present level of human development, and whether the levels of human development have been able to promote further economic opportunities. The study is conducted in few major steps:

First, the trends in economic performance and regional disparities across the included states over the study period are traced. We have a glance of overall national record in income generation since independence. The state level economic performances and possibility of income convergences during the study period of three decades (1970-71 – 2000-01) have been illustrated under the neoclassical framework of testing convergence hypothesis. The obtained trend of income convergence has been ratified further reviewing their ran-order stability over decades.

Second, the trend in the expansion of human capability across the states in last three decades is drawn. Following HDR (1999) methodology, HDI values for each of the included states are computed for four different years: 1971, '81, '91 and 2001 – each a decade apart. The obtained HDI values for each state have been strictly comparable to global perspective. The possibility of regional convergence in human development is examined. The analysis of state-wise performances in HDI-shortfall reduction further examines the converging trend of human development.

Third, applying a number of standard measures the trend in regional inequalities, dispersion and polarisation for all HDI indicators (economic as well as noneconomic) over the decades is empirically estimated. The evolution of these measures relative to their initial levels of early 1970s is studied to follow the economic interpretation of the trend.

Fourth, the interaction between economic performance and expansion of HD across the included states over the decades is studied under the existing framework of two-way relationship. Using the pooled data technique there is an attempt to examine the strength of two chains of transformation (i.e. from economy to HD, and from HD to economy) that actually operates in Indian sub-national context. The states are classified according to their performances in economic aspect and in the expansion of HD. The movement of the states from one quadrant to another over the decades is studied carefully to understand the dynamic nature of the causal relationship.

Finally, applying Granger-Causality Test the direction of causality between levels of income and that of HD has been explored. The model, specified for the test in Chain-A, postulates that the current level of HD is determined by the past levels of HD itself as well as by the past levels of income. To establish the influence of income on HD we should get that the coefficients of lagged values of income are statistically different from zero as a group. Similarly, in Chain-B the current level of income is determined by the past levels of income itself as well as by the past levels of HD. To establish the influence of HD on income we should get that the coefficients of lagged values of HD are statistically different from zero as a group. The tests are carried out for each of the constituent indicators of HDI i.e. life expectancy at birth, adult literacy rate and combined enrolment ratio as well as for the composite indices of NIHDI and HDI.

Results: Key findings of this study reveal that regional income disparity across the states has been rising very fast, and there is no sign of convergence over time. Levels of human development also suffer from acute regional variation. Although we obtain a converging trend of human development if the current trend of rising income disparity is not controlled divergence in HD is likely in future. Granger Causality Test results reveal that in general there is a bidirectional causal relationship between economic performance and human development. Both composite indices of HDI and NIHDI are found to be both-way related to per capita income level. In case of health attainment we find clear evidence of bidirectional causal relationship. Economically affluent states are better performer in health aspect, and states with higher life expectancy are likely to perform better in economic aspect. In case of educational attainments at most unidirectional causality is established. The adult literacy rate is found to be influenced clearly by income levels; however, combined enrolment ratio influences the latter. Economic prosperity encourages literacy while the reverse flow is not found significant. Combined enrolment ratio precedes income levels, but not influenced by income levels. As such Chain-B i.e. transformation from human development to economic prosperity has been found comparatively stronger than Chain-A.

Conclusion: The policy suggestions arising out of the present study intend primarily to draw an outline for evolving an inclusive & even as well as balanced & sustainable development path for India. For inclusive growth and even development it is important that all regions of the country should have similar expansions in economic attainment and human capability. In addition, the achieved level of development would be balanced and sustainable only when there is a strong feedback between economy and human development.

An unprecedented effort will be needed to halve the disturbing level of regional disparities in both income and non-income dimensions of human development. The present level of regional disparity, if not arrested and reversed fast, will have serious adverse implications for the national economy, society and polity. For evolving an inclusive development path it is important to review the disparities beyond the regional level – the existing level of disparities within a region needs to be addressed.

In Indian context, we find comparatively stronger existence of Chain-B i.e. the transformation from human capability to economic opportunities is more certain than the transformation from the economic opportunity to human capability. Therefore, we reject the strand of neoliberal paradigm of *Washington Consensus* which has been encouraging economic growth as a prerequisite for investment in human development and argues that human development may be postponed until economic resource expansion makes it affordable. Instead, we recommend a consistent strategy of promoting both objectives simultaneously, and supporting key issues such as social justice, female literacy, equity in income distribution and investment in education and heath sectors are taken care of. There are enough evidences that indicate clearly the two-way causal links between economic performance and human development. Therefore, a planned initiative is needed to improve the performances in both aspects of human well-being to achieve sustainable growth and even development.

Key Words: Human Development (HD), Human Development Index (HDI), Non-income Human Development Index (NIHDI), Economic Growth (EG).

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DECLARATION

I, Sri Santanu Ray, hereby declare that the subject matter of this thesis is the record of the work done by me, that the contents of this thesis did not form the basis of the award of any previous degree to me or to the best of my knowledge to anyone else, and that the thesis has not been submitted by me for any research degree in any other University/Institute.

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Abstract

Economic growth, in recent development paradigm, has been identified as the necessary but not sufficient condition for the expansion of human capabilities. Academic literature hypothesizes that there exists a two-way relationship between economic prosperity and human development. Growth, accompanied with appropriate public policy, raises income of the people which can reduce poverty, lower down unemployment, reduces infant mortality, increases life expectancy, educational attainments etc which are taken as essential ingredients of human development. On the other end, decent level of human development enriches the economy directly by expanding people's capacities, which in turn enhances efficiency and productivity of the individual as well as of the society as a whole. It is quite possible for the absence of income growth to steadily erode standards of human development; and without human development, growth is not sustainable and offers only temporary gains.

Indian economy has been especially strong in the last few decades, with average national per capita income growing as rapidly as ever before. However, expansion of human development is not satisfactory as compared to other nations of the developing world. Using disaggregated state-level data over a reasonably long period (1970-71 to 2000-01), this study examines the relationship between economic performance and human development in Indian sub-national context. The effort has been to address the intriguing questions: whether the economic growth, achieved by the states in the last three decades, has any significant influence to determine the present level of human development, and whether the levels of human development have been able to promote further economic opportunities. The study is conducted in three major steps: first the economic performances of each included state are evaluated. Second, HDI values for each of them are computed following HDR (1999) methodology so that they remain comparable to global standards. Finally, applying Granger-Causality Test the direction of causality between levels of income and human development across the states over a period of three decades has been explored.

Key findings of this study reveal that regional income disparity across the states has been rising very fast, and there is no sign of convergence over time. Levels of human development also suffer from acute regional variation. Although we obtain a converging trend of human development if the current trend of rising income disparity is not controlled divergence of human development is likely in future. Both chains of transformation are found to be operational in Indian sub-national context. However, as the chain of transformation from human development to economic prosperity is comparatively stronger than that of the other this study recommends a policy which emphasises the promotion of both aspects of development.

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Abbreviations

ALR	Adult Literacy Rate (%)
CER	Combined Gross Enrolment Ratio (%)
CSO	Central Statistical Organisation
DQI	Development Quality Index
EG	Economic Growth
EPWRF	Economic and Political Weekly Research Foundation
GDP	Gross Domestic Product
GNP	Gross National Product
HD	Human Development
HDI	Human Development Index
HDR	Human Development Report
ICP	International Comparison Program
MESW	Ministry of Education and Social Welfare
MHRD	Ministry of Human Resource Development
MSPI	Ministry of Statistics and Programme Implementation
NIHDI	Non-Income Human Development Index
NSDP	Net State Domestic Product
PCGDP	Per Capita Gross Domestic Product
PCGSDP	Per Capita Gross State Domestic Product
PCNSDP	Per Capita Net State Domestic Product
PPP	Purchasing Power Parity
PQLI	Physical Quality of Life Index
SCHAT	School Attendance Rate (%)
SDP	State Domestic Product
SHDR	State Human Development Report
TFP	Total Factor Productivity
WDI	World Development Indicator
UNDP	United Nations Development Program

Chapter – I

Introduction

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Introduction

1.1 Evolution in Development Discourse

Recent decades have witnessed intense debate over development thinking. The focus of development analysis in many ways has shifted away from the traditional foundations to people-oriented realities. The performance of an economy is traditionally assessed by the production of output and its growth over time. Economists of all ages, especially in the war-stricken world of 1940s, emphasized economic growth as an end in itself with the belief that growth does trickle down. Economic growth improves the quality of life of common people, at least in the long-run. However, the cross-country experiences for a period of over 50 years suggest that transformation of economic prosperity to the well-being of the people is not automatic. Serious inadequacy of Gross Domestic Product (GDP) and its growth over time as the yardstick for a country's developmental achievements has led to the search for composite measures of development which necessarily incorporate a number of dimensions of development process.

Several attempts have been made to capture the real developmental achievements of the nations which necessarily focus on the socioeconomic realities of the people. Morris (1979) developed his physical quality of life index (PQLI) which was constructed on a number of non-income socioeconomic indicators of countries – infant mortality, life expectancy and literacy. Later, a successful attempt in this direction was made by Dasgupta and Weale (1992). Streeten (1979) reported that the United Nations always emphasized on the socioeconomic levels, achieved by the countries. By 1970s, UN undertook a thorough study based on a very different development approach. According to which developing countries should satisfy some basic needs through public policies. Subsequent theoretical contributions have been made by Paul Streeten, Amartya Sen and others. In 1990 United Nations Development Programme (UNDP) published its first Human Development Report (HDR) where a comprehensive developmental framework

was presented. Haq (1995: 20) argues that this framework covers all aspects of development- whether economic, international trade, budget deficit, fiscal policy, savings, investment in basic technology, social services or safety nets for the poor. No aspect of development model falls outside its scope, but the vantage point is the widening of people's choices and enrichment of their lives. All aspects of life – economic, political or cultural – are viewed from that perspective.

The concept of Human Development (HD) has become an important development paradigm of our time. The attempt in this approach is to put people back in the centre of the discussions, and actions related to economic and social policies. The paradigm is based on the broadest possible definition of development '*....a process of expanding real freedoms that people enjoy for their economic wellbeing, social opportunities and political rights...*' Sen (1999). These freedoms are not just constitutive as the primary ends of development; they are also instrumental as the principal means of attaining development. The new paradigm, hence, has significantly advanced the thinking on development by focusing attention away from per capita GDP towards what people really value.

The intellectual antecedent of this development paradigm may be traced into the capability approach which is an evaluative framework for individual welfare and social states. This new paradigm shares few ideas of earlier people-oriented approaches (e.g. Basic Needs Approach, Human Capital/Human Resource Development Approach) that investing in people's education and health is a powerful means to achieve overall economic and social progress. However, the new paradigm of HD goes much further in many ways. The most important among them are in its concern with the role of human agency for changing policy, social norms etc which require collective action, and in its concern with human rights (Fukuda-Parr, 2003).

Dissatisfied with any measure of income as a sufficient measure of human well-being, a number of alternative measures have been proposed in the last few decades. Human Development Index (HDI), formulated by UNDP, has perhaps been the best-known and well-accepted composite index of human well-being. The composite index is based on the premise that human beings strive to lead a long healthy life, to acquire

knowledge and to have a decent standard of living. Hence, the focus on development policy should be on the expansion of capabilities of people in these areas. UNDP's effort to measure HD through HDI is often taken as an example of operationalisation of Amartya Sen's Capability Approach. HDI measures capabilities in terms of life expectancy, educational attainments and income – three choices of human well-being that are referred to as *most critical* in HD literature (HDR, 1990). Additional choices such as political participation, guaranteed human rights, self respect, role of human agency in enhancing real freedoms etc are not reflected in HDI. Neff (2007) regards HDI as a pragmatic approach which avoids measuring levels of achievements (or functionings) as a measure of well-being due to the practical difficulties of doing so. Of course, the income component of HDI has often been taken as a proxy of functioning.

Human development paradigm has significantly advanced the thinking on development by focusing attention away from per capita GDP towards what people really value. Several attempts have been made so far to transform the focus from economic indicator to human, social and political indicators (Streeten, 1995). However, income and its growth over time still play a crucial role in determining the levels of other attainments of human well-being. The relation between HD and growth is highly controversial (Tridico, 2007). Although in cross-country scenario we find a positive relation between them there are evidences of exceptions in both directions. Countries like Cuba and other few Latin American countries experienced a stable or improved level of HD together with economic decline. On the contrary, there are evidences of the countries like Botswana where good economic performance coincides with a reduction of HD levels. HDR (1996) describes economic growth as a necessary but not sufficient condition for the enhancement of HD. The academic literature hypothesizes that there exists a two-way relationship between growth and HD. There are overwhelming empirical evidences which establish strongly that economic progress, if accomplished with appropriate public policy and strong social will, raises incomes of the poor which in turn reduces poverty, lowers down unemployment, reduces infant mortality, pulls up life expectancy which are taken as the key issues of human development.

Attempts have been made to explore the links between investment in HD and sustained economic growth (EG). Strong complementarities between them emerge in advanced studies (Muysken et al., 2003). Two theoretical strands are often regarded in this context. First is the strand of neoliberal paradigm of so-called *Washington Consensus* which has been encouraging EG as a prerequisite for investment in HD. They view that HD may be postponed until economic resource expansion makes it affordable (Willamson, 1993; World Bank, 1995; Ravallion, 1997). The other strand, originated from Ramirez et al. (1998), White (1999), Ranis et al. (2000), Boozer et al. (2003) and advanced by Ranis and Stewart (2005) and Mabsout (2006), strongly view that a virtuous cycle can only be achieved through a consistent strategy of promoting both objectives simultaneously and supporting key issues such as social expenditure, female literacy, equity in income distribution and investment are taken care. The latter strand identifies a fundamental two-way links between EG and HD, suggesting that HD can be enhanced directly or indirectly via policies and programmes which promote income growth. It is quite possible for the absence of income growth to steadily erode standards of HD. In addition, none of the economies with economic growth-lopsided realities moved to virtuous spiral. Quite clearly, without HD, growth is not sustainable and offers only temporary gains.

Economic prosperity of a nation, if accomplished with reasonably fair distributional justices, contributes to HD through household activities and government actions, community organizations and non-governmental organizations. There are evidences that same income level for different economies may result very differently in the achievement of HD depending upon the nature of public action and consequent social responses. In general, as incomes of low-income groups rise, spending on food, education and health increases, which in due course, is likely to enhance HD. In addition, with better economic performance government enjoys better opportunities to allocate resources in the sectors that directly and indirectly help to evolve sustainable HD. Turning to the other chain in which HD promotes EG, decent level of HD enriches the economy directly by expanding people's capacities which in turn enhances efficiency and productivity of the individual as well as of the society as a whole. Healthy and properly

nourished, educated people with a decent level of self respect can contribute more effectively to economic operations - not only through improved productivity, better technology, increased ability of attracting foreign capital and promoting exports - they, according to recent empirical evidences, have a crucial role in determining the distributional patterns of income and wealth (Gylfason, 1999: 101-105 and Schaper, 2003). The level of HD has bearing on the quantity and quality of investment, overall policy environment etc.

1.2 Indian Experience

Turning to the national context the Indian economy as a whole has been especially strong in the last two decades, with average national per capita income growing as rapidly as ever before. Although there has been mention worthy improvements in life expectancy, literacy rate, and other broad measures of well-being in the last few decades; the expansion in these areas is less impressive as compared to other developing nations. Moreover, it is commonly observed that Indian experiences imply a great deal of uneven expansion in both fields of development. One group of Indian states has been at the forefront of national growth; their economies are growing faster than national average. These forward states, on an average, are also performing better in noneconomic aspects of human well-being, including life expectancy, literacy rate, poverty reduction etc. These achievements altogether place them in comparatively higher levels of HD, measured by the new yardstick of HDI. On the contrary, another group of states, representing a significant share of national population, has undoubtedly grown in this period, but at a slower rate as compared to the national average. As a result, they are being continually left behind, and moving further away economically from the former group of forward states in the country. Moreover, as a general trend the improvements in other noneconomic aspects of human well-being in this economically backward group of states have been less impressive. For long-term sustainable development of a nation as a whole it is arguably important that all regions should grow at reasonably similar speed.

Indian performance in the last four decades is classified into vicious cycle mode with a slight inclination towards economic development-lopsided reality during 1980s.

'...India – remains in the weak links quadrant with low human development and low growth during the 1960s and 1970s. It moves to lopsided development in 1980-92 as growth accelerates while progress in human development remains slow'.

(HDR, 1996: 81).

India belongs to the group of countries, characterized by weak social development indications. Abject poverty and malnourished children, low rate of literacy and high rate of out-of-school children, poorer social and economic indicators for women, girls and members of low-caste and tribal population are the features that always blur Indian economic achievements. Moreover, the quality of life has become increasingly uneven across the states. The chance of being born in one state in India rather than another pervasively determines the chances of life, literacy, economic opportunities etc. For example, a child born in Kollam or Alappuzha District of Kerala has a life expectancy at birth of 77.1 years (SDHR-Kerala, 2005); few years less than that of the top three countries in the world in order of HDI value (HDR, 2005). On the contrary, a child born in Kurung Kumey District of Arunachal Pradesh has a life expectancy at birth of 42.5 (SDHR-Arunachal Pradesh, 2005) – very close to that of the bottom three countries in the world. More surprisingly, Arunachal Pradesh consistently enjoyed much higher per capita NSDP during 1990s as compared to Kerala. Besides per capita public spending on health in Arunachal Pradesh ranges from 3.5 times in early 1990s to 5.5 times in late 1990s of Kerala (Planning Commission, 2002: 146 and 291).

Sluggish rate of progress in HD is a serious concern, but disparity in levels of living across the states is more serious concern than any thing else. This has been repeatedly pointed out by several organizations.

'..... *Their* (China and India) *successes in advancing average well-being imply major improvements for a large portion of humanity. But their experiences also point to the importance of looking beyond national averages to understand differences within the countries.'*

HDR (2003:73)

The average performance of a nation depends on the different levels of performances at the regional/sub-national levels. However, national averages tend to

mask wide variations between regions. For a long-term sustainable development it is important that all regions should grow at reasonably similar speed. Therefore, a study with exclusive focus at state level variations needs to be undertaken to explore how the states differ in terms of income as well as in human development and in addition, how strong the relationship between these two aspects over time.

1.3 Research Question

Recent Indian development trajectory has raised certain questions with regards to acute unevenness in developmental achievements. In the light of increasing interest on the two-way links between the economic performance and human development, Indian states are chosen in the present study to examine the links and to find suitable answers to a set of holistic questions that are often raised in the recent times in the context of India:

- whether India's economic acceleration implies any indication of similar economic opportunities for all regions in future;
- whether expansion of human capability across regions is potential enough to converge over time;
- whether expansion of economic opportunity and enhancement of human capability in India's sub-national levels indicate any causal relationship between them.

To address these questions a disaggregated study needs to be undertaken where achievements of the states in expanding economic opportunities as well as in enhancing human capabilities are documented empirically; the existing disparities in both these aspects are measured quantitatively. Further, the dynamic links between economic progress and HD are to be examined under the framework of new development paradigm. This study would be helpful not only to explore the national and state-wise failures in translating the achieved economic prosperity into parallel expansion of HD but also would be helpful in prioritizing the policies to achieve a balanced level of sustainable development. Further, the study of dynamic links between them across the states would motivate the policy-makers to draw long-term strategy to strengthen the link.

1.4 Thesis Organization

The thesis comprises of nine chapters and two appendices. After the introductory chapter which indicates the relevance and importance of the present work the remaining chapters are organized as follows:

- ❖ Chapter II reviews the existing literature and identifies the gap areas in the relevant field.
- ❖ Chapter III presents the research design with which the present study is carried out. It sets the objectives, outlines the focused area and period of the study, sets hypotheses, identifies the indicators that are able to capture the explanatory variables and discusses their data sources.
- ❖ Chapter IV draws an illustrative description of three-decade trend of economic performance of the included states. It tests the hypothesis of regional income convergence over a period from 1970-71 to 2000-01.
- ❖ Chapter V evaluates the levels of HD using the latest UNDP methodology. The HDI for all included states and for the country as a whole have been computed for four different years: 1971, 1981, 1991 and 2001. This chapter tests the hypothesis of convergence in HD across the states.
- ❖ Chapter VI enumerates the regional inequality and polarization for four different years. It also presents a critical analysis of the evolution of inequality levels over the decades.
- ❖ Chapter VII captures the econometric relationship between economic prosperity and human development across included states over three decades. It also classifies the states on the basis of their performances in these two aspects.
- ❖ Chapter VIII tests the hypothesis of causal relationship between economy and human development.
- ❖ Chapter IX contains a summary conclusion of the thesis and policy recommendations derived from the findings, and a discussion of some future research directions.

- ➢ Appendix A.1 provides the notes on the statistical tools and mathematical formulations employed in this work.
- ➢ Appendix A.2 provides Supplementary Statistical Tables, elaborated in the work.

Chapter – II

Review of Literature

Chapter – II

Review of Literature

The present study intends to correlate economic performance and human development in Indian sub-national context. Review of existing literature, therefore, needs to cover three distinct but interrelated issues: record of income-generation and growth estimates of Indian states for the past few decades; estimates of capability expansion across the states for different periods; and finally, the two way links between economic achievements and HD in global and national perspective.

2.1 Literature on Growth Empirics

There is a rich literature analyzing growth experience of Indian state in the last few decades. Most of these researches have a common objective of examining so-called convergence theorem which postulates that when growth rate of an economy accelerates, initially some regions with better resources and infrastructure grow faster than others. However, with the passage of time the law of diminishing returns applies and growth rates across region converge in the long run [Barro (1991); Barro and Sala-i-Martin (1995)]. Several attempts have so far been made to examine the possibility of convergence across Indian States.

Two early studies of Dholakia (1994) and Cashin and Sahay (1996) observed the tendency of convergence of long-run economic growth rates for Indian states. Aiyar (2001) studies interstate growth differentials and the evidences pointing to a widening of per capita income gaps. The lack of convergence across Indian states is partly determined by the differences in literacy and private investment rates. For him, education and investment helped immensely to reduce cross-state income divergence.

A number of studies have opposed these findings of interstate income convergence. The preliminary study of Margit and Mitra (1996) observes that Indian states show a trend of divergence in terms of per capita income. Ghosh et al. (1998) test the hypothesis of absolute convergence for 26 states for a period from 1960-61 to 1994-

95. They found that the dispersion of per capita state domestic product declined marginally during 1960s and 1970s, however, increased steadily after 1981-82 – thereby indicating absolute divergence. Nagaraj et al. (1998) examine the issue of convergence and long-run growth trends. They use fixed effects estimation, but do not address the issue of parameter heterogeneity. Rao et al. (1999) found that per capita income trends across Indian states show a tendency to diverge as growth and initial level of income are positively associated. This phenomenon has received further momentum in post reform era of 1990s. Dasgupta et al. (2000) confirm this tendency of divergence during the period 1960-95 so far as per capita income is concerned, but of convergence in shares of different sectors in state domestic product. Kurian (2000) reports widening regional disparities across the states and a clear dichotomy between the forward and backward states. The forward group of states consists of Andhra Pradesh, Gujarat, Haryana, Karnataka, Kerala, Maharashtra, Punjab and Tamil Nadu while backward group of states consists of Assam, Bihar, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh and West Bengal. The forward states are not only better off in per capita income levels – they have better infrastructure, higher resource flows and even brighter social and demographic indicators. From slightly different angle Ahluwalia (2000) points out that not all richer states (e.g. Punjab and Haryana) got richer relative to poorer states. In contrast, two poorer states Rajasthan and Madhya Pradesh performed comparatively better in the post-reform decade of 1990s. Using panel data technique Das (2002) verifies the *convergence hypothesis* for Indian states via factor pricing (wages in agricultural sector) rather than per capita Net State Domestic Product (NSDP). The 14 major states of India are classified in the study into three categories viz. high, middle and low income group states. The panel estimates of convergence are computed for each category of states. All the categories of states show indication of convergence, however, the convergence rate is highest in the low income group of states, followed by middle and high income groups. Steady state values for low and middle income states are found to be negative, indicating that in a steady state the low and middle income states grow at a lower rate than the national average.

Emphasizing on growth empirics of Indian major states rather taking part into the debate of convergence, Chaudhuri (2000) and Krishna (2004) focus on the issues like growth variability and volatility in Indian states over last four decades: from 1960s to 1990s. Chaudhuri (2000) traces the overall economic growth experience of 19 states and asserts that there exists a great divide between Southern and Western states on the one side and the Eastern and Northern ones on the other. Krishna (2004) measures volatility of growth performance of 14 major states. The study uses the coefficient of variation of year-to-year growth rates of a state as a measure of volatility. The results indicate that the most volatile states in the country are Orissa, Rajasthan, Gujarat and Uttar Pradesh while least volatile states are Punjab, Maharashtra and Kerala.

In an illustrated frame of convergence theorem Trivedi (2003) examines the evidence for regional convergence or catch-up in levels and growth rates of per capita income among 16 major states between 1960 and 1992. The results establish that no sign of unconditional convergence in growth rates occurs, however, tentatively conditional convergence is evident which suggests that small group of states are pulling away from the rest of the distribution, causing an incipient second peak.

Bhattacharya and Sakthivel (2004) attempt to answer the question whether and how regional disparity has widened in the post-reform period. Their results indicate that while growth rate of GDP has improved only marginally during 1990s regional disparity in the State Domestic Product (SDP) has widened much more drastically. Backward states, on average, do not show significant sign of convergence in terms of growth rates. Moreover, population also grows at faster rates in backward states.

Purfield (2006) investigates the variation of growth and economic performance across Indian states over a period of 30 years. Among five stylized facts about their performance the dominating ones are that the gap between income levels across the states has widened significantly and that the states with poor economic performances have been less effective in reducing poverty, in generating private jobs etc.

Baddeley et al. (2006) examine regional disparities in Indian economic performance during 1970-97. The preliminary analysis shows that, in absolute terms,

initially poorer states grew at slower rates than initially wealthier ones, and that there is also increasing dispersion of income levels across Indian states. However, econometric analysis, based on the investigations of the possibility of club convergence and conditional convergence, does not find evidence of the former. Their suggestion in this regard is that some of the factors are associated with the latter. The study indicates that the economic policy reforms in 1991 significantly intensified growth differentials between states.

Bandyopadhyay (2006) documents the stylized facts of twin-peaked dynamics over the period 1965-1997. Her empirical model of dynamically evolving distributions shows that EG across the state has polarized into two income convergence clubs: one at 50 per cent of the national whiles the other at 125 per cent of the national average. The later half of the 1960s show some tendencies of convergence, which are eventually found to dissipate in the 1970s, 1980s and 1990s.

Wu (2008) examines EG and regional disparity of two Asian giants – China and India for the last two decades. The study finds clear evidence of divergence across the regions of both the countries. The important finding of our relevance warns that present level of regional disparity is more severe in China, however, deteriorating more rapidly in India. Along with variations in infrastructure development and urbanization, human resource development plays a crucial role in affecting regional disparity in recent years in India.

Several studies in recent days undertake careful analysis of the sources and changing pattern of EG at national level. Basu and Maertern (2007) present an overview of the pattern of macroeconomic performances in Indian economy since independence. They express their concerns over inadequate infrastructure, labour and bankruptcy regulations, level of corruptions in governance. Moreover, erratic and low growth in agriculture, rising inequality between states; between and within rural and urban areas in the post-reform period are serious issues that need to be addressed immediately to sustain the present level of EG in India.

Bosworth et al. (2007) documents the economic performances of India using the growth accounting framework that produces estimates of the contribution of labour, capital, education and Total Factor Productivity (TFP) separately for the three sectors of agriculture, industry and service as well as for the economy as a whole. They pointed out that relatively small difference between the rates of growth of capital and labour in the past made growth accounting results for India relatively insensitive to the choice of factor share parameters.

While providing an up-to-date projection of India's potential EG, Oura (2007) draws an illustrative framework of standard growth accounting for India. Under this framework the components of growth including factor share, TFP, physical and human capital accumulations are critically discussed. He views that productivity gains and investment in medium-term could be volatile, but determined reforms could sustain strong productivity growth in India.

Rakshit (2007) raises several serious questions on India's recent Services Revolution. Drawing evidences from developing countries he urges that revealed comparative advantage of services does not imply that primary and secondary sectors should have a least role in the development process. Moreover, labour absorption in services remained very low in the era of high growth. He suggests for efficient allocation of resources across sectors for a cost effective way of meeting the optimal menu of domestic absorptions.

2.2 Literature on Human Development

After the publication of UNDP's first HDR in 1990 several attempts have been made to estimate Human Development Indices in India's sub-national levels. Interestingly, as the formulation of constructing HDI has undergone many changes over the years, empirical studies on India's national and sub national levels reflect the application of these modifications. In some cases suggestions are made to modify the existing formulation for a better perception.

Tilak (1991) as well as Kumar (1991) constructed HDIs for major Indian states applying HDR (1990) methodology. Drawing data mainly from 1981 and 1991 Census

their estimates were based on the development indicators of expectancy of life at birth, literacy rate and per capita SDP.

Shah et al. (1993) constructed two sets of HD indices for different periods covering 16 major states. The first index was computed on the basis of real per capita SDP, life expectancy and literacy rate for the years: 1960-61, 1970-71, 1980-81 and 1986-87. The second set of index advanced the educational attainment by combining literacy with average years of schooling. This index was computed for the census years of 1960-61, 1970-71 and 1980-81. The goal posts of development indicators, used to compute both sets of indices, were 1960-61 values as minimum and the targets for each indicator to be achieved by 2010 as maximum.

Pal and Pant (1993) argued that in case of developing countries achievements in poverty alleviation must be taken as an explicit social goal and accordingly they modified the composite index introducing the percentage of people living above the poverty line as an additional indicator. Their computation of indices did not use the maximum values attained by developed countries instead, the concept of dividing by the range between maximum and minimum values was done away with. These modifications help to identify the least developed states by sharply reducing their index value relative to their value using HDR (1990) methodology.

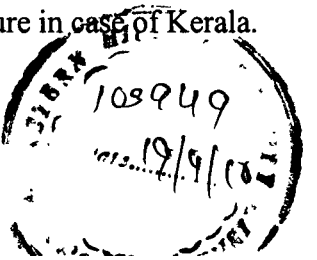
Indrayan et al. (1999) computed HD indices for India and her 16 major states for three years – each a decade apart – applying HDR (1995) method. Their study was precisely aimed at computing indices for major states of India and the nation as a whole, which were strictly comparable to the global values of HDI, and also to obtain a trend of HDI values for three decades: 1971, 1981 and 1991.

Planning Commission (2002) ranks all Indian federal units according to their level of HD captured by the composite index – HDI for 1981, 1991 and 2001. The level and ranks of HD obtained by Indian States and Union Territories have become a permanent basis of reference in all national and even in international studies. Departing significantly from the conventional UNDP methodology it is a unique effort to formulate HDI with a conscious and realistic view which incorporates a number of other information to capture

individual's real freedom in three attainments. The most important one is the indicator of economic attainment – *inflation and inequality adjusted per capita consumption expenditure* in place of conventional per capita income. No doubt, the former is definitely a better indicator in Indian context to capture individual's command over resources. There is no denying that the vast literature with substantial state level statistics provided in this volume has emerged as a milestone in the analysis of HD.

Employing a number of inequality measures Noorbakhsh (2003) examines the regional disparities in HDI for major Indian states. The primary aim of the study is to find out whether the states show any tendency of convergence or diverge further. Key finding of the study suggests that serious lack of infrastructure in the backward states causes the evidence of divergence rather than convergence.

Chatterjee (2005) criticizes UNDP prescribed HDI formulation on the ground that it ignores the extent of inequality that exists in attainments over the population and proposes an *alternative index of human development* (AIHD) which takes both general level as well as extent of inequality of the distribution of all three attainments into account. He defines his AIHD as the simple average of the *uptilt* indices of three characters: longevity, level of education and income. This makes the index sensitive to changes in general level and inequality in respect of each of the constituent characters. The computation of alternative *index of human development* for rural and urban sectors of a number of selected states (Kerala, Maharashtra, Tamil Nadu, Uttar Pradesh and West Bengal) and India as a whole exhibits some interesting observations. It is seen that the score and ordering in terms of *uptilt* are not always same as that in terms of general level. For example, in health attainment (longevity) West Bengal scores better than Tamil Nadu in terms of general level, however, scores lower in terms of *uptilt* level; indicating that although West Bengal, on average, has a higher level of longevity, it also has more inequality than Tamil Nadu. Likewise, in terms of economic attainment (monthly per capita consumption expenditure) both Maharashtra and Tamil Nadu score over Kerala, but in *uptilt* level Kerala scores over both Maharashtra and Tamil Nadu indicating a more egalitarian distribution of monthly per capita consumption expenditure in case of Kerala.



2.3 Studies on Causal Links

Previous researches on the two-way links between EG and HD have focused mainly on how they are associated and how public policies play a crucial role to translate economic progress into HD. However, the literature that examines the contribution of HD in furthering EG is surprisingly limited. Here, we review the evidences from previous researches on the subject.

The links and causality between HD and EG has been of crucial importance in UNDP literature. A systematic documentation of the role of EG in the enhancement of HD was found in the 7th HDR which drew a new dimension in categorizing the quality of growth and contributed immensely to set a holistic view on growth performance of any nation. HDR (1996) recognizes that HD and EG are closely connected. There are evidences which establish that EG alone may not be able to benefit everyone of the society. However, for long-run sustainable welfare of the people a meaningful and uninterrupted EG has been inevitable – a most important means in this regard.

'There are striking contrasts in today's relationship between human development and per capita income. ... ...Short-term advances in human development are possible – but they will not be sustainable without further growth. Conversely, economic growth is not sustainable without human development'

(HDR, 1996: 5)

The significance of public expenditure choices for improving HD can be traced into HDR (1996: 71) from the comparison between Kenya and Malawi. It was documented that almost same per cent of GDP was spent by the governments of these two nations during 1980s. However, higher social allocation ratio and priority ratio in Kenya witnessed a significantly higher proportion of GDP to enter directly to HD improvement function.

The formal documentation of the two-way relationship between EG and HD was presented by Ramirez et al. (1998). They examine the significance of the relationship, for the chains as a whole and for particular links in them, with the help of cross-country statistics. The framework was advanced by Ranis and Stewart (2000) and Boozer et al. (2003). Using data from 69 developing countries Ranis and Stewart (2005) extend the analysis for the period from 1960 to 2001.

In parallel efforts, Mazumder (1995 & 2000), scrutinized the causal relationship between human well-being and economic prosperity. Human well-being in this framework is captured by the core indicators like life expectancy at birth, adult literacy rate and infant mortality rate while economic achievements by per capita real gross product. Key findings in Mazumder (2000) reveal that the relation varies significantly with different income groups.

Several empirical researches have been conducted in this regard. Few of them can be highlighted: Anand and Ravallion (1993) view development indicators or social outcomes as aggregate of individual capabilities and find that Gross National Product (GNP) and life expectancy are significantly and positively correlated. The relationship is predominantly mediated through (i) direct rise of the income of the poor and (ii) the effect of growth on public spending – GNP per se explains almost nothing.

Aturupane et al. (1994) observe from their empirical work that EG is negatively related to infant mortality rate, however, can explain hardly 28 per cent of the infant mortality variance.

Taking three income decomposed health aggregates – life expectancy, infant mortality and perinatal mortality, Bidani and Ravallion (1995) find that overall per capita health spending has a positive effect on life expectancy at birth and infant mortality rate of the poor only. Further, increased basic schooling increases average life expectancy of the nation through its effects on the life expectancy of the poor. However, in case of prenatal mortality the per capita public spending affects both and non-poor.

Chakraborty (1997) criticizes the findings of earlier scholars as they suffer seriously from methodological errors and suggests the usage of non-parametric approaches to re-examine the relationship. Her empirical findings suggest that dependency of life expectancy on income is tethered to time and space. Hence, income explains life expectancy only below a certain range and that range is moving up over time. But there are some outliers – below that line life expectancies are unaffected by incomes. She concludes with the note that effectiveness of public action depends on the coverage of public services rather than on the public expenditures. Well-targeted public

policies are often successful to improve the living condition of the poor in short-run, however, growth-based strategies are necessary in the long-run.

White (1999) presents a path-breaking graph to summarise the on-going debate on this issue between UNDP and World Bank and concludes while some policies are win-win, others are not; given the knowledge on which policy brings about what outcome, not much can be said about the effectiveness of each. According to him, the policies advocated by the World Bank and IMF are not always for 'broad-based' or 'pro-poor' growth.

Boozer et al. (2003) explore the dual relationship between EG and HD. They urge that economic growth is just a means of HD while HD reinforces economic growth.

Drawing attention on a series of studies in human capital theory, basic needs as well as welfare approach, Ranis and Stewart (2005) view that in most cases EG and HD run parallel. Tracing two alternative chains from their previous contributions such as Ranis et al. (2000) and Ranis and Stewart (2000) they outline two chains: from EG to HD (Chain-A) and from HD to EG (Chain-B). For them, most of the developing countries are within the vicious cycle mode – below average HD and EG and few in the other realms – lopsided realities where growth and HD are not coherent. The countries with lopsided development experiences, according to them, tend to fall over time into either a vicious or virtuous cycle. Their findings suggest strongly that neither lopsided situation is sustainable over periods. Both types refer to unstable equilibriums. Decent HD with low expansion of economic opportunities can cause serious fiscal constraints which is likely to create balance of payment crisis while *economic growth first strategy* can reach limits of domestic supply of skilled labour and political instability.

Turning to Welfare Approach, Berry (2005) attempts to establish the relationship between economic progress and human welfare. Highlighting different setbacks to achieve a positive association between the two, he argues that causes of failure for EG to provide proportional poverty reduction and those of per capita income growth to provide higher satisfaction/happiness vary substantially within societies. Relative income and employment stability has been stressed to establish the links. Citing the examples of Latin

American countries, he opines that worsening income distribution over periods in growth and even, in no growth situations is most prominent cause of failure in this regard.

The new development paradigm claims on the other hand that HD is not only an end-product of the development process – it reinforces growth. However, the existing stock of empirical evidences in UNDP literature, leading the achievements in HD to EG is comparatively less articulated. Theoretical as well as empirical findings of this can be traced into the findings under the purview of new growth theory, human capital/human resource development literature.

Lucas (1988 & 1990) view that higher the level of education of workforce, the higher the overall productivity of capital. This happens because more educated are more likely to innovate which improves overall productivity. Studies of Psacharopolous (1994), Behrman (1995) and Strauss and Thomas (1995) indicate that additional years of education of workers increase their earnings while the rate of return of educational attainment vary significantly on the level and quality of education.

Under the purview of endogenous growth theory there are several studies that recognize a clear association between the indicators of economic and human/social development. Studies of 1990s document the high association between the educational attainment of labour force and TFP. According to Romar (1994), education plays a key role in contributing R&D and via interactive learning which in turn promote growth of output and TFP. Gylfason (1999: 101-105) establishes several high correlations on health, education, income distribution, and per capita income.

In recent endogenous growth model, Schaper (2003) finds that investment in education is able to enhance EG and income equality, depending upon the way it is financed. At *first sight* education policy of a government can make sense in the long-run – a period of at least 10-20 years. However, at *second sight* education policy leads to an intergenerational redistribution of utility. Studies reveal that improved health and nutrition affect directly on labour productivity – especially in poor economies. Cornia and Stewart (1995) observe that calorie intake of labour force determines the productivity of both farm and non-farm sectors.

Muysken et al. (2003) investigate optimal health expenditure and consumption by adding a health accumulation function to the Cass-Koopmans optimal-growth model. Their finding suggests that poor countries with bad health condition should allocate more resources to overcome this deficiency. A healthy population may contribute more to growth than a fast-growing capital stock. Physical capital and quality of labour are complements rather than substitutes. The quality of labour force depends on their health condition. Economies will only develop successfully if both inputs meet high standards. Bloom et al. (2004) confirm that at the aggregate level also, health has shown to be an important input in economic growth.

India's position in the above framework is often reflected in the cross-country studies.

'.....India – remains in the weak links quadrant with low human development and low growth during the 1960s and 1970s. It moves to lopsided development in 1980-92 as growth accelerates while progress in human development remains slow.....'

(HDR, 1996: 81)

Ramirez et al. (1998) find Indian performance during 1960's and 1970's in vicious cycle category. However, in 1990's India moved to the EG-lopsided group. Almost same views have been expressed about India by Ranis and Stewart (2000) and Boozer et al. (2003). Ranis and Stewart (2005) point out categorically that India remained in vicious cycle for first two decades, however, her movement toward EG-lopsided quadrant during 1980's received a reversal in 1990's.

In national level empirical studies on causality between EG and HD attempts are made in both ways. Few scholars find that EG determines the level of HD, however, others argue for reverse causality.

Dholakia (1985: 112-118) tested both the hypotheses of neoclassical school: a higher human capital formation would lead to higher growth of the TFP in a region and of human capital approach: human capital base of a region plays an important role in determining the growth of output and TFP using data from 15 major states for the period 1961-71. However, Indian data could not support any of these hypotheses even at 10 per cent level of significance.

Geeta Rani (1995) finds that economic progress in India is one of the important factors that determine the level of HD. Zaidi and Salam (1998) report a high positive correlation between NSDP per capita and enrolment in higher education. Foster and Rosenzweig (1996) focus attention on the relation between education levels and EG in rural India during 'Green Revolution'. They concentrate mainly on the agricultural transformation in that period and show how initial education levels translated into subsequent EG through new opportunities, created by technical change. Nosbusch (1999) uses school enrollment rates in a test of Solow-type model augmented with human capital.

Duraisamy (2000) provides estimates of the return to education in India by gender, age cohort and location for the period up to 1993-94; and evaluates the changes in returns over a period from 1983 to 1994 using a large national level household survey data. The result shows that the returns to education increases up to the secondary level and declines thereafter. There is evidence of substantial gender and rural-urban differences in the returns to schooling. The returns to women's education for primary and middle levels have declined while those for secondary and college levels have increased during the decade 1983-1994.

Pradhan and Abraham (2002) investigate the role of HD policy on EG, taking 17 major states of India into account for the period 1980-97. Their results confirm that the level of HD in a state is significantly determined by the HD policies, pursued by the state governments, and that EG depends upon the HD policy. Government spending for education is critical for economic prosperity; however, per capita health expenditure does posses any significant growth impact in their study.

Dholakia (2003) finds that HD indicators positively influence income with a lag of about eight years, whereas, income per capita affects the other within two years. Therefore, he argues that the planners in India should not be unduly concerned about regional imbalance in human and economic development. Economic growth itself is potential enough to address the issue of disparities in income and HD speedily.

Using Indian mortality statistics World Bank (2004) documents that both household living standards and national income levels have a positive effect on the reduction of infant (under age 1) mortality. This result is for Indian infant mortality in five years preceding 1998-99.

Gupta and Mitra (2004) investigate the possible links between EG, poverty and health, using panel data for 15 major states covering a period from early 1970s to late 1990s. Their results indicate that though growth tends to reduce poverty, significant improvements in health status are also necessary for poverty to decrease. The study explores a two-way relationship between growth and health status: better health condition of the people enhances economic growth by improving productivity, and higher growth allows better human capital formation.

In a unique effort Ghosh and Pal (2004) examine the effects of initial inequality (in consumption expenditure, state-level development expenditure etc) on subsequent EG across the states of India. They include 16 major states of India and cover the period from 1960 to 1994. The empirical analysis is based on a multiple regression which applies both econometric tools of single cross-sectional estimates and panel-data estimates. In contrast to the results of earlier studies in this field, they find a strong and negative association between inequality and growth of output – especially in case of rural inequality. In addition, the indicator of inter-sectoral inequality seems to be more important in explaining sectoral growth of output.

In other attempt Duraisamy and Mahal (2005) examine the same relationship between the rate of EG, health indicators and poverty levels of 14 major Indian states for the period from 1970-71 to 2000-01. They document a strong association between income growth and health indicators: with the increase in income life expectancy increases significantly, and infant mortality falls sharply. However, poverty level and income growth, on average, are inversely related.

In another attempt, Bhalotra (2006) arrives at the result that unconditional growth elasticity of under-5 mortality in India is about -0.7 which means that a 10 per cent increase in per capita income is associated with a 7 per cent reduction in mortality. This

result corresponds to the under-5 mortality statistics of 14 major Indian states for a period from 1970 to 1994.

Trivedi (2006) studies the relation between income levels and levels of educational capital in Indian states. The key findings is that the stock of educational capital, proxied by the secondary school enrollment rate, has s significant positive impact on steady-state level of per capita income; and also on attendant growth rates. Other interesting set of findings is that both male and female educational capitals are positively related to the steady-state incomes; or that gender-gaps in education reduce long-run incomes.

Aggregating about 15 socio-economic and 13 governance related variables for 16 states of India, Basu (2004) constructs economic well-being index and good governance index respectively. The interaction between the two indices suggest that governance measures, and policy variables are crucial to explain differential level of development performances across states during 1980s and 1990s. The same author in a recent attempt, Basu (2007) develops a new measure of development what he calls *development quality index* (DQI). This composite index is constructed applying multivariate statistical technique of principal component analysis. Performances of 16 Indian states are scrutinized under this frame between the periods of 1980-84 and 2000-04. Appealing features revealed under this framework are that Kerala has outperformed the rest of Indian states. States of Punjab, Tamil Nadu, Maharashtra and Gujarat performed quite well; however, Bihar, Madhya Pradesh, Rajasthan, Uttar Pradesh and Orissa are consistently lagging behind in DQI.

Deviating significantly from the earlier strand of Kurian (2000), Kurian (2007) expresses serious concern on the widening economic social disparities across the regions, genders and social groups in India. To achieve an inclusive growth the issues of these imbalances need to be addressed.

Drawing data mainly from Planning Commission (2002) for 15 major states covering a period from 1980-81 to 2000-01, Ghosh (2006) found strong evidence of regional convergence in HD despite significant divergence in real per capita income. This

indicates that the poor states have failed considerably to catch-up in terms of income, however, have shown a tendency to converge in HD. The study classifies (15 included) states on the basis of their performances on HD and EG for the years 1981, 1991 and 2001. Four states namely, Gujarat, Haryana, Maharashtra and Punjab have been in virtuous cycle category while seven states namely, Andhra Pradesh, Assam, Bihar, Madhya Pradesh, Orissa, Rajasthan and Uttar Pradesh are in vicious category. Other four states included in the study are in the row of lopsided realities.

2.4 Summarisation of Existing Literature

The literature survey, presented above, shows how recent economic research has been shifting its focus on the issues that people have reasons to value. The analytical framework of growth and human development differentials across nations or across regions within a nation has received serious attention. The new growth theories discovered the role of capital accumulation; technological progress as being responsible for growth differentials. The role of human capital and physical infrastructure were put into place to explain the growth process as well. However, the advent of human development paradigm in early 1990s raises questions on quality of growth. Economic prosperity of an economy should promote the quality of life of the people, at least in the long run. This is viewed as an essential ingredient for the sustenance of growth. Hence, the link between the economic performance and human development is extremely important for the mutual backup of both events. The studies on Indian states on this particular issue are not only limited in number, attempts have hardly been made to correlate them directly. To bridge up the inadequacy in the existing literature an attempt has been under taken in the present study where the links between the economy and human development across Indian states are empirically evaluated.

Chapter – III

Present Study

3.1 Objectives

3.2 Focused Area and Period

3.3 Hypotheses

3.4 Indicators: Definition and Data Sources

Chapter – III

Present Study

The research questions by which the present study is motivated and the gap area revealed after the review of existing literature suggest to undertake a disaggregate study that correlates between economic performance and human development in India's sub-national context over a reasonably long period of time. To address those questions a comprehensive research frame is designed in the present chapter. The first section of the chapter sets the objectives of the study while the second describes the included states and focused period of the study. The models used in the study to fulfill the objectives are specified and the hypotheses are set in the third section. The fourth section deals with the indicators that can capture the performances of the states in economic prosperity and human development during the study period.

3.1 Objectives

An economy, according to the framework described above, may be on a mutually reinforcing upward spiral with high levels of EG leading to decent level of HD (Chain-A) and enhanced human capability in turn promoting further income growth (Chain-B). Conversely, weak human development may result in low growth and consequently poor progress towards HD. Hence, HD is not just an end product of development process but an important input as well and a key ingredient in the process of economic prosperity. Because of the strong two-way relationship it is extremely important for any economy to promote both EG and HD to sustain progress in either. Hence, the dynamic links between the economic performance and human development across the regions of any nation is quite significant for policy decisions. Especially in a country like India where disparity in economic indicators and in level of living across the states is increasingly acute, a disaggregated investigation in this regard is necessary. Moreover, the economic prosperity of the country as a whole in terms of income growth has been impressive at least for the last two decades. This achievement has never been even across the regions

and often raised question mark on the sustainability of recent growth. On the other hand, the achievements in HD at the national level remained unimpressive for decades.

For a sustainable move of the nation from present vicious cycle to virtuous one, an even and systematic progress in both economic and social fronts across the regions remains only option for the policy makers. For that, existing dynamic links between them need to be explored. The investigation of Indian states – how they change their quadrants over time has strong implication for phasing of policies at the state level; which in turn would improve the situation at the national level. The present study, therefore, intends to investigate empirically the role of economic indicator (income and income growth over periods) in enhancing non-income indicators (literacy, life expectancy etc) that come closer to reflecting the well-being and freedom, actually enjoyed by the Indians living in different parts and *vice-versa*. The focus of this study lies on the relationship between EG and HD that exists across Indian states. Progress in income growth and that of HD had differed to a considerable extent in the national context, particularly in 1990s when the economy received a significant acceleration after wide-ranging reforms of economic policies. The main objective of this study is, therefore, to examine the strength of the links between EG and HD in Indian states for a period of three decades: 1970-71 to 2000-01. Specifically, the study seeks to

- identify the trends in economic performance of Indian states over a reasonably long period of time;
- identify the trends in human development across the states for the same period;
- explore the causal relationship between economic prosperity and human development across Indian States; and
- make policy recommendations based on the findings.

3.2 Focused Area and Period

India is a vast country with second largest population of the world. Over a billion of her population is living today in 28 States and 7 Union Territories. However, the process of state formation as well as the changes in the state boundaries is very common in Indian context. To examine the dynamic links between the economy and human

development across Indian states, we need to narrow our focus on those particular states of the country for which consistent time series data are available. And also to highlight a specific period which is reasonably long and during which period state boundaries remained unaltered.

Considering these two important constraints the present study focuses its attention on 16 most populous states of the country which are commonly referred as *major Indian states*. The period of this study, however, covers three decades from 1970-71 to 2000-01. In the year 2000, three new states – Jharkhand, Chhattisgarh and Uttaranchal were created by curbing three populous states of Bihar, Madhya Pradesh and Uttar Pradesh respectively. To maintain comparability of variables/indicators over the years of our study period (1970-71 – 2000-01), we have merged the data of these newly created states with their parent states and constructed a comparable series of all the variables/indicators for the study period. In other words, the older boundaries of the States of Bihar, Madhya Pradesh and Uttar Pradesh are considered for the entire period of three decades.

The focused states in this study, as shown by the shaded area in the Map: 3.2.1, include four northern states of Punjab (PJ), Haryana (HR), Himachal Pradesh (HP) and Uttar Pradesh (UP); the central state of Madhya Pradesh (MP); three western states of Maharashtra (MH), Gujarat (GJ) and Rajasthan (RJ); four eastern states of Bihar (BH), Orissa (OR), West Bengal (WB) and Assam (AS); and finally, four southern states of Andhra Pradesh (AP), Karnataka (KK), Kerala (KR) and Tamil Nadu (TN). The included states have a combined population of 987.92 million, accounting for over 96 per cent of India's total population (Census 2001); and 2.87 million square kilometers, accounting for 87 per cent of India's total geographical area. We exclude the Himalayan state of Jammu & Kashmir; seven small northeastern states of Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura; the beach state of Goa; and seven Union Territories.

The focused period of the present study, 1970-71 – 2000-01, which covers three decades of 1970s, 1980s and 1990s has been significant in many ways. The decade of 1970s is in fact the final decade of the period known in the literature as the period of *Hindu Rate of Growth*. This decade was characterized by restrictions and commonly known as policy regime. The decade of 1980s witnessed a real economic acceleration for

the first time in independent India and is known as the beginning of a new economic regime with a number of policies towards openness. Finally, in the decade of 1990s, the economy received a significant acceleration after wide-ranging reforms of economic policies. This decade is often accused of growing inequalities across the regions.

Map: 3.2.1: Focused Area

The variation in economic performances and disparity in levels of living within the focused area are large. The real per capita income in the fiscal year 2000-01 varies from Rs.4150 in Bihar to Rs.15390 in Punjab – the population from 6.08 million in Himachal Pradesh to 174.54 million in Uttar Pradesh – the density of population from 903 persons per sq. km. in West Bengal to 109 in Himachal Pradesh.

The important socioeconomic and demographic features of 16 included states are summarised in Table 3.2.1. Third column of the table exhibits the distribution of population across the included states. Next two columns describe the wide-ranging variation in two socio-economic aspects of the people: *inflation and inequality adjusted* per capita consumption expenditure and the per cent of population living below poverty line. Final two columns show the status of the states in two noneconomic aspects of human well-being i.e., health and education.

According to Census 2001, Uttar Pradesh and Bihar emerge as two most populous states in pre-partition scenario, with about 17 and 11 per cent of Indian population respectively. Two northern states - Himachal Pradesh and Haryana, created in 1965-66 curving the former Punjabi Suba, are the smallest states in the list of 16 included states in terms of population. The highest population growth between 1971 and 2001 is recorded in Rajasthan, followed by Haryana and Uttar Pradesh. Kerala's low rate of population growth, on the other end, has already received appreciation.

A wide-ranging inter-state variation in per capita consumption expenditure *(inflation and inequality adjusted)* is reported for the fiscal year of 1999-2000. Five front-runner states in this aspect (Kerala, Punjab, Haryana, Himachal Pradesh and Gujarat) account for 137, 132, 126, 121 and 118 per cent of national average respectively. In contrast, five poor states (Madhya Pradesh, Bihar, Uttar Pradesh, Orissa and Assam) account for 83, 84, 86, 87 and 90 per cent of national average. Nine included states are lying below the national level and seven above national average.

The next column reveals that all five front runner states in the previous column emerge as the states with least below poverty population and five most backward states with highest poverty rate in the country. The percentage of below poverty population ranges from 6.16 per cent in Punjab to 47.15 per cent in Orissa. The infant mortality is least in Kerala, followed by Maharashtra, Tamil Nadu, West Bengal and Punjab while highest in Orissa, Madhya Pradesh, Uttar Pradesh, Rajasthan and Assam.

Table: 3.2.1

Basic Features of Included States

State	Code	Population (in thousands) 2001	Per Capita Consumption Expenditure* (Rs./month) 1999-2000	Population Below Poverty Line (%) 1999-2000	IMR (%) 2001	Literacy Rate (%) 2001
1	2	3	4	5	6	7
Andhra Pradesh	**AP**	**75728**	**104.24**	**15.77**	**66**	**61.11**
Assam	**AS**	**26636**	**99.81**	**36.09**	**78**	**64.28**
Bihar	**BH**	**109788**	**93.88**	**42.60**	**67**	**49.15**
Gujarat	**GJ**	**50597**	**130.78**	**14.07**	**64**	**66.43**
Haryana	**HR**	**21083**	**140.18**	**8.74**	**69**	**68.59**
Himachal Pradesh	**HP**	**6077**	**134.34**	**7.63**	**64**	**75.91**
Karnataka	**KK**	**52734**	**116.66**	**20.04**	**58**	**67.04**
Kerala	**KR**	**31839**	**152.74**	**12.74**	**16**	**90.92**
Madhya Pradesh	**MP**	**81181**	**92.38**	**37.43**	**97**	**64.35**
Maharashtra	**MH**	**96752**	**121.95**	**25.02**	**49**	**77.27**
Orissa	**OR**	**36707**	**96.53**	**47.15**	**98**	**63.61**
Punjab	**PJ**	**24289**	**147.11**	**6.16**	**54**	**69.95**
Rajasthan	**RJ**	**56473**	**110.90**	**15.28**	**83**	**61.03**
Tamil Nadu	**TN**	**62111**	**127.54**	**21.12**	**53**	**73.47**
Uttar Pradesh	**UP**	**174532**	**95.64**	**31.15**	**85**	**58.09**
West Bengal	**WB**	**80221**	**118.98**	**27.02**	**53**	**69.22**
All India	**AI**	**1027015**	**111.28**	**26.10**	**71**	**65.20**

*Inflation and Inequality Adjusted

Sources: **Column 3 & 7: Census of India (2001)**
Column 4 & 5: Planning Commission (2002)
Column 6 : Economic Survey (2005-06)

Notes:

- Infant Mortality Rate is defined as number of death by age 1 per 1000 live births
- Literacy Rate is defined as the proportion of literates to the population in the age group 7+
- The older boundaries of the States – Bihar, Madhya Pradesh and Uttar Pradesh are taken into Consideration i e the newly formed States of Jharkhand, Chhattisgarh and Uttaranchal are included respectively

The Literacy (7+) Rate in included states, according to Census 2001, ranges from above 90 per cent in Kerala to below 50 per cent in Bihar. The second best performer in literacy is Maharashtra, followed by Himachal Pradesh. It is interesting to note that there remains a huge gap of 14 per cent points between Kerala and Maharashtra – the two best performers in terms of literacy rate. Seven states are falling below the national average of about 65 per cent while nine included states lie above that bench mark. However, the poor performer states being comparatively populous influence significantly to determine the national average.

3.3. Hypothesis

To fulfill the study objectives, described in section 3.1, we set the following hypotheses:

H_{01}: Real per capita income across included states diverges over time;

H_{02}: Levels of HD across included states diverge over time;

H_{03}: Levels of per capita income and HD are two independent events.

The first two null hypotheses (H_{01} and H_{02}) are tested against the following single alternative hypotheses respectively:

H_{11}: Real per capita income across included states converges over time;

H_{12}: Levels of HD across included states converge over time;

However, the third one (H_{03}) is against the following three alternative hypotheses:

H_{13a}: Per capita income level precedes HD but the reverse is not true.

H_{13b}: HD precedes per capita income but the reverse is not true.

H_{13c}: There is bi-directional relationship between them.

3.4 Indicators: Definition and Data Sources

To explore the dynamic links between economy and HD over a period of three decades of our study a reliable dataset is our primary concern for a number of socio-economic indicators at sub-national levels. In this study we depend on secondary data,

obtained from various national publications: Census of India, Central Statistical Organization (CSO), Ministry of Human Resources Development (MHRD), Planning Commission of India etc. This section presents a brief discussion on the definition and data sources of different variables/indicators that are involved in this study.

3.4.1 State Domestic Product

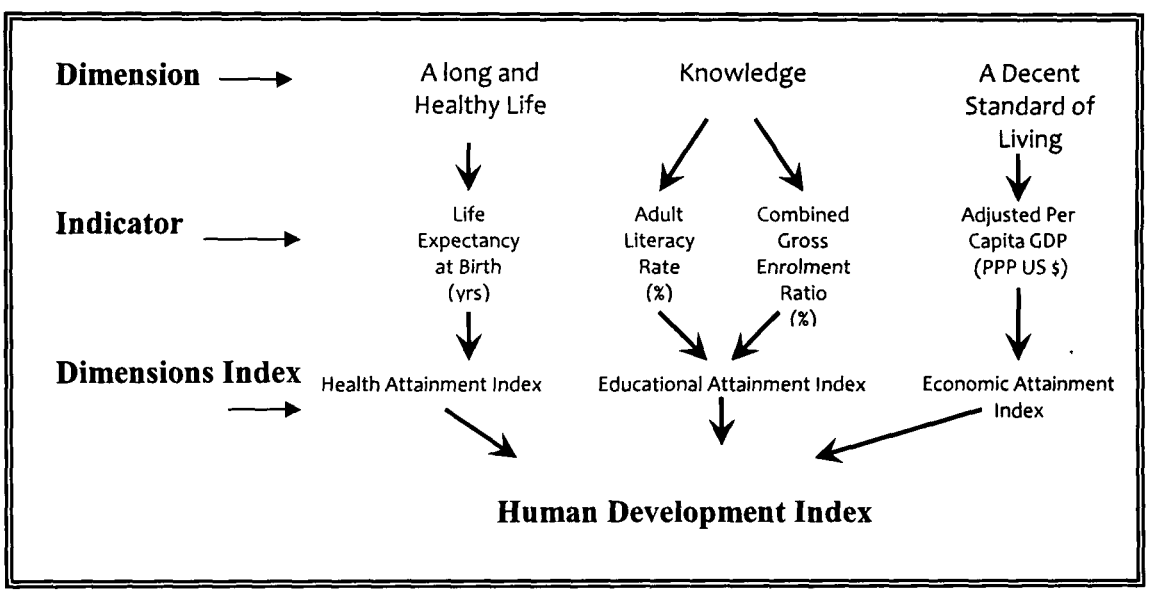
Per Capita Gross Domestic Product (PCGDP) at constant prices is a widely accepted indicator for measuring a country's economic performance. In our sub-national context the corresponding indicator is Per Capita Gross State Domestic Product (PCGSDP) at factor cost. The problem associated with PCGSDP as an indicator for comparing the level of economic performance of Indian states is that prior to 1980-81 there was no estimation of the same at the state level. Instead, Per Capita Net State Domestic Products (PCNSDPs) were regularly estimated by the CSO. Since the present study covers the period from 1970-71 to 2000-01 it is convenient for us to consider the latter as an indicator for measuring economic performances of the states. Of course, a drawback in using PCNSDP can not be ruled out. There are states like Kerala, Bihar etc in the country where PCNSDP is an underestimation of the State Domestic Product (SDP). However, for the sake of comparability in computing growth rates of SDP in Pre- and post- 1980-81 we have considered PCNSDP as an indicator for measuring economic performance of the included states.

There are two common sources for Indian State Domestic Products: Ozler et al. (1996) and Estimates (various issues) of CSO. In the present study we use the latter from EPWRF (2003). To obtain the real per capita SDP at constant 1993-94 prices we go through few steps: first, we get the data directly from Annexure 1 and Appendix 11.6 for the period from 1980-81 to 2000-2001 at constant 1993-94 prices. For the states of Bihar, Madhya Pradesh and Uttar Pradesh we merged the data of Jharkhand, Chhattisgarh and Uttaranchal respectively in case they are provided separately. A deflator is constructed

for each of the included states using the price index of the respective state to convert the figures of 1970-71 prices (obtained from Appendix 8C.2) into 1993-94 prices.

3.4.2 Human Development Index (HDI)

The HDI, as it is currently measured, consists of a region's average achievements in three dimensions of human well-being: Health, Knowledge and Income. The dimension of health is directly measured by life expectancy at birth. Knowledge is presented by a measure of educational achievement based on a weighted sum of adult literacy rate and the combined gross enrolment ratio at primary, secondary and tertiary levels. Access to resources is presented by the logarithm of real per capita income in Purchasing Power Parity (PPP) term. Therefore, to capture the level of achievements in three attainments and thereby, to construct the composite index (HDI) for Indian states we should have a consistent dataset for a number of indicators. We now discuss the definition, importance and the source of the dataset of the indicators that are directly involved in computing HDI according to their respective positions in three attainments.



3.4.2.1 Health Attainment

Since the first HDR in 1990, life expectancy at birth has remained the single indicator to capture the health attainment. Life expectancy at birth is defined in UNDP literature as the number of years a newborn infant would live if prevailing patterns of

age-specific mortality rates at the time of birth were to stay the same throughout the child's life. Life expectancy at birth is a direct indicator of the health of population which covers overall health status of the people including their level of nutrition, infant and maternal mortality conditions etc. Dasgupta (1995: 58) focused "*If we had to choose a single optimal measure of general well-being, life expectancy at birth would seem to be the best.*"

To obtain life expectancy at birth in a particular Indian state for a particular year a number of steps are involved. The Registrar General of India, since early 1970s, estimates life-tables for major Indian states on the basis of 6 or 5-year averages of age-specific death rates. These are estimated for the blocks of 1970-75, 1976-80, 1980-85, 1986-90, 1989-93, 1993-97, 1994-98, 1995-99, 1996-2000, 1997-2001 1998-2002 (MSPI, 2006). Using these values of state-specific life expectancy at birth regression lines for each of the major state of the country are fitted applying Ordinary Least Square method. From the regression line the estimate of life expectancy at birth for a particular state in a particular year is commonly obtained by the researchers for different purposes. These estimates are widely referred and used in socio-economic researches. We obtain the same from Planning Commission (2002) and MSPI (2006).

3.4.2.2 Educational Attainment

The present formulation of HDI considers two indicators of educational attainment: adult literacy rate and combined gross primary, secondary and tertiary enrolment ratio. It may be recalled that adult literacy rate was the only indicator in the first HDR of 1990 which was enlarged in the next report of 1991 with the inclusion of mean years of schooling. Accordingly, educational index was constructed as a composite of adult literacy rate with 2/3 weight and mean years of schooling with 1/3 weight. Educational attainment indicator was further modified in HDR (1995) when mean years of schooling was replaced by combined gross primary, secondary and tertiary enrolment ratio. Since then, no change in the composition of educational index is adopted. In our study, therefore, we have considered the adult literacy rate together with combined enrolment ratio to compute the composite index for educational attainment.

Adult Literacy Rate (ALR) is defined as the percentage of people aged 15 and above who can, with understanding, both read and write a short, simple statement related to their everyday life. In Indian national and sub-national studies the literacy rate (7+) is commonly used instead of adult literacy rate (15+). Planning Commission (2002) also considers the former in computing educational index. So far as the State Human Development Reports are concerned, in our knowledge two reports of SHDR-Delhi (2006) and SHDR-Tripura (2007) consider adult literacy rate (15+). Since one of our primary objectives in the present study is to construct HDI for India and Indian major states which are strictly comparable to the values of global Human Development Reports we have to consider ALR as on of the indicators with 2/3 weight. Planning Commission (2002) provides data on adult literacy rate for the years of 1981 and 1991 [Table: 4.8 pp-193] of our concern from Census of India sources. From the same source, Census of India (1976) and Census of India (2007) we collect the adult literacy rate for the years 1971 and 2001 respectively. Srivastava (2002) also provides useful feedback on adult literacy rate of Indian states for different census years.

Combined Enrolment Ratio (CER) is comparatively a complicated indicator, used in computing HDI by UNDP. HDR (1995) introduced this indicator for the first time replacing mean years of schooling. CER is in fact a summary indicator of three enrolment ratios of three different levels/stages: primary school age (6-11 years); secondary school age (12-17 years) and tertiary school age (18-23 years) [HDR (1995): Annex Table A. 2.1, pp-12-17]. Taking these three stages' enrolment together this indicator summarises the CER at primary, secondary and tertiary levels covering the age group between 6 to 23 years. In recent UNDP (2007: 146) document this indicator is conceptualized as "the number of students enrolled in primary, secondary and tertiary levels of education, regardless of age, as a percentage of the population of the official school age of the three levels" [pp-146]. CER actually depicts the current flow or the spread of education among population. In Indian sub-national studies the use of this educational indicator is limited due to perhaps non-availability of data in the precise form. Narayana (2009) makes it clear that gross enrolment ratio in India's HDRs differs from UNDP-HDRs by exclusion of tertiary enrolment except in SHDR-Chhattishgarh (2005). Planning Commission

(2002) considered a completely different indicator to capture the spread of education called, *estimated adjusted intensity of formal education in years* which is actually the weighted average of the enrolled students from Class-I to Class-XII where weights to 1 for Class-I, 2 for Class-II and so on. Then it is adjusted by the population of total enrolment to population in age group 6-18. Das (2008) admits that due to non-availability of enrolment data on a regular basis, School Attendance Rate (SCHAT) has been taken as a proxy of enrolment ratio to capture the flow aspect of educational attainment.

However, Indrayan et al. (1998) in our knowledge is the only study that computes CER for major Indian states using official information. Enrolment information for Indian states are provided in MESW (1976) for the census year 1971, MHRD (1985) for 1981, MHRD (1994) for 1991 and Geeta Rani (2007) for 2001. On the basis of these information from former three sources Indrayan et al. (1998) computed CER for major Indian states for the years 1971, 1981 and 1991. We adopt their figures for those three years and using the information from Geeta Rani (2007) and the same tool we compute the CER for the year 2001.

3.4.2.3 Economic Attainment

Human Development Reports, since 1990, use the World Bank dataset to capture the economic attainment in computing HDI while Word Bank regularly generates the same for many countries of the world on the basis of International Comparison Program (ICP) surveys. To obtain an internationally comparable figure the conversion of official rates into a common currency is necessary. Purchasing Power Parity (PPP) rate of exchange allows this conversion to take this price differences into account. Finally, the indicator for income component of HDI is taken as GDP per capita in PPP$.

For Indian states the corresponding indicator is Gross State Domestic Product (GSDP) at factor cost. These are estimated for all included states since 1980-81 by CSO. Prior to 1980-81, NSDP used to be estimated. To overcome this problem, the NSDP per capita figures of 1970-71 are multiplied by the state-specific ratio of gross to net in the year 1980-81 to obtain GSDP per capita for 1970-71. Throughout this study we use the

conversion factor (from official exchange rate to PPP exchange rate) of HDR (2003) which corresponds to the data for the year 2001. WDI (2003) notes that these are calculated on the basis of data on GDP at market prices (constant 1995 US$) and GDP per capita at PPP US$.

Following HDR (1999) methodology and using HDR (2003) dataset we first prepare national HDI value of the year 2001 which is strictly comparable to the HDI trends, presented in Table 2 of HDR (2003:241-244). Repeating the same procedure for 1991, 1981, 1971 we obtain national attainments for the respective years. Finally, the state-level achievements in economic attainment (*command over resources*) are computed by applying the above-said conversion methodology.

Chapter – IV

Trend in Economic Performance

Chapter – IV

Trend in Economic Performance

This chapter is devoted to capture the trend in economic performance of included states over the years of study period. First, in section 4.1 we have a glance of overall national record in income generation since early 1950s. Section 4.2 captures the state level performances. Next section provides an empirical illustration of convergence issue. Finally, we summarize the results obtained in this chapter.

4.1 National Trend

Economists of all ages have paid serious attention to the issue of understanding economic growth. The impetus to economic growth, in classical political economy, was provided by capital accumulation and innovations. The contribution of Adam Smith is always regarded as the first revolution in growth economics. Smithian concept of economic growth stands on three important ingredients: productivity of labour which depends heavily upon *division of labour*; concept of *real price* which is almost synonymous with *value*; and finally, accumulation of capital which originates out of rent and profit. Marx's alternative formulation of economic growth deals with full-fledged industrial economy and hence, one of the most significant elements in Marxian system is innovation which is marked by booms and depressions. As the economy is more and more mechanized it moves jerkily towards what Marx describes as crisis (Dasgupta, 1985: 20-38).

The second revolution in economic growth theory is neoclassical growth models of Solow-Swan in early 1960s which establishes the stability of neoclassical growth equilibrium in terms of a simple adjustment mechanism. However, the neoclassical line of growth analysis focused mainly on the question whether the cross-country long-run economic growth process would converge to a stable equilibrium or not. For them,

technological progress plays a key role in determining income growth, however, technological progress in their models are determined exogenously.

The proponents of the third revolution in growth theory, Easterly and Levine (2001) documents *five stylized facts* of economic growth of 1990s. Those are

1. The residual (Total Factor Productivity, TFP), rather than factor accumulation accounts for most of the income and growth differences across countries.
2. Per capita income diverges over the long run.
3. Factor accumulation is persistent while growth is not, and the growth of countries exhibit remarkable variation.
4. Economic activity is highly concentrated with all factors of production flowing to the richest areas.
5. National policies are closely associated with long-run economic growth rates.

Despite several planned initiatives since independence to accelerate economic growth and to achieve an even regional spread India has emerged today as classic example of regional disparity in income level as well as in growth performances which, in turn, results in a huge inter-state variation in level of living. Before entering into the detailed inter-state income and growth analysis we just have a glance of overall record of national performance in income generation over the years of the second half of 20^{th} Century i.e. the period from 1950-51 to 2000-01. In Figure: 4.1.1 we have graphed the normalized values of real NDP per capita at constant 1993-94 prices, keeping the initial value of 1950-51 equal to unity so that we can read the year/decade wise fluctuations directly from the graph itself. It is noteworthy that we prefer real NDP per capita over real GDP per capita simply due to the fact that prior to 1980s Central Statistical Organisation never estimated Gross State Domestic Product for the states. To maintain certain degree of comparability between per capita national income and that of state income Real Per Capita Net Domestic Product (PCNDP) is taken here although we are

aware of the fact that it is an underestimation of national income and that real GDP per capita is considered as better measure of the standard of living.

Figure: 4.1.1: Real NDP Per Capita 93-94 Prices [Scale: 1950-51=1]

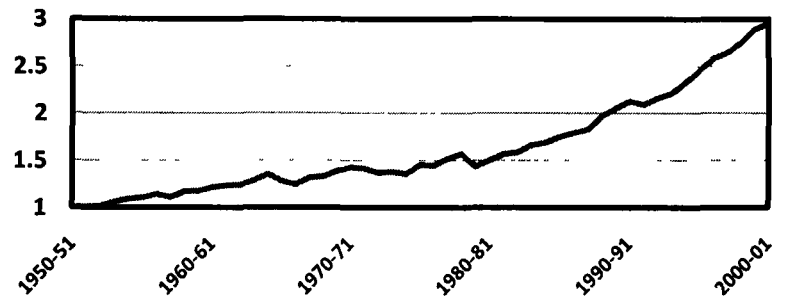
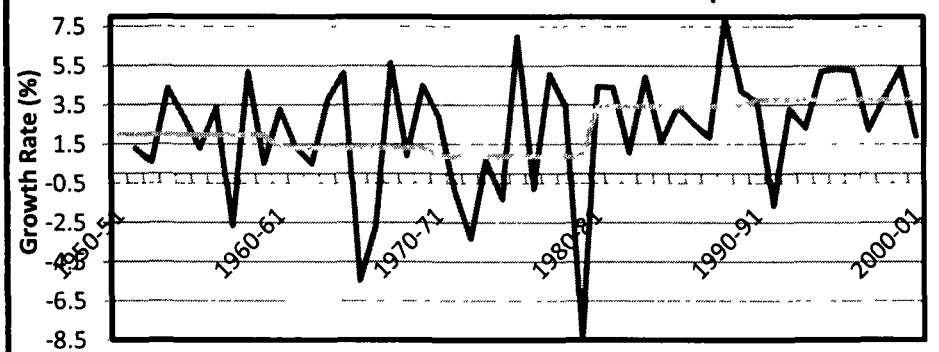


Figure: 4.1.2: Annual Growth Rate &Decadal GrowthTrend - Real NDP Per Capita



***Source*: Elaborated from RBI (2006)**

We again design Figure: 4.1.2 which depicts year-wise growth of real NDP per capita over the previous years and the trends of average growth rates for successive five decades from 1950s to 1990s. Though the real NDP per capita has increased nearly threefold during this period it is clear from the figures that there is a perceptible acceleration in growth rates since early 1980s. More precisely, per capita income grew by 1.99 per cent per annum in 1950s and reduced to mere 1.32 per cent in 1960s. In 1970s it

fell down to 0.89 per cent. The acceleration was first observed in 1980s with a decadal average of 3.43 per cent which was further accelerated to 3.79 per cent in 1990s. The average annual growth rate of per capita income in first three decades was about 1.37 per cent per year – the rate which is commonly reoffered in the literature as *Hindu rate of growth*. However, next two decades show a trend of 3.43 per cent per annum. In other words, during the period from 1950s to 1970s real per capita income has increased by 1.4 times while in next two decades it has doubled further at constant prices. For this acceleration two factors are attributable: significant acceleration in NDP growth as well as nominal reduction in population growth.

The nearly three and half per cent annual rate of real per capita income growth that India had averaged since early 1980s seems to be spectacular. However, this growth trend is often accused of regional disparity. It is commonly realized that the fruits of the growth in India has been heavily skewed not only across regions but also across sectors. As a result it leaves a major segment of population much behind in relative and even in absolute terms.

4.2 Performances at State Level

For the analysis of state level performances in income generation and growth records we depend on our panel data for 16 included states, prepared on the basis of Per Capita Net State Domestic Product (PCNSDP) instead Per Capita Gross State Domestic Product (PCGSDP). The reason behind this is that prior to 1980-81 Central Statistical Organization, Government of India used to estimate the former. To maintain a reasonable parity over the years of our study period we follow this throughout.

For the analysis of inter-state income differentials over the study period, real per capita Net State Domestic Product (PCNSDP) at constant 1993-94 prices of each state for every fiscal year are plotted in Figure: 4.2.1 in (natural) logarithmic scale. The top most line represents Punjab – the richest state throughout the study period in terms of per capita income; while the bottom one is for Bihar which remained poorest state throughout with some exception in late 1980s. The vertical distance between these two bold lines

implies the variation of income of 16 states included in the study. Initially, there was a moderate variation of income across the states which had widened in subsequent decades.

Figure: 4.2.1 shows clearly that top four positions in terms of per capita income are uninterruptedly occupied by the states of Punjab, Haryana, Gujarat and Maharashtra although there had been some minor changes of positions among themselves. Interesting example in this regard is Maharashtra which started its journey as fourth richest state in 1970-71. Superceding Gujarat in late 1980s and Haryana in early 1990s the western state had emerged as second richest state in the list of 16 included states.

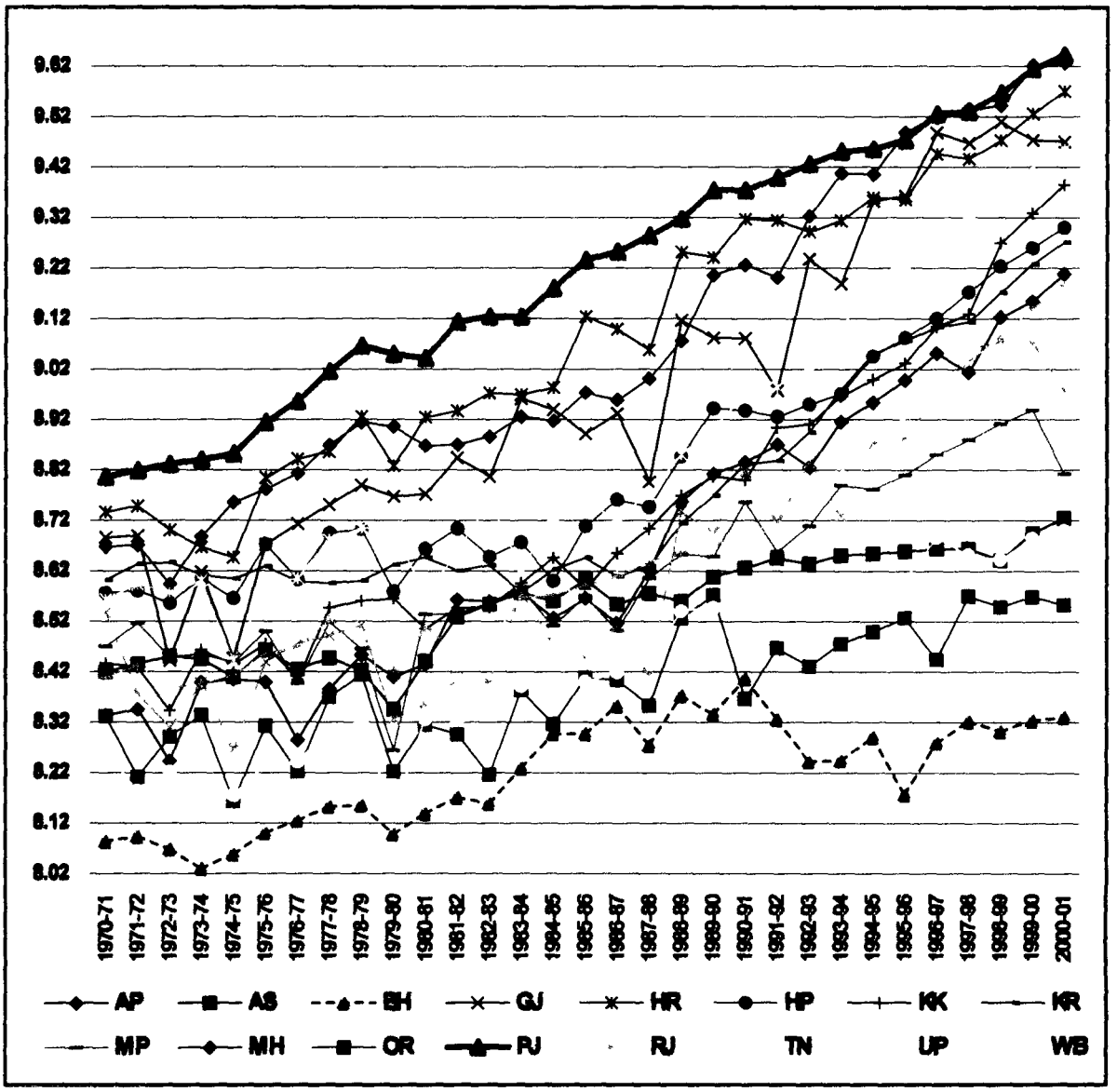
On the other end, in early 1970s four poorest states namely Bihar, Orissa, Uttar Pradesh and Andhra Pradesh continued to maintain their positions till the end of 1990s except Andhra Pradesh. Since middle 1980s the most populous northeastern state of Assam entered in the group of four poorest states. The curves for Kerala and Madhya Pradesh suggest relative down fall in income levels while Karnataka and Andhra Pradesh are the two states that improved remarkably during the study period of three decades. It is note worthy that in early 1970s the second, third and fourth richest states namely Haryana, Gujarat and Maharashtra had their per capita incomes, accounting roughly 93 per cent, 89 per cent and 87 per cent respectively of the richest state – Punjab. In contrast, four poorest states - Bihar, Uttar Pradesh, Orissa and Andhra Pradesh accounted for 48 per cent, 58 per cent, 62 per cent and 63 per cent respectively of Punjab in 1970-71. The scenario has changed sharply in the span of three decades. In 2000-01 the second , third and fourth richest states – Maharashtra, Haryana and Gujarat accounted for 99 per cent, 93 per cent and 84 per cent respectively of the richest state while four poorest states – Bihar, Orissa, Uttar Pradesh and Assam fell down to 27 per cent, 34 per cent, 39 per cent and 40 per cent respectively. If we further narrow our focus Bihar had per capita income little below 50 per cent of Punjab in early 1970s; reduced sharply to around 40 per cent during 1980s and deteriorated further to staggering 27 per cent in 2000-01.

Apparently, there is a trend of divergence in inter-state income disparity as the gap between two bold lines has widened over time. This trend is not only true for Punjab and Bihar. The income divergence is obvious for all the 16 major states of India which we shall examine in later part of this section.

Figure: 4.2.1

Real Per Capita Net State Domestic Product

[In Logarithmic (natural) Scale]



Source: Calculations, Based on Dataset from EPWRF (2003)

From our dataset of real PCNSDP at constant 1993-94 prices we shall now review the growth performances across the states in three successive decades namely 1970s; 1980s and 1990s as well as in the entire study period of three decades – from 1970-71 to 2000-01. The annualized growth rates of 16 included states are obtained by fitting log-linear growth curves. The state-wise annual rate of growth of per capita state income for three successive decades are shown in Figure: 4.2.2.

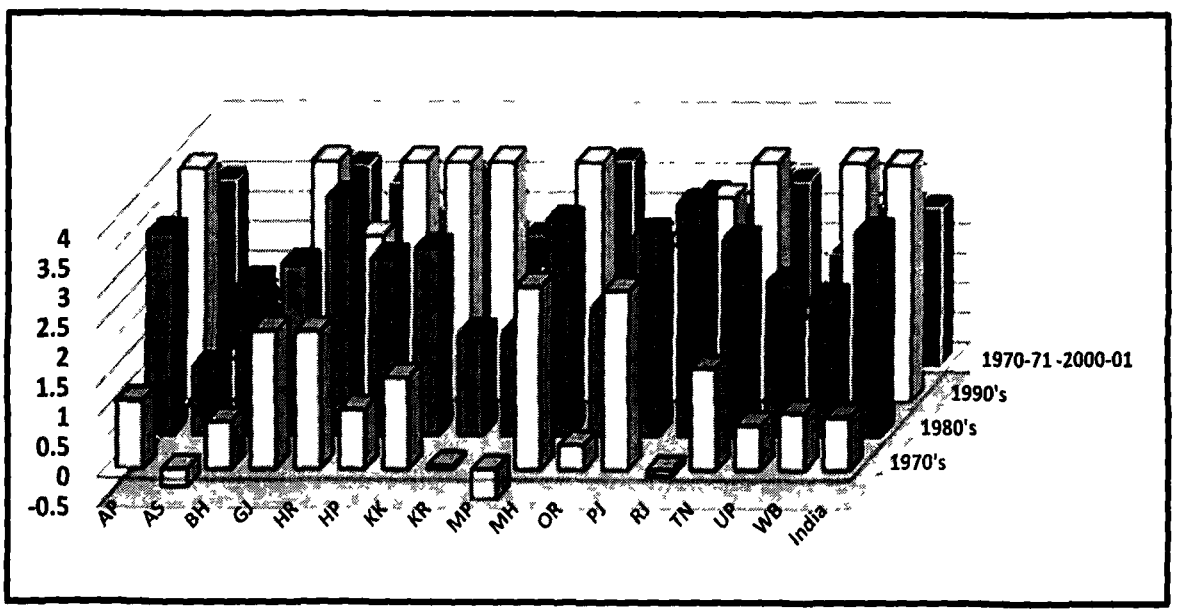
We mentioned earlier that till the end of 1970s the growth performance of the country as a whole was below moderate and especially in 1970s it was recorded as low as .89 per cent per annum. This has been typically reflected in our bar diagram. Maharashtra and Punjab are the only two states which could achieve growth rates over 3 per cent followed by Gujarat and Haryana over 2 per cent level. Tamil Nadu, Karnataka and Andhra Pradesh could manage growth rate above national average. On the other hand, among the poor performers Madhya Pradesh, Assam and Rajasthan witnessed negative growth. The coefficient of variation of growth rates across 16 included states is calculated about 76 per cent in 1970s indicating that decadal growth performance was quite uneven.

During 1980s the national growth rate accelerated steeply to 3.43 per cent from below 1 per cent in the previous decade. All 16 included states recorded positive growth with a minimum at 1.14 per cent in Assam. In fact, only three states namely Assam, Kerala and Madhya Pradesh recorded growth rates lower than 2 per cent per annum. Impressive performances were shown by Haryana (4 per cent), Rajasthan (3.89 per cent), Maharashtra (3.6 per cent) and Punjab (3.4 per cent), and of course by Andhra Pradesh (3.39 per cent) Tamil Nadu (3.29 per cent) and Karnataka (3.14 per cent) while moderate performances by Himachal Pradesh (2.97 per cent), Gujarat (2.85 per cent), Uttar Pradesh (2.58 per cent), Bihar (2.56 per cent), West Bengal (2.32 per cent) and Orissa (2.13 per cent). The coefficient of variation of growth rates across the states was much less (about 30 per cent) compared to the previous decade indicating that growth performance of the states was comparatively even in 1980s.

During the 1990s, when national per capita income growth rates accelerated further to 3.97 per cent per annum, Karnataka (5.74 per cent), Tamil Nadu (5.36 per cent), West Bengal (5.13 per cent), Gujarat (5.07 per cent), Kerala (4.56 per cent),

Maharashtra (4.37 per cent), Himachal Pradesh (4.13 Per cent) and Andhra Pradesh (3.88) are the states that achieved growth rates higher than all India average. However, two green revolution states of Punjab (2.62 per cent) and Haryana (2.76 per cent) suffered significant deceleration in 1990s. Other states which showed deceleration in the post-reform decade of 1990s relative to the previous decade are the traditionally poorer states – Bihar (-.05 per cent), Orissa (1.68 per cent) and Uttar Pradesh (1.43 per cent) and also Assam (.69 per cent) and Rajasthan (3.42 per cent). Though Madhya Pradesh (2.07 per cent) performed better than 1980s, the state's performance lies much below the national average. The inter-state variation of growth rates (50 per cent) had considerably widened in this decade compared to the 1980s.

Figure: 4.2.2: Widely Varying Growth Performances



***Source*: Calculations, Based on Dataset from EPWRF (2003)**

The growth patterns of the states in three successive decades are quite diverse and characterized by considerable instability. Almost all the states comparatively performed better in 1980s; however, few of them could sustain their performance in the post-reform decade of 1990s. The states like Karnataka, Tamil Nadu, West Bengal and Gujarat and to a certain extent, Kerala showed remarkable performance in the 1990s. Now we look at the average growth records of the states during the entire span of three

decades of our study: 1970-71 – 2000-01. The all India performance during this period is estimated as 2.68 per cent per annum. The states that performed better than nation average are Maharashtra (3.44 per cent), Gujarat (3.36 per cent), Karnataka (3.13 per cent), Tamil Nadu (3.1 per cent), Andhra Pradesh (3.1 per cent), Haryana (2.9 per cent) and Punjab (2.9 per cent). Moderate growth was achieved by West Bengal (2.51 per cent), Rajasthan (2.48 per cent), Himachal Pradesh (2.42 per cent) and Kerala (2.18 per cent) while Bihar (.96 per cent), Assam (1.07 per cent), Orissa (1.09 per cent) Madhya Pradesh (1.68 per cent) and Uttar Pradesh (1.9 per cent) emerged as poor performers. The coefficient of variation of average growth rates in the span of three decades is estimated as 35 per cent indicating considerable level of unevenness in growth performances.

4.3 Question of Regional Convergence

The vast literature on economic convergence typically refers to two concepts: β-convergence and σ-convergence. The weak (β) convergence implies mean reversion – a negative association between growth rates and initial (log) income while the strong (σ) convergence implies declined dispersion as well as means reversion of per capita income levels in the long-run. The β - convergence is, however, not a sufficient condition for σ - convergence. The relationship between these two concepts of convergence is discussed in detail in Appendix A.1.2. This section examines both concepts on the basis of our present data set for 16 included states.

4.3.1 Test of Convergence Hypothesis (H_{01})

The convergence equation in Sala-X-Martin (1996) sense can be approximated as

$$(\frac{1}{T})[Ln(\frac{y_{it+T}}{y_t})] = \alpha_y - \beta_y Ln(y_{it}) + u_{it} \ldots\ldots (4.3.1)$$

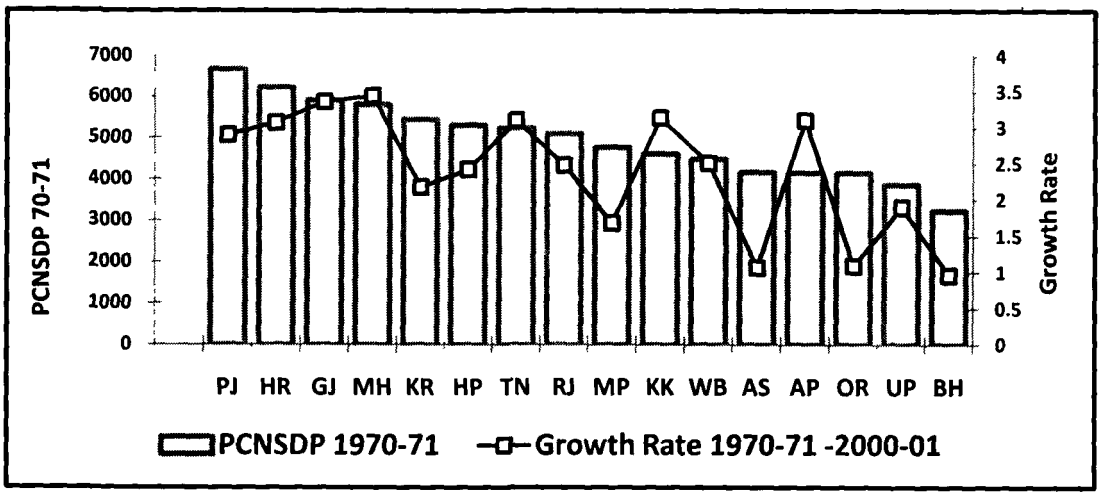
where the annualized growth rate $(\frac{1}{T})[\ Ln\ \frac{y_{it+T}}{y_{it}}]$ of per capita income is taken as a linear function of initial (logarithmic) income. In the backdrop of the equation 4.3.1 the hypothesis (H_{01}), we set in Section 3.3, can be interpreted as

$\mathbf{H_{01}}$: $\beta_y < 0$ and $\sigma_{yt+T} > \sigma_{yt}$, against $\mathbf{H_{11}}$: $\beta_y > 0$ and $\sigma_{yt+T} < \sigma_{yt}$

β_y is the speed of convergence and σ_{yt} is cross-regional dispersion of income at t.

The relationship between initial per capita income and average annual growth rate of real per capita income has remained a favorite tool for the researches that intend to examine the so-called convergence hypothesis. We first examine the relationship in Figure: 4.3.1 where the per capita NSDP of each state in 1970-71 and the respective state's growth rate for the entire study period of three decades are depicted using two different scales for Y-axis. The left of Y-axis measures PCNSDP of 1970-71 by the height of the bars while the right measures the growth rates. In general, states with low initial incomes witnessed low growth rates. Exceptions in this regard, are Andhra Pradesh and Karnataka. In contrast, states with comparatively higher initial incomes experienced higher growth rates, with notable exceptions of Kerala.

Figure: 4.3.1: Initial Income and Growth Rate
[1970-71 – 2000-01]



Source: **Calculations, Based on Dataset from EPWRF (2003)**

The equation 4.3.1 has been estimated using two methods. First [referred as Method (a)]; we estimate the relationship between annualized growth rates for each state between 1970-71 and 2000-01 and corresponding initial levels of income (PCNSDP) in1970-71; and second [referred as Method (b)] the same relationship pooling the data for three decades: 1970s, 1980s and 1990s. Therefore, the latter method of estimation takes

the estimated average annual growth rate of a particular state in a particular decade and the initial level of per capita income in the beginning year of the respective decade. For a particular state we have three pairs of values: PCNSDP of 70-71 and the growth rate in 1970s; PCNSDP of 80-81 and the growth rate in 1980s and finally, PCNSDP of 1990-91 and the growth rate in 1990s. The regression results of the equation are summarised in the Table: 4.3.1. Neither of the regressions confirms statistically significant evidence of absolute β-Convergence. In other words, the figures and the regression results suggest that weak convergence is limited for Indian states; instead absolute divergence more likely i.e. on average, initially poorer states growing at slower rates. The regression results (Table: 4.3.1) are presented graphically in Figures: 4.3.2 (a) and (b).

Table: 4.3.1

Results of Absolute β-Convergence Test

Method	N	α	β	$\bar{R}^2$	F-Statistic
(a)	16	-23.38 [-3 295]*	-3.04 [3 634]*	.449	13.205*
(b)	48	-24.6 [-4 308]*	-3.13 [4 733]*	.313	22.403*

Notes:

1 In all regressions growth rates are taken in per cent form
2 Figures in [ ] are t-statistics
3 *implies statistical significance at 1% level

If the dispersion of per capita income across regions/states increases over time i.e. if $\sigma_{y_{t+T}} > \sigma_{y_t}$ the case of *strong convergence* is ruled out. The possibility of *strong convergence* across our included Indian states is examined in Figure: 4.3.3 where the coefficients of variation in real per capita income across the states over the years are plotted in three categories:

- All 16 states taken together
- Group of richer states
- Group of poorer state

The groups of richer and poorer states are categorized according to their per capita income in 1970-71. The group of richer states comprises of Punjab, Haryana, Gujarat, Maharashtra, Kerala, Himachal Pradesh, Tamil Nadu and Rajasthan while the other group of poorer states is made up of Madhya Pradesh, Karnataka, West Bengal, Assam, Andhra Pradesh, Orissa, Uttar Pradesh and Bihar. Instead of standard deviation, we consider here coefficient of variation (defined as the standard deviation of PCNSDP divided by its mean) as a measure of dispersion due to a strong statistical reason. The standard deviation would only work if mean remains approximately same over time. When mean changes over time, it becomes pointless to look at standard deviation as it is naturally bigger in absolute term when mean has increased. In order to rectify this, one can consider the coefficient of variation over time to examine σ–convergence. Coefficient of variation normalizes the variable of interest to facilitate comparison of the same variable at different means (Neumayer, 2003). The trend of coefficient of variation in Figure: 4.3.3 suggests that while there is evidence of some degree of convergence between the richer states, this is not true for poorer states. However, the trend for all states taken together indicates that the coefficient of variation increases with the passage of time and that the degree of dispersion is marked during the post-reform period.

Figure: 4.3.2

Test of Absolute β-Convergence of PCNSDP

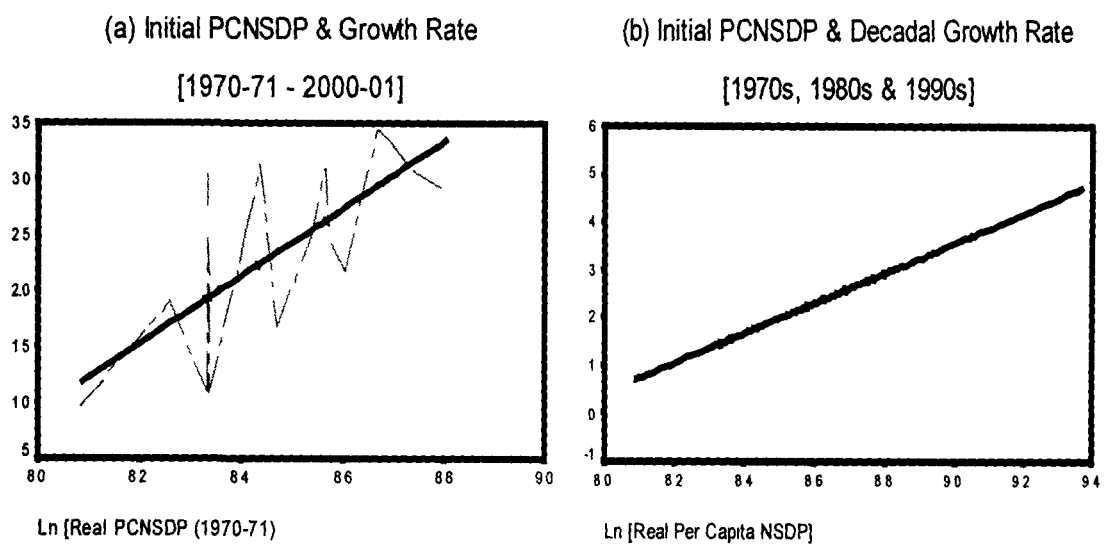
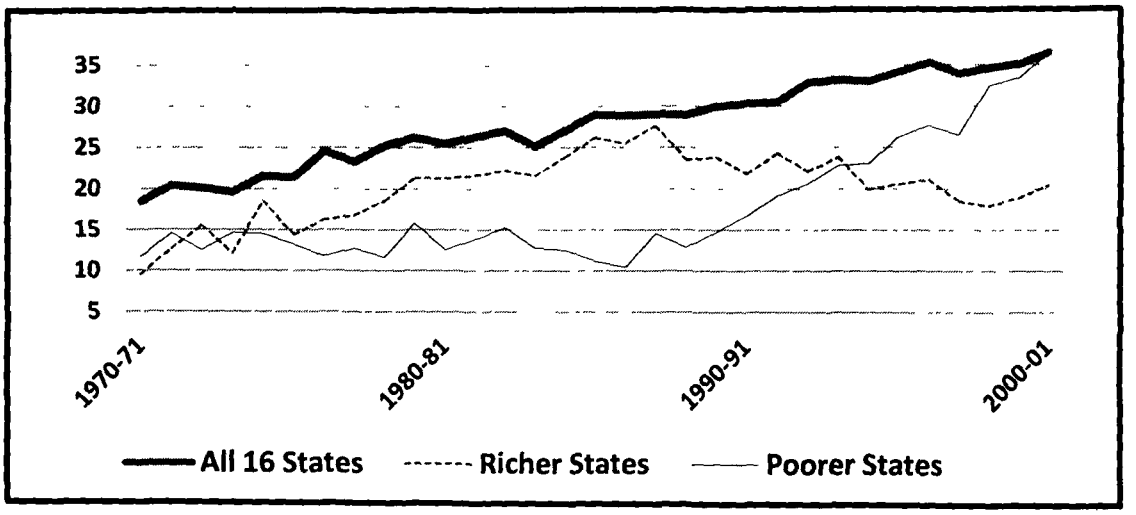


Figure: 4.3.3

Test of σ–convergence of PCNSDP



Source: **Calculations, Based on Dataset from EPWRF (2003)**

4.3.2 Ranks-Order Ratification

For further illustration of this issue we next focus on the mobility of individual states within the overall distribution by showing Spearman's rank order correlation coefficient for PCNSDP for four different years – each decade apart. And then the correlation matrix of state rankings in different years is computed in Table: 4.3.2 which gives correlations between state rankings in any two of the four block years – 1970-71, 80-81, 90-91 and 2000-01.

From the Table: 4.3.2 it is evident that there is a stable pattern of rank orders over time. On average, the high-ranked states in 1970-71 like Punjab, Haryana, Gujarat and Maharashtra continued to have high rank in the following years. In the span of three decades, two southern states of Andhra Pradesh and Karnataka improved their relative positions in the list of 16 included states by four points. The former moved from 13th position in 1970-71 to 9th position in 2000-01 while the latter from 10th to 6th position. Another southern state of Tamil Nadu and the western state of Maharashtra improved their position by two points. In contrast, Kerala, Madhya Pradesh and Rajasthan are the three states that fell down by 3 points. The rank correlation coefficients of states' relative

positions between different periods suggest that there is a high positive association. The consistently high values of the coefficients indicate a high degree rank-order stability in which a state's rank in initial years of our study is highly correlated with its ranks in later years. In other words, the rank analysis indicate strongly that through our study period states' changes in their relative positions are statistically insignificant: the richer states in 1970-71 were richer in 1980-81, 1990-91 as well as in 2000-01. This phenomenon is described in literature as limited convergence.

Table: 4.3.2

Rank of States in Real Per Capita NSDP

Andhra Pradesh	**AP**	**13**	**12**	**7**	**9**
Assam	**AS**	**12**	**11**	**13**	**13**
Bihar	**BH**	**16**	**16**	**15**	**16**
Gujarat	**GJ**	**3**	**4**	**4**	**4**
Haryana	**HR**	**2**	**2**	**2**	**3**
Himachal Pradesh	**HP**	**6**	**5**	**6**	**7**
Karnataka	**KK**	**10**	**10**	**10**	**6**
Kerala	**KR**	**5**	**6**	**8**	**8**
Madhya Pradesh	**MP**	**9**	**8**	**11**	**12**
Maharashtra	**MH**	**4**	**3**	**3**	**2**
Orissa	**OR**	**14**	**15**	**16**	**15**
Punjab	**PJ**	**1**	**1**	**1**	**1**
Rajasthan	**RJ**	**8**	**13**	**9**	**11**
Tamil Nadu	**TN**	**7**	**7**	**5**	**5**
Uttar Pradesh	**UP**	**15**	**14**	**14**	**14**
West Bengal	**WB**	**11**	**9**	**12**	**10**
1970-71		**1**	**.944**	**.906**	**.891**
1980-81			**1**	**.891**	**.906**
1990-91				1	.950
2000-01					1

Source: **Elaborated from Dataset**

4.4 Chapter Summary

This chapter discussed the trend in real per capita income and its growth rates in national and sub-national levels over a period of three decades. It is observed that the levels of disparity across the states have increased over the periods. The per capita income gap between richer and poorer states has widened over time. There is a widely varying growth performance across included states in all the three decades of our concern. The comparative variation in decadal growth performance indicates that the significant improvement in 1980s has taken a reverse turn in the decade of economic reforms. Both the standard tools of convergence analysis indicate a clear trend of diverging income during the period from early 1970s to late 1990s. This result is also substantially supported by the analysis of mobility of individual states within the overall distribution by testing the significance of Spearman's rank order correlation coefficient.

Chapter – V

Trend in Human Development

Chapter – V

Trend in Human Development

5.1 New Development Paradigm and Measures of Development

UNDP's effort to measure human development has perhaps been the first operationalisation of Amartya Sen's Capability approach which constitutes a comprehensive framework for conceptualizing human well-being and thereby, development. HDI measures capabilities in terms of life expectancy, educational attainments and income – three choices of human well-being that are referred to as *most critical* in human development literature (HDR, 1990). Additional choices such as political participation, guaranteed human rights, self respect, role of human agency in enhancing real freedoms etc are not reflected in HDI.

Haq (1997) describes HDI as a summary index representing human well being which is *still revolving*. As we mentioned earlier the formulation of HDI takes three *most critical* aspects of human life into account '*... for the people to lead a long and healthy life, to acquire knowledge and to have access to resources needed for a decent standard of living....*' HDR (1990:10). In a sense, HDI measures a country's average achievements in these three areas. Accordingly, the selected indicators to measure human capabilities for HDI are *life expectancy to measure longevity*; a measure of educational achievements based on a sum of *adult literacy rate* and *mean years of schooling* which was replaced by the *combined enrolment ratio in primary, secondary as well as in tertiary levels* and finally *an appropriately adjusted real GDP per capita (in PPP US $)* for command over resources. In this context, Neff (2007) regards HDI as a pragmatic approach which avoids measuring levels of achievements (or functionings) as a measure of well-being due to the practical difficulties of doing so. Of course, the income component of HDI is often taken as a proxy of functioning. The evolution of HDI formulation over the years has been discussed in Chapter-III. In the present study for all computational purposes the latest HDR (1999) methodology is followed.

5.2 Status of Human Development in Indian States

National achievements attribute average values of indices for all individuals living within a country. It indicates the specific problems and priorities of a country. However, national average trends to mask wide variation across the regions. A comparison across states in Indian context can suggest which states require most attention. Taking the stock of secondary information from different sources and following HDR (1999) method we compute the values of (attainment-wise) indices and composite indices for each individual state for four years: 1971, 1981, 1991 and 2001. The results are summarized in Appendix A.2. Following UNDP classification the low and medium human development states are shown in Map: 5.2.1. The spotted area of states indicates medium level of HD (i.e. HDI $\geq$ 0 .5) otherwise below the threshold. In first two years of our concern (i.e. 1971 and 1981) India scored the values of HDI which are classified in UNDP literature as low HD (i.e. below 0.5). Kerala was the only state in 1971; and Kerala, Maharashtra and Punjab were the three states in 1981 that could overcome the threshold of low HD. In 1991, India emerged as a member of medium HD nation. Ten states in the list of 16 included states – namely Andhra Pradesh, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Punjab, Tamil Nadu and West Bengal were the medium HD states. In 2001, five more states namely Assam, Madhya Pradesh, Orissa, Rajasthan and Uttar Pradesh entered into the group of medium HD. Bihar is the only state in 2001 which fails to cross the threshold. Here we carry out an analytical discussion of the levels of achievements by states and their evolution over the years. A set of five 3-dimensional column diagrams in Figure: 5.2.1 describes the decadal achievements of each of our included states in three attainments and two composite indices. These are referred in figure as

(a) Health index
(b) Educational index
(c) Non-Income Human Development Index
(d) Income Index
(e) Human Development Index

Map: 5.2.1

Levels of Human Development over Decades

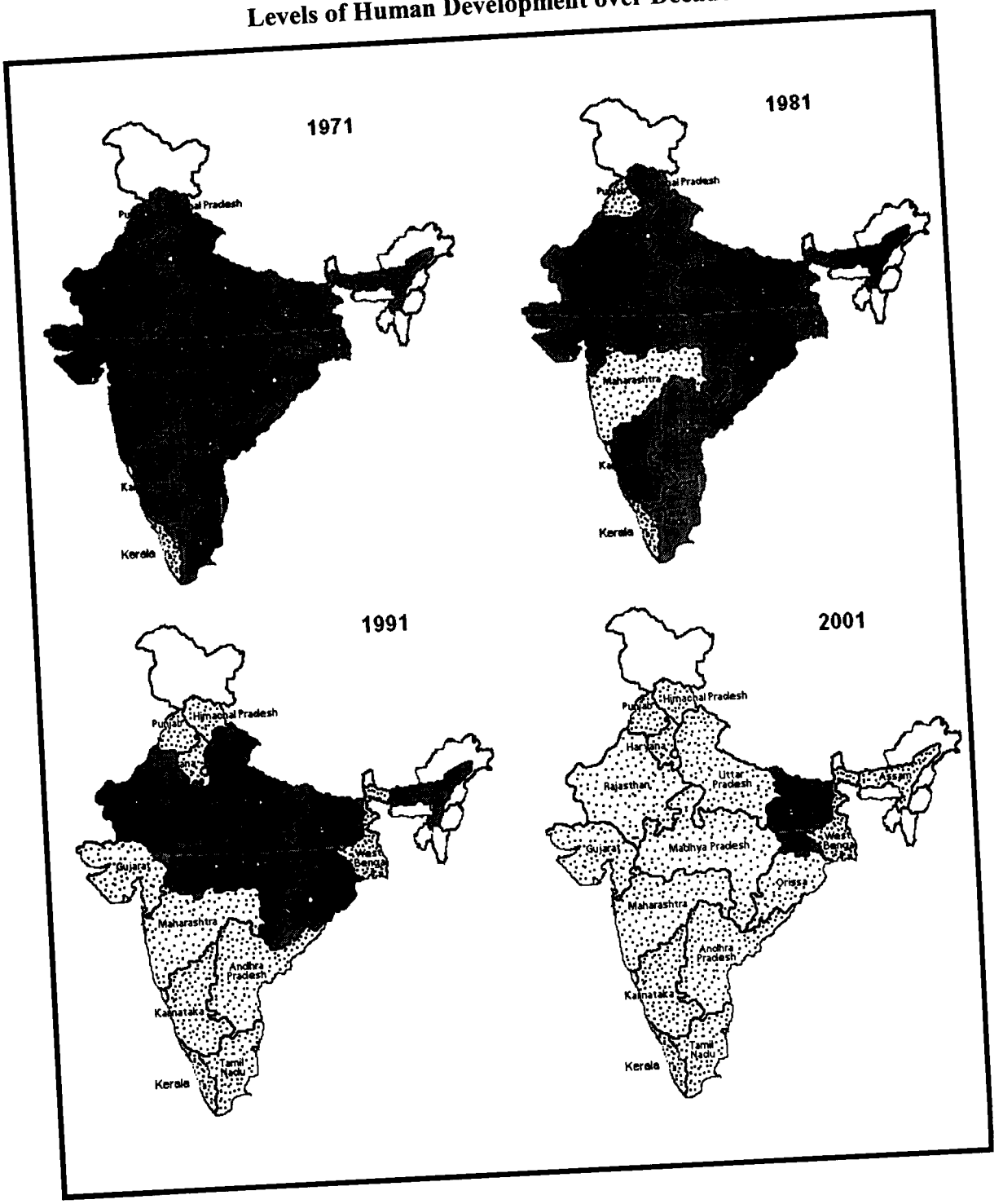


Figure: 5.2.1

Four-Decade Trend in Human Development

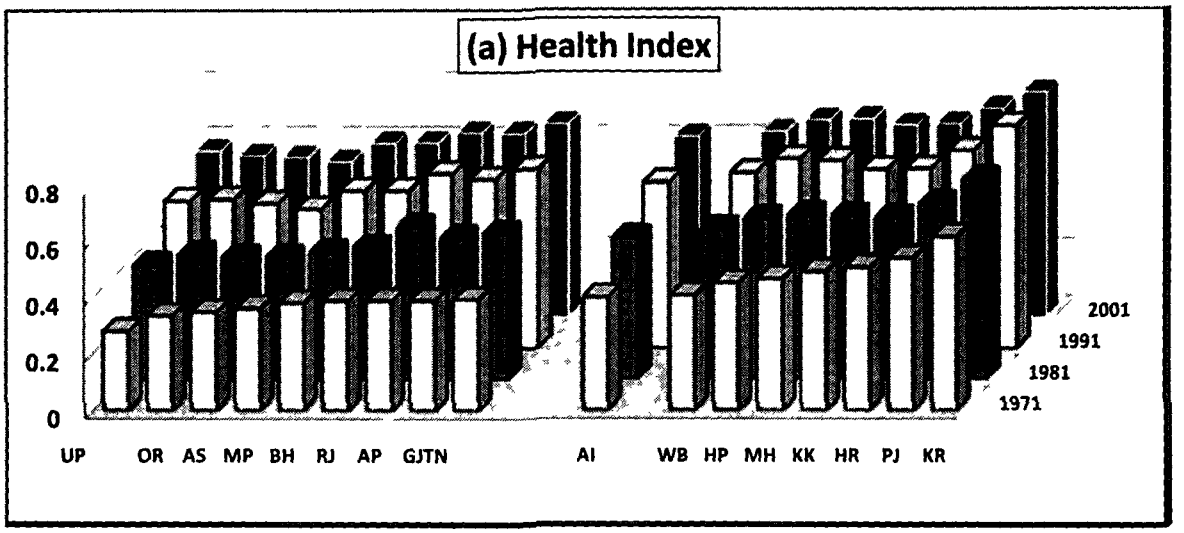
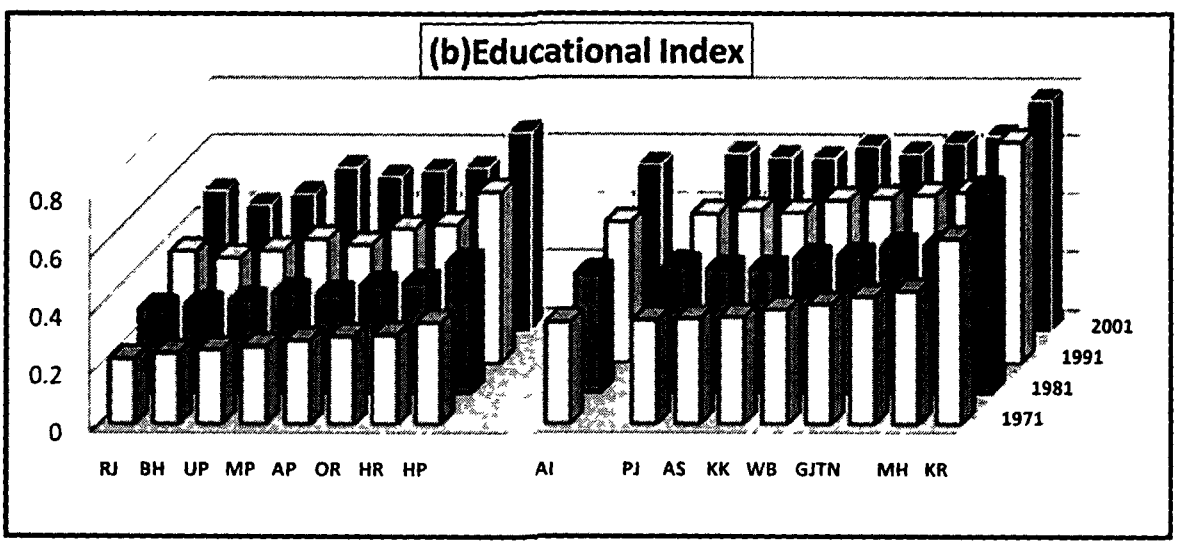


Figure: 5.2.1

Four-Decade Trend in Human Development

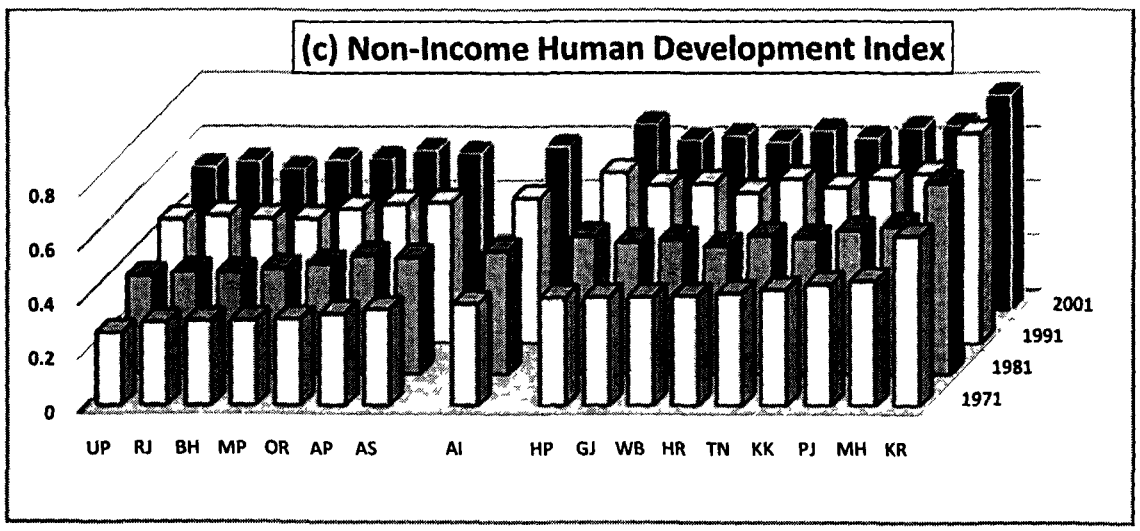


All these indices are displayed for four different years of our concern – each of which represents the first year of four successive decades. Each of our included states is depicted in horizontal axis of the diagram in ascending order according to their performances in the respective attainments in 1971 – the initial year of our study. There is also a reference of the national average in the diagram so that whether the states are

lagging behind or ahead of national average in 1971 can be viewed readily from the diagram itself. The height of the columns, measured in the vertical axis, implies the level of achievements by the particular state in a particular year. Finally, the depth axis of the three dimensional column diagrams refers the four years of our concern: 1971, 1981, 1991 and 2001.

Figure: 5.2.1

Four-Decade Trend in Human Development



Four-decade trend of states in health index along with a reference of national average are presented in Figure: 5.2.1. (a). In 1971, nine states – namely Uttar Pradesh, Orissa, Assam, Madhya Pradesh, Bihar, Rajasthan, Andhra Pradesh, Gujarat and Tamil Nadu are found to be below average performers in health index while remaining seven states have higher index values than the national average. The lowest index value in health attainment in 1971 was .280 in Uttar Pradesh and Highest .612 in Kerala. Thus, the ratio between the lowest, national average and the highest index value in 1971 was as high as **.28 : .398 : .612 : : 1 : 1.42 : 2.19.** The scenario does not seem to change significantly after three decades. Three states namely - Tamil Nadu, Andhra Pradesh and Gujarat moved above the national average which itself recorded an improvement from .398 in 1971 to .640 in 2001 – a rise of the index value by over 60 per cent. The lowest index value in 2001 is .552 in Madhya Pradesh while highest .802 in Kerala. The ratio

between the lowest, national average and the highest index value in 2001 has improved to **.552 : .640 : .802 : : 1 : 1.16 : 1.45.**

Almost similar trend is observed in Figure: 4.2.1 – (b) for educational index, which itself summarises the achievements of states in two educational indicators: adult literacy rate and combined gross enrolment ratio in primary, secondary and tertiary levels. The former is assigned two-third weight and the latter one-third weight in the computation of overall educational index. Eight states had adult literacy index in 1971 below national average. The highest index value in adult literacy was .691 in Kerala, the lowest .22 in Rajasthan against the national average of .341. The progress in this educational indicator in India during the period of three decades is marked by an increase of index value by a factor of about 72 per cent which implies a rise of adult literacy rate by over 24 per cent during the period. The index value of other educational indicator – combined enrolment ratio also improved in national level by a factor of about 54 per cent i.e. from .38 in 1971 to .584 in 2001. The highest index value in 2001 was .682 in Himachal Pradesh, lowest .446 in Bihar against the national average of .559. The overall educational index in 1971 was as low as .354 in national level – eight states namely, Rajasthan, Bihar, Uttar Pradesh, Madhya Pradesh, Andhra Pradesh, Orissa, Haryana and Himachal Pradesh remained below the national average while exactly eight states performed better than national average. The ratio between lowest index value (.227 in Rajasthan), national average (.354) and highest (.642 in Kerala) is obtained as .227 : .354 : .642 : : 1 : 1.56 : 2.83. After three decades two northern states of Himachal Pradesh and Haryana moved above the national average in 2001. The national average has improved by a factor of over 62 per cent in the span of three decades. The ratio between lowest index value in Bihar (.434), national average (.575) and highest in Kerala (.806) improved significantly to 1 : 1.33 : 1.86.

Now we turn to the composite index – Non-Income Human Development Index (NIHDI) which by definition is the mean of two non-income indices of health and educational attainments. Figure: 5.2.1 - (c) depicts the levels of achievements by the states in four successive decades. The national average in this composite index in 1971 .376 improved to .608 in 2001 – an increase of the index value by a factor of about 62 per

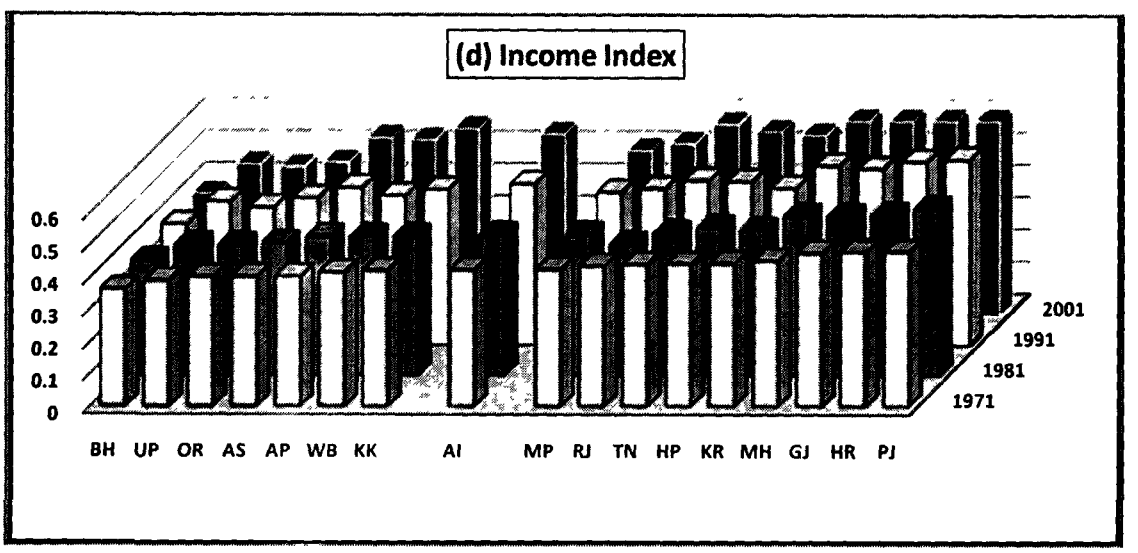
cent. The consistently best performer in all these years of our concern has been Kerala with a huge margin to national average. Initially, seven States namely, Uttar Pradesh, Rajasthan, Bihar, Madhya Pradesh, Orissa, Andhra Pradesh and Assam scored below national average and surprisingly, all these states remained below for all these years. The lowest index value in 1971 was scored by Uttar Pradesh and by Bihar in 2001. The evolution of the ratios between lowest, national average and highest index values over the decades is summarised below:

1971	0.269	(Uttar Pradesh)	:	0.376	:	0.627	1	:	1.4	: 2.33
1981	0.363	(Uttar Pradesh)	:	0.456	:	0.707 . .	1	:	1.26	: 1.95
1991	0.453	(Uttar Pradesh)	:	0.534	:	0.774 . .	1	:	1.18	: 1.71
2001	0.526	(Bihar)	:	0.608	:	0.804	1	:	1.16	: 1.53

The level of disparities, captured by the ratios of worst performer to national average, and worst performer to best performer, show a clear trend of improvement over the years.

Figure: 5.2.1

Four-Decade Trend in Human Development



The new development paradigm is often differentiated from other schools of social development due to its inclusion of income dimension as one of the three attainments of human well-being. Income, along with other two non-income dimensions

is allotted equal weight in the conceptualization of HDI; however, income is discounted with the belief that unlimited income is not essential for a decent level of living. We next incorporate the income dimension in our present analysis. Figure: 5.2.1–(d) presents the achievements of Indian states in income index. The national average of the index value had been .425 in 1971 with a lowest of .361 in Bihar and the highest of .482 in Punjab. Seven States namely – Bihar, Uttar Pradesh, Orissa, Assam, Andhra Pradesh, West Bengal and Karnataka had index values lower than national average. In 2001 as many as nine states are counted with index values below national average. Three new states - namely Kerala, Madhya Pradesh and Rajasthan have entered into the group of below average performers while Karnataka improved beyond national average – although the national average has improved by a factor of about 32 per cent. The ratios between the lowest, national average and the highest index values in all four years of our concern are presented below:

1971	0.361 (Bihar)	:	0.425	:	0.482		1	:	1.18	: 1.34
1981	0.358 (Bihar)	:	0.438	:	0.523	. .	1	:	1.22	: 1.46
1991	0.374 (Bihar)	:	0.5	:	0.577	. .	1	:	1.34	: 1.54
2001	0.374 (Bihar)	:	0.559	:	0.623		1	:	1.5	: 1.67

It is interesting to note that unlike non-income indices, income index ratios of our interest have been deteriorating over the years. Not only the gaps between lowest and highest index values have widened, the gaps between lowest income index and national average have worsened over the years.

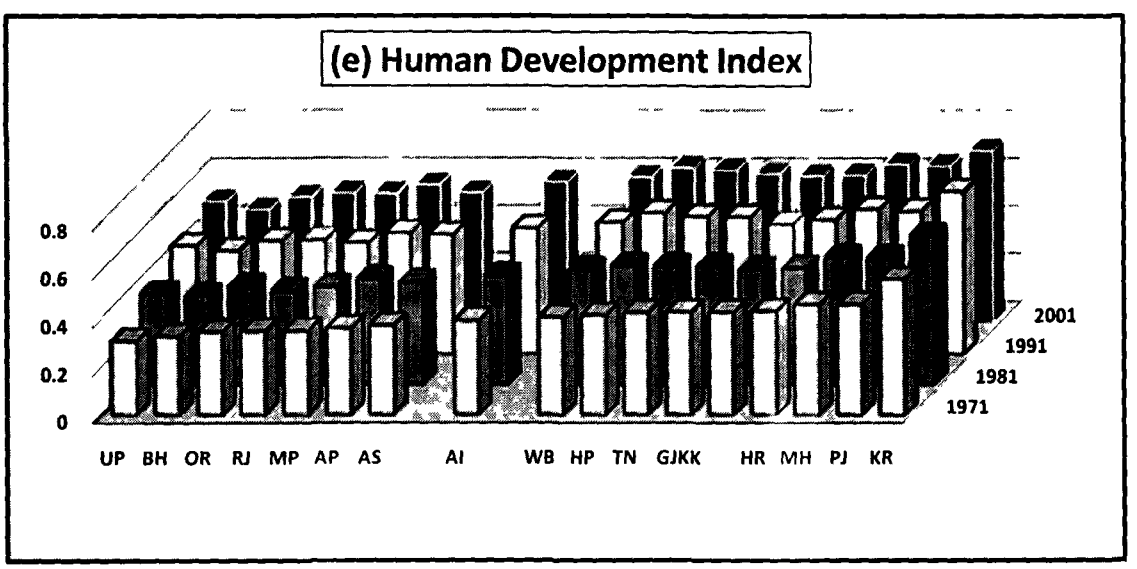
Finally, the achievements of states in the composite HDI are depicted in Figure: 5.2.1 – (e). In 1971 the national index value was as low as .392. During 1970s the national average improved by a factor of about 15 per cent and reached to .450 in 1981; further by a factor of 16 per cent on 1980s to reach .523 in 1991; and again by 13 per cent during 1990s. The national average of the index value in 2001 rose to .591. In first two years of our concern i.e. 1971 and 1981, India scored the values of HDI which are classified in UNDP literature as low HD (i.e. below .500). Kerala was the only state in 1971; and Kerala, Maharashtra and Punjab were the three states in 1981 that could overcome the threshold of low HD. In 1991, India emerged as a member of medium HD nation. Ten states in the list of 16 included states – namely Andhra Pradesh, Gujarat,

Haryana, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Punjab, Tamil Nadu and West Bengal were the medium HD states. In 2001, five more states namely Assam, Madhya Pradesh, Orissa, Rajasthan and Uttar Pradesh entered into the group of medium human development. Bihar is the only state in 2001 which failed to cross the threshold. The states that always performed below the national average in HDI score are Bihar, Uttar Pradesh, Orissa, Rajasthan, Madhya Pradesh, Andhra Pradesh and Assam. The ratios between the lowest, national average and the highest index values in all four years of our interest are summarised below. It is evident that the ratio between lowest index value and national average improved during 1970s; however, witnessed a clear reversal in the following decades although the ratio between the lowest and highest index values improved over the decades.

1971	0.309	(Uttar Pradesh)	:	0.392	:	0 566	1	:	1.27	: 1.83
1981	0.371	(Bihar)	:	0.45	:	0 622 . .	1	:	1.21	: 1.68
1991	0.43	(Bihar)	:	0.523	:	0.678 . .	1	:	1 22	: 1.58
2001	0.475	(Bihar)	:	0.591	:	0.722	1	:	1.24	: 1.52

Figure: 5.2.1

Four-Decade Trend in Human Development



The HDI is taken as simple mean of mean achievements in three selected attainments of human well-being. The same levels of HD are very much achievable with

very different achievements in three dimensions. The present formulation of HDI allows that the serious shortfall in educational index or in health index could easily be compensated by better performance(s) in other indicator(s). The national HDI score of .392 in 1971 was achieved with .398, .354 and .425 in health, education and income indices respectively. Thus, the ratios of each of these indices to overall HDI score in 1971 were 1.02, .90 and 1.08 respectively. The income index seemed to dominate over the non-income indices. The scenario had reversed dramatically by 2001 to 1.08, .97 and .95 respectively. The relative contribution of income index in overall HDI value has been the least.

Moreover, there are states which have same or very close health indices – for example Andhra Pradesh and Gujarat in 1971; and Haryana and Tamil Nadu in 2001, but due to very different performances in other two attainments they achieve very different scores in HDI. Even very close HDI scores – for example Madhya Pradesh and Orissa in 1981; and Gujarat and Tamil Nadu in 1991 can be attained with very different scores in three indices. Therefore, it appears that the formation of HDI in a year and the evolution of the relative dominance of different indices over the decades need to be scrutinized carefully.

Four line-diagrams, marked according to their reference year as 1971, 1981, 1991 and 2001 in Figure: 4.2.2, shed light on the relative achievements of states in three attainments and overall HDI scores in four different years. The line-diagrams in each year-specific figure present state-specific index values in three dimensions of well-being: health, education and income; as well as the overall scores in HDI – which by definition is the mean of these indices. There is also a reference of national average of each of these indices so that a comparison can readily be made from the diagram itself. Different symbols are chosen for different indices of health, education and income as well as for overall HDI.

The *figure-1971* makes it clear that in nation level income index stands over other two indices in 1971 resulting in a lower value of overall HDI. This is directly reflected in state-level performances: as many eight states namely – Andhra Pradesh, Assam, Gujarat, Madhya Pradesh, Orissa, Rajasthan, Tamil Nadu and West Bengal follow the national

trend. The next dominating attainment in 1971 was health. In six states of Bihar, Haryana, Himachal Pradesh, Karnataka, Maharashtra and Punjab health index is found to be the dominating index. Kerala was the only state where education is revealed as the dominating index. In national level the ratio between health, education and income indices in 1971 is computed as **1 : .889 : 1.068.**

Figure: 5.2.2

Human Development Index and Contributors – 1971

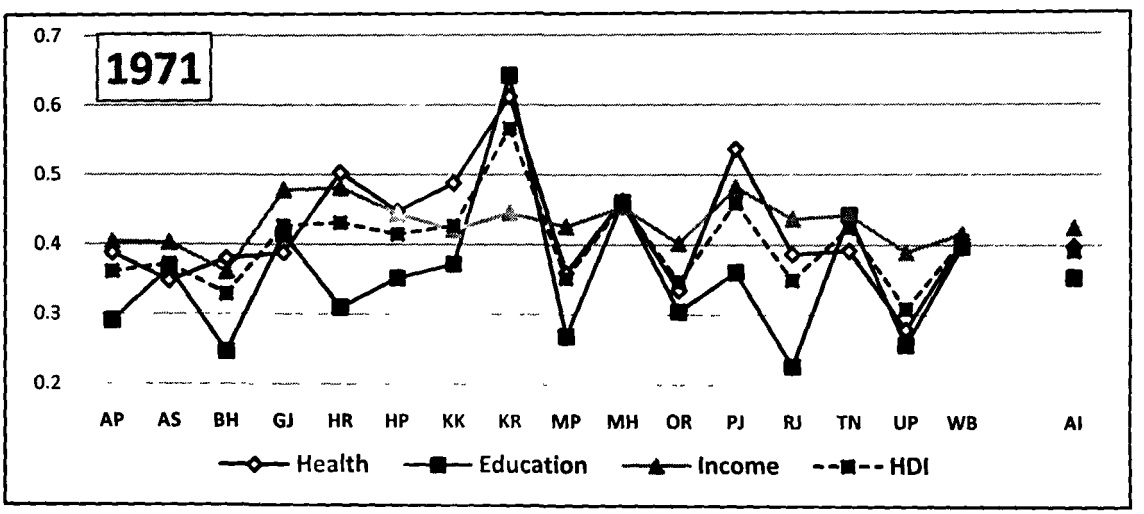


Figure-1981 reveals that health happened to be the dominating index - both in national as well as in state levels, excepting Madhya Pradesh and Uttar Pradesh. For these two states income still remained the dominating index. Overall income is found to be the second important dimension in HDI. In national level the ratio between health, education and income indices in 1981 has changed sharply to **1 : .824 : .876.** Again in 1991 health had emerged as the dominating dimension in the formation of HDI. Except Assam in all states the contribution of health index had been the highest as compared to other two indices. Income is revealed as the second dominating index. In national level the ratio between health, education and income indices in 1991 is computed as **1 : .826 : .890.** Finally, *Figure-2001* suggests that health retains its dominance over education and income, however, education has emerged as second dominant dimension in the formation

of HDI. Except the states of Assam and Kerala in all states health remained the dominating dimension. In national level the ratio between health, education and income indices is computed as **1 : .984 : .957.**

Figure: 5.2.2

Human Development Index and Contributors – 1981

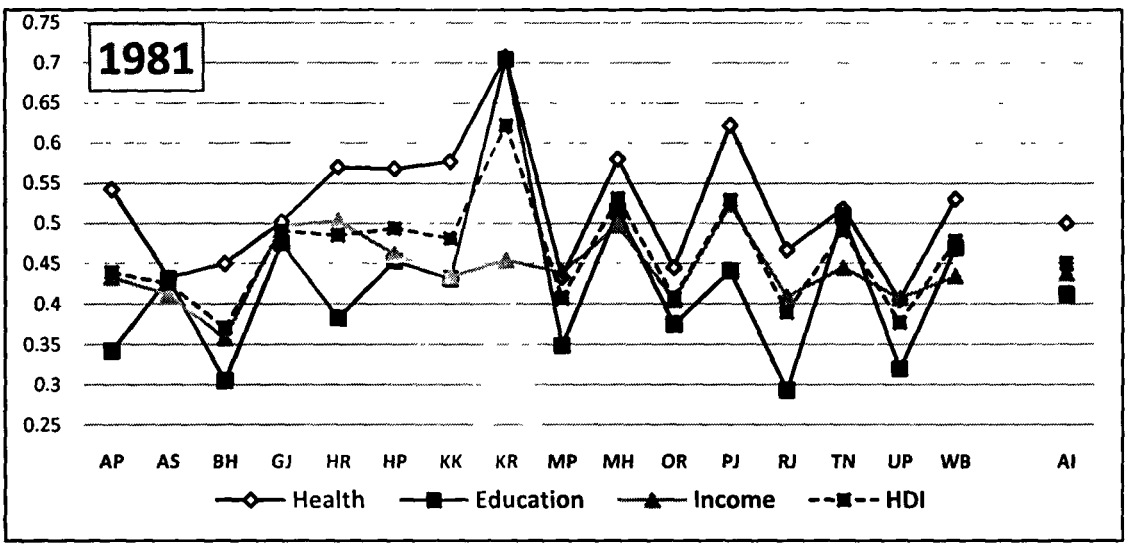


Figure: 5.2.2

Human Development Index and Contributors – 1991

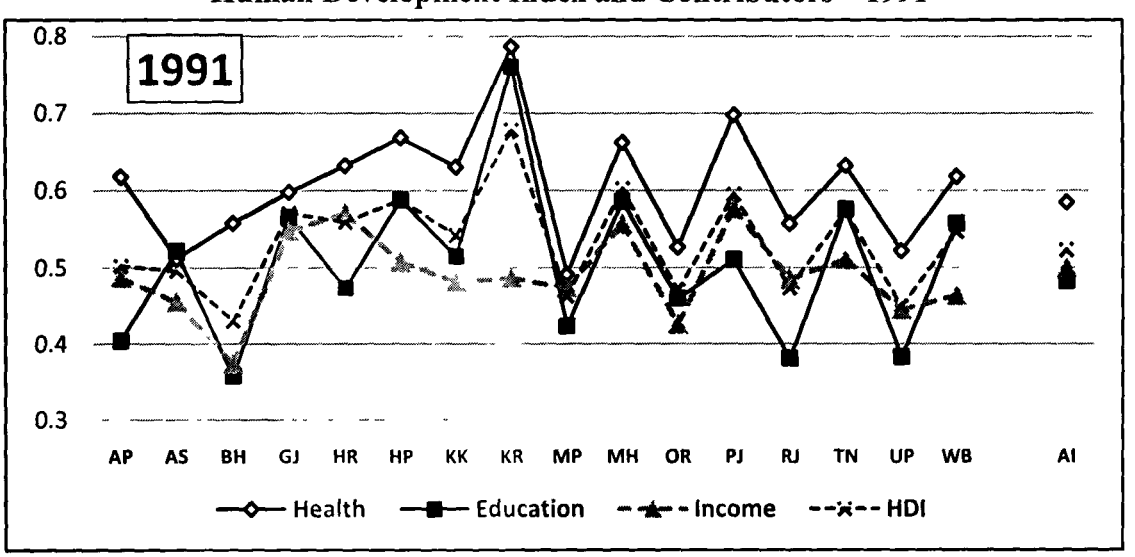
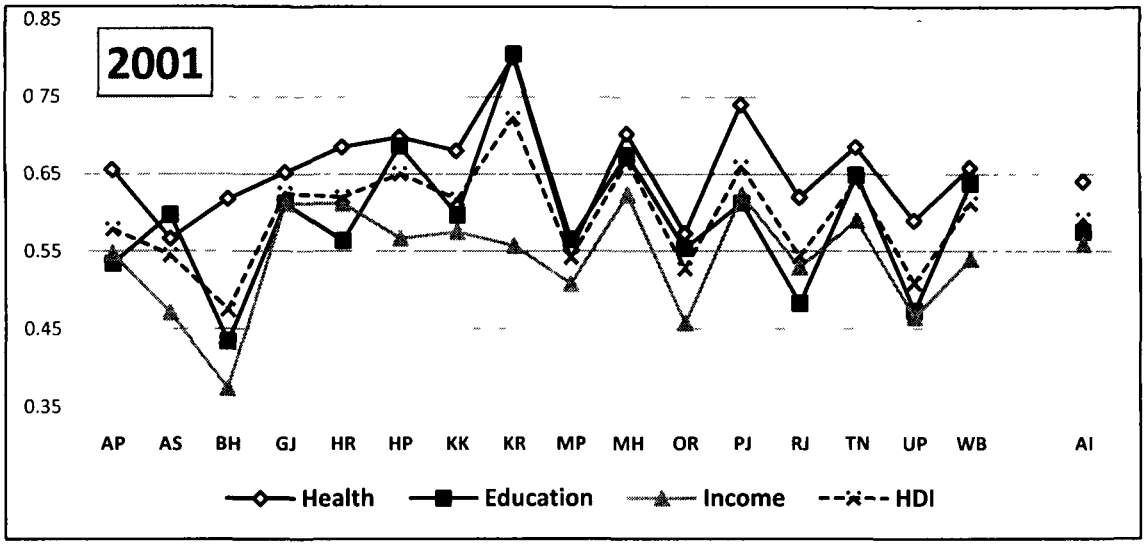


Figure: 5.2.2

Human Development Index and Contributors – 2001



5.3 Convergence of Human Development

Both concepts of convergence analysis: β–and σ–convergences, which are generally tested in the context of income, are equally relevant in case of the composite index – HDI as laws of diminishing returns are equally applicable to the income as well as non-income components of the index [Noorbakhsh (2006), Erdal et al. (2006)]. It is argued that for any region it is much more difficult to attain a higher level of life expectancy from an initially high level than a low level. Similarly, for a region that has already reached a very high level of educational attainment the scope of further improvements is far more limited compared to those which have low initial level of educational attainment. Hence, the concept of steady state rate of growth would be equally applicable to health and educational components of HD. Again, the importance of technological progress which remains as the backbone of neoclassical convergence analysis is also relevant to education and health indicators for improving the level of ALR, CER at primary, secondary and tertiary levels and life expectancy in the economies which are at a lower level of these indicators.

Table: 5.3.1

Regression Results of Absolute β-Convergence

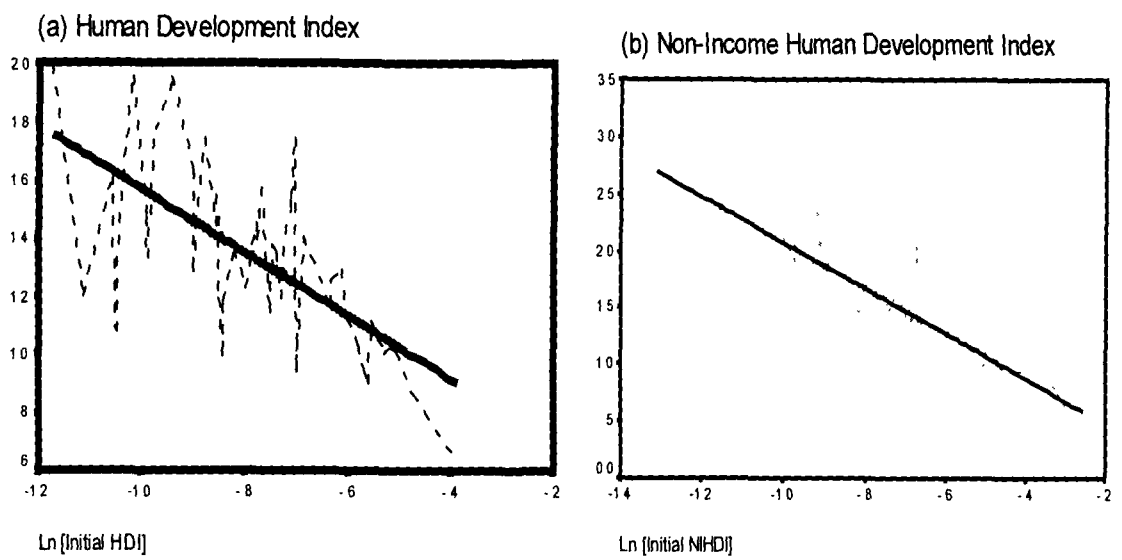
Indicator/Index	α	β	$\bar{R}^2$	F-Statistic
Life Expectancy at Birth	**10.92** [10.12]*	**2.51** [-9.35]*	**.65**	**87.438***
Adult Literacy Rate	**6.59** [6 59]*	**1.27** [-4.73]*	**.313**	**22.38***
Combined Enrolment Ratio	**8.34** [5.46]*	**1.82** [-4.44]*	**.285**	**19.743***
Gross State Domestic Product	**-18.48** [-4.10]*	**-2.82** [4.60]*	**.319**	**21.13***
Human Development Index	**.479** [3.30]*	**1.09** [6.00]*	**.427**	**35.99***
Non-Income Human Development Index	**.073** [594]*	**2.004** [-13 21]*	**.787**	**174.53***

Note:

1. In all regressions growth rates are taken in per cent form
2. Figures in [ ] are t-statistics
3. *implies statistical significance at 1% level.
4. Number of observations (N) = 48
5. Gross State Domestic Product implies per capita PPP US $.

Figure: 5.3.1

Absolute β-convergence of HDI & NIHDI



5.3.1 *Test of Hypothesis (H_{02})*

The formal test of absolute β-convergence of HD indicators as well as the composite index can be undertaken by estimating the following equation:

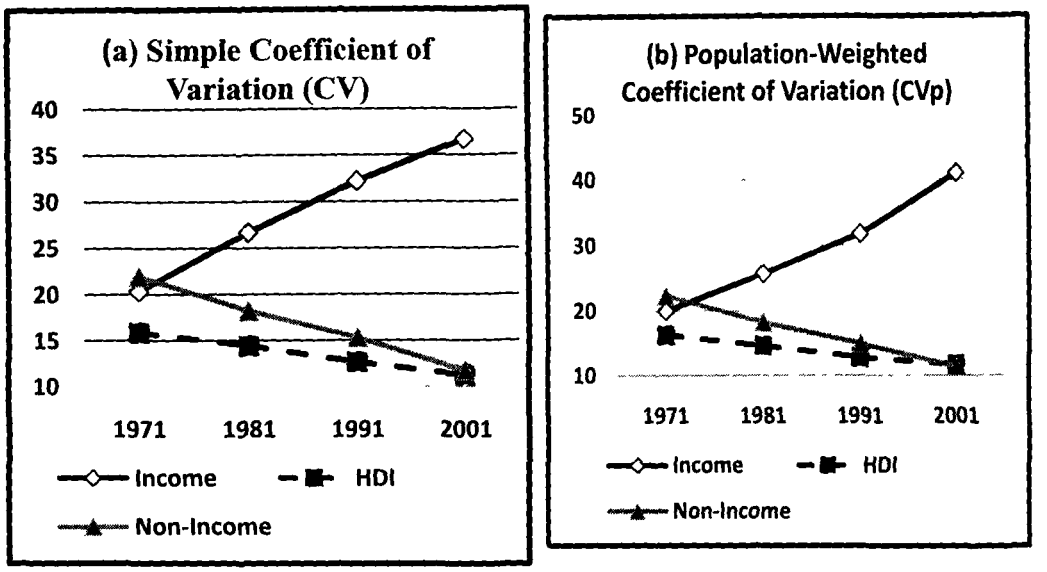
$$(\frac{1}{T})[Ln(\frac{h_{jt+T}}{h_t})] = \alpha_h - \beta_h Ln(h_{jt}) + \nu_{jt}$$

where annualized growth rates of HD indicators (like life expectancy, adult literacy rate, combined enrolment ratio. Per capita GSDP in PPP US $) or the annualized growth rates of composite index itself $(\frac{1}{T})[\log \frac{h_{jt+T}}{h_{jt}}]$ are taken as a linear function of initial (logarithmic) value of the indicator. If estimated trend of the equation is sloped negatively (i.e. if $\beta > 0$) the regions under consideration (j = 1, 2...N) are said to be absolutely β-convergent. The regression results of the equation for all indicators are summarised in the Table: 5.3.1. Except income component of HD (Per Capita GSDP in PPP US $), all regressions confirm statistically significant evidence of absolute β-Convergence. The speed of convergence is found to vary significantly across indicators. Though the values of adjusted R^2 in some cases are poor the coefficients are significant at 1 per cent level. The regression result of absolute β-convergence for the composite indices – HDI and NIHDI are also depicted in the Figure: 5.3.1.

The possibility of strong σ-Convergence of HD indicators/indices i.e. $\sigma_{ht+T} < \sigma_{ht}$ which is often taken as sufficient condition for convergence is examined in figure: 5.3.2. The left part of the figure [marked as (a)] plots the simple coefficients of variation of income and non-income indices as well as overall HDI for four years – each of which representing a decade apart. The right part of the figure [marked as (b)] depicts population-weighted coefficients of variation of same indices. In both cases there are clear evidences of strong convergence for non-income index and divergence for income index. However, the composite index HDI in which both income and non-income components are taken together show a long term trend of convergence.

Figure: 5.3.2

Test of σ - Convergence of Human Development



5.3.2 Rank-Order Ratification

For further examination of the issue of convergence of HD indices we next shift our focus on the mobility of individual states within the overall distribution by computing Spearman's rank order correlation coefficients of HDI and NIHDI for four different years – each year being the first year of four successive decades. Tables: 5.3.2 and 5.3.3 depict the rank of states in terms of HDI and NIHDI respectively for 1971, 1981, 1991 and 2001. In each case the correlation matrix of state rankings in different years is presented below the Rank Tables which computes the correlations between state rankings in any two of the four years. It is evident that there is a stable pattern of rank orders over time in both HDI and NIHDI as all correlation coefficients are found to be statistically significant. This implies that on average the high-ranked states of 1971 continued to maintain high ranks in the following years.

The states of Kerala Maharashtra and Punjab were the three best performers during 1971 in both HDI and NIHDI and retained their positions till 2001 in HDI; while replacing Punjab, Himachal Pradesh entered in the group of best three performers in terms of NIHDI since early 1990s. On the other end, Orissa, Uttar Pradesh and Bihar remained in the group of worst performers in both HDI and NIHDI throughout the period

of our study. During the span of focused three decades remarkable improvements both in terms of HDI and NIHDI are observed in case of Himachal Pradesh. The tiny state has improved its position in HDI by four points: from eighth position in 1971 to forth position in 1981 and maintained till 2001; and more impressively by seven points in NIHDI: from ninth to second position. Tamil Nadu in HDI ranking and West Bengal in NIHDI improved their respective positions by two points. Haryana and Karnataka are the two states that witnessed sharp deteriorations of relative positions in both the composite indices.

Table: 5.3.2

Rank of States in Human Development Index

Andhra Pradesh	AP	11	10	10	10
Assam	AS	10	11	11	11
Bihar	BH	15	16	16	16
Gujarat	GJ	6	5	6	6
Haryana	HR	4	7	7	7
Himachal Pradesh	HP	8	4	4	4	
Karnataka	KK	5	8	9	8
Kerala	KR	1	1	1	1
Madhya Pradesh	MP	12	13	14	13
Maharashtra	MH	3	2	2	2
Orissa	OR	14	12	13	14
Punjab	PJ	2	3	3	3
Rajasthan	RJ	13	14	12	12
Tamil Nadu	TN	7	6	5	5
Uttar Pradesh	UP	16	15	15	15
West Bengal	WB	9	9	8	9
1971		1	.929	.915	.932
1981			1	.985	.985
1991				1	.994
2001					1

***Source*: Elaborated from Dataset.**

The rank correlation coefficients of states' relative positions between different decades suggest that there has been a high positive association. The consistently high values of the coefficients in both HDI and NIHDI indicate a high degree rank-order stability in which a state's rank in initial years of our study is highly correlated with its ranks in later years. The advanced states in 1971 remained, on average, advanced in 1981, 1991 and 2001. Therefore, the rank analysis of states in HDI and NIHDI do not indicate clear evidence of convergence across states over last three decades.

Table: 5.3.3

Rank of States in Non-Income Human Development

State	Code	Rank			
		1971	1981	1991	2001
Andhra Pradesh	AP	11	10	11	10
Assam	AS	10	11	10	11
Bihar	BH	14	15	14	16
Gujarat	GJ	7	8	7	8
Haryana	HR	6	9	9	9
Himachal Pradesh	HP	9	5	2	2
Karnataka	KK	4	6	8	7
Kerala	KR	1	1	1	1
Madhya Pradesh	MP	13	13	15	13
Maharashtra	MH	2	2	3	3
Orissa	OR	12	12	12	12
Punjab	PJ	3	3	4	4
Rajasthan	RJ	15	14	13	14
Tamil Nadu	TN	5	4	5	5
Uttar Pradesh	UP	16	16	16	15
West Bengal	WB	8	7	6	6
Matrix of Rank Correlation Coefficient					
1971		1	.947	.871	.871
1981			1	.962	.976
1991				1	.979
2001					1

Source: Elaborated from Dataset.

We have arrived at a situation where both measure of convergence - β and σ indicate the evidences of convergence in HDI and NIHDI; however, the analyses of the mobility of individual state within the overall distribution of the indices do not support the existence of convergence. The phenomenon may be possible theoretically in the sense that initially backward states are growing at a faster rate as compared to the initially advanced states without any major change of their relative positions. But the most practically possible conclusion of this phenomenon can be drawn from the fact that non-income indicators of human development, namely life expectancy, adult literacy and combined enrolment ratio have strictly rigid upper limits to achieve unlike the unlimited upper limit of income indicator. In a very rare occasion we see life expectancy to cross 80 years even in developed nations. Similarly, the upper limits of educational indicators are bound at 100 per cent. It is noteworthy that Kerala, during the span of three decades could improve the life expectancy by 11.4 years while Uttar Pradesh by 18.6 years, Orissa by 14.3 years, Assam by 13.1 years and Madhya Pradesh by 11.5 years. Again in case of adult literacy rate, Kerala's improvements in three successive decades were about 24 per cent, 10 per cent and 1.3 per cent against the national improvements of 9 per cent, 8 per cent and 10 per cent respectively.

Hence, the inevitable question mark on the issue of convergence of human development indicators/indices across Indian states remains whether the states have been really converging or the apparent converging trend is the result of comparatively high rate of diminishing returns of human development indicators.

5.3.3 Shortfall Reduction Trend

A basic problem in capturing progress in particular indicator or in overall HDI over two periods consists of the assumption of the functional form underlying the relationship between the HD level and the determinants. If the absolute change in HDI between two periods is taken as a measure of progress we assume a linear relationship between the outcome variable and the covariates which simply imply that an increase in HDI from .200 to .500 would be the same achievement as an increase in HDI from .500 to .800. The shortfall reduction of a particular state in a particular period can be

measured by the magnitude of change over the period in the percentage of deficiency of state's level of performance relative to the best performing state. For jth state, the shortfall in HD at period t can be defined as

$$S_t = \frac{Best\ (h_t) - (h_{jt})}{Best\ (h_t)}$$ Where h_{jt} is the HDI score of jth state at period t and Best (h_{jt}) for the best performing state at period t.

The shortfall reduction during T can then be obtained as

$$SR_T = \left[\frac{Best\ (h_t) - (h_{jt})}{Best\ (h_t)} - \frac{Best\ (h_{t+T}) - (h_{jt+T})}{Best\ (h_{jt+T})}\right]$$ and is multiplied by 100 for the expression on percentage. However, the rate of shortfall reduction (r_T) in a particular period must take the initial shortfall into consideration. Hence, the rate of shortfall reduction (r) at T is obtained as

$$r_T = \left[\frac{SR_T}{S_t}\right] * 100$$

After minor algebraic modification the above equation takes the form

$$r_T = \frac{[(h_{jt+T})\ Best\ (h_t) - (h_{jt})\ Best\ (h_{jt+T})]}{Best\ (h_{jt+T})[\ Best\ (h_t) - (h_{jt})]} * 100$$

The magnitude of HDI-shortfall has reduced over the decades – both in national average as well as in state levels. The situation is depicted in Figure: 5.3.3. The overall HDI-shortfall in national level during 1971 was as high as 30.74 per cent. The variation across the states was also remarkably high – over 45 per cent in Uttar Pradesh to about 19 per cent in Punjab and Maharashtra. The states that had shortfall over national level in 1971 were Uttar Pradesh (45.41 per cent), Bihar (41.87 per cent), Orissa (38.69 per cent), Rajasthan (38.16 per cent), Madhya Pradesh (37.81 per cent), Andhra Pradesh (36.22 per cent) and Assam (34.28 per cent). In 1981 the national average reduced to about 28 per cent – Bihar with 40.35 per cent had become the worst performer among all included states. In 1991 national average of HDI-shortfall was about 23 per cent which further reduced to 18 per cent in 2001. The highest shortfall was in Bihar (34.21 per cent), followed by Uttar Pradesh (29.50 per cent), Orissa (26.87 per cent), Madhya Pradesh

(24.93 per cent), Rajasthan (24.65 per cent), Assam (24.52 per cent) and Andhra Pradesh (19.81 per cent). HDI-shortfall in better performer states ranges from 15.24 per cent in West Bengal to 7.76 in Maharashtra.

It then follows that the achievements of states in HDI shortfall reduction over the decades are overwhelmingly different from their relative position in HDI-shortfall levels. However, the rate at which the states were able to reduce their existing shortfall in HDI must take the initial level of HDI-shortfall into account as the law of diminishing returns prevails in case of HDI. Otherwise the entire estimation process will seriously underestimate the performances of the initially better performer states. The rate of HDI-shortfall reduction in a sense captures the differences of HDI-shortfall of a state between two periods relative to the state's HDI-shortfall in the former period. The rates of HDI-shortfall reduction by different states during 1971-2001 are shown by the smooth curve in Figure: 5.3.4. The right of Y-axis measures the rate of shortfall reduction. During the span of three decades Himachal Pradesh with 62.62 per cent emerged as the highest shortfall reduction state; followed by Maharashtra (58.97 per cent), Tamil Nadu (54.97 per cent), Punjab (53.41 per cent) and West Bengal (46.11 per cent). On the other end, the poor performers in terms of the rate of HDI-shortfall reduction between 1971 and 2001 are Bihar (18.30 per cent), Assam (28.48 per cent), Orissa (30.56 per cent) and Madhya Pradesh (34.06 per cent).

Figure: 5.3.4 actually presents the comparative relationship between the existing HDI-shortfall in 1971 and the rate of HDI-shortfall reduction during 1971-2001 (measured by the smooth curve). In general, the states with higher initial HDI-shortfall had reduced their shortfall at a slower rate. The performances of the states in the HDI-shortfall reduction with a reference to their respective initial shortfall have been outstanding in Himachal Pradesh, Andhra Pradesh, and West Bengal, and to a certain extent in Uttar Pradesh. The reverse situation is observed in Case of Haryana, Assam and Karnataka. Therefore, the inference of converging HDI trend across Indian states during our study period has, to a certain extent, been illusionary as initially backward states on average improved slowly.

Figure: 5.3.3

HDI-Shortfall in States (%)

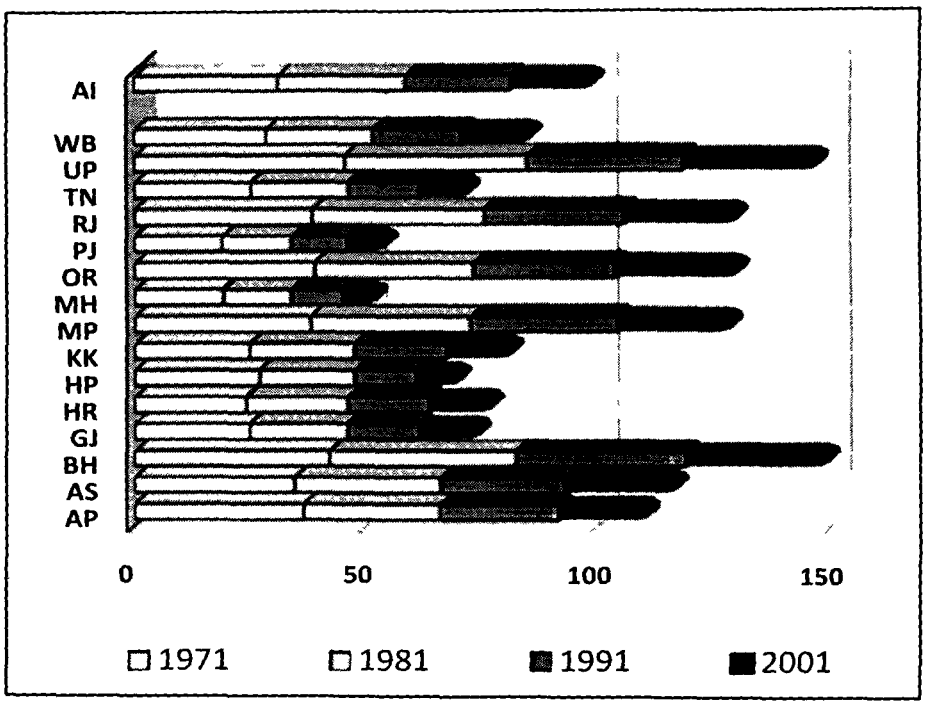
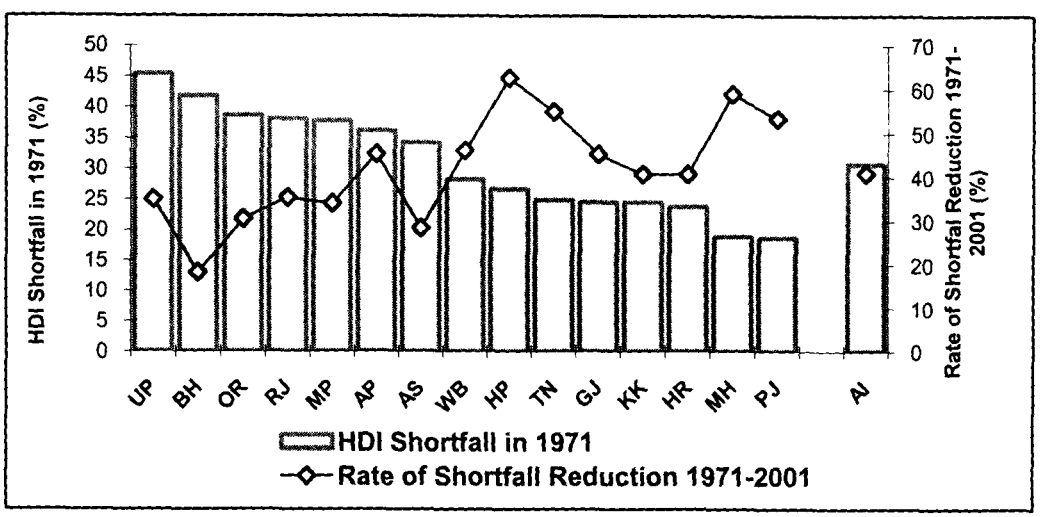


Figure: 5.3.4

Initial HDI-Shortfall and Rate of Shortfall Reduction [1971 – 2001]



5.4 Chapter Summary

Taking the stock of information from the secondary sources this chapter measured the levels of human development across included states for four years: 1971,'81, '91 and 2001 – each a decade apart. The same HDR (1999) methodology is used to compute HDIs for all the years. The obtained HDI values for each state and for each year are strictly comparable to global values. The possibility of regional convergence in levels of composite indices (HDI and NIHDI) as well as in levels of individual components is examined under the light of conventional methods. Both types of β – and σ – convergences indicate a clear evidence of converging trend for HDI, NIHDI and for all non-income components while income component of HDI (PCGSDP in PPP US $) has been clearly diverging over the years. However, the converging trend of HDI levels is not supported by Spearman's rank order correlation coefficients indicating that the states are moving closer in terms of HDI values while there is statistically insignificant change in their relative positions over the years. On the contrary, the performance of the states in terms of HDI-shortfall reduction raises question on the converging trend of human development as states with high initial shortfall, on average, improved slowly.

Chapter – VI

Regional Disparity and Polarisation

Chapter – VI

Regional Disparity and Polarisation

This Chapter measures empirically the existing levels of interstate disparities in economic attainment and human development indicators/indices. Taking the stock of different index values, computed in the previous two sections, we estimate a number of inequality and polarisation measures for four different years: 1971, 1981, 1991 and 2001.

6.1 Indian States in Global Perspective

Before entering into the discussion of four-decade inequality trend of economic and HD indicators the position of Indian states in 2001 are compared in global perspective. In Figure: 5.2.1 [(a) – (e)] of Chapter-V it apparently looks comfortable in terms of regional disparity - excepting Bihar all major states in the country fall into the category of medium HD. Hopefully, Bihar would not take much time to cross the threshold. However, one should recall that *medium human development* as per UNDP's classification has been a wide-ranging criterion. According to HDR (2003) which computes HDI for the year 2001, about 50 per cent of the total nations in the list of 175 qualify the criterion. The relative positions of these *medium human development* nations range from 56 in Antigua and Barbuda (with HDI value of .798) to 141 in Togo (with HDI value of .501). Since the values of HDI for the year 2001, we have obtained for each of our included states, are strictly comparable to HDR (2003) global scores we must explore the opportunity to compare the relative positions of Indian states in global scenario. Table: 6.1.1 first identifies the nations from HDR (2003: 237-240) that score equivalent or close in HDI to each of our included states. This effort is an attempt to identify the hypothetical rank of each of our included states in HD. The next question, dealt in the same table, is that how far the state of our concern stands away from the average of 94 developing countries in HDI as well as in NIHDI and Income Index. This would clear the picture of the state's achievements in two components of HDI. The regional variation in HDI in 2001 across Indian states ranges between .722 in Kerala and

.475 in Bihar. The closest achievements are observed in China (with HDI of .721) and Yemen (with HDI of .470) with the respective ranks of 104 and 148 in the list of 175 countries. Therefore, when India as a nation obtains the rank of 127 in 2001 the states are scattered over a range of 45 nations of the world.

Table: 6.1.1

Indian States in Global Perspective: 2001

States		Closed Global Score		Lagging Behind or Ahead of the Average of the Developing World		
		Country	Rank	HDI	NIHDI	Income Index
1	Andhra Pradesh	Vanuatu	128	- 076	- 082	- 062
2	Assam	Swaziland	133	- 11	- 094	- 138
3	Bihar	Yemen	148	- 18	- 151	- 235
4	Gujarat	Namibia	124	- 03	- 045	003
5	Haryana	Botswana	125	- 035	- 052	003
6	Himachal Pradesh	Guatemala	119	- 005	015	- 042
7	Karnataka	Botswana	125	- 038	- 038	- 034
8	Kerala	China	104	067	127	- 052
9	Madhya Pradesh	Papua New Guinea	132	- 113	- 118	- 101
10	Maharashtra	Honduras	115	011	011	014
11	Orissa	Comoros	134	- 127	- 113	- 152
12	Punjab	Mongolia	117	004	0	014
13	Rajasthan	Swaziland	133	- 111	- 125	- 08
14	Tamil Nadu	Nicaragua	124	- 014	- 01	- 019
15	Uttar Pradesh	Lesotho	137	- 146	- 145	- 144
16	West Bengal	Botswana	125	- 043	- 029	- 069
India			**127**	**-.064**	**-.069**	**-.05**
Average of 94 Developing Countries				**.655**	**.677**	**.609**

Source: **Elaboration, Based on a Comparison between Table-A.2.5 in Appendix and Table-1 HDR (2003), 237-240**

Note: The (-) sign indicates that the state is lagging behind.

Indian performance as a nation remained below the average of 94 developing countries in both income and non-income components of HDI, resulting in a below-average performance. Three states – Kerala, Maharashtra and Punjab could manage their overall scores in HDI higher than the said average. However, Himachal Pradesh, Kerala and Maharashtra performed better in non-income component while Gujarat, Haryana,

Maharashtra and Punjab in income component. A number of important observations can be drawn here: first, despite below average performance in income front Kerala could cross the average of HDI. Second, two better performers in income front Gujarat and Haryana are still lagging behind in HDI. Third, with higher score in non-income component Himachal Pradesh failed to cross the average of HDI. Finally, Maharashtra is the only state in the country that remained above the said average in both fronts.

6.2 Measures of Dispersion and Inequality

The concept of equality is a pivotal issue in development studies which describes a distribution or a state of distribution. Equality measures examine how different is the distribution for different groups of people, however, does not answer whether the distribution is good or bad, or judge whether it is reasonable or unreasonable. There are a number of equality/inequality measures that are often used in social science researches. The concept and formulation of the measures of dispersion and inequality, we worked out in the present study, have been discussed in detail in Appendix: A.1.4. For each year of our concern we have calculated three measures of dispersion: Simple Coefficient of Variation (CV), Gini of Concentration (G_c) and Population-weighted Coefficient of Variation (CV_p); two inequality measures: Gini Coefficient (G_p), General Entropy (GE for c = 0, 1 and 2). As Bourguignon inequality index (L) is same as GE: $_{c=0}$ the values of L are not repeated in the Table. All measures are calculated for a number of non-income indicators viz. life expectancy at birth, adult literacy rate, combined enrolment ratio as well as for the income indicator namely PCGSDP; and also for two composite indices namely HDI and NIHDI. These measures we have reported in the Table: 6.2.1and Table: 6.2.2.

Both measures of (simple) dispersion, depicted in Table: 6.2.1, show almost similar trend for almost all indicators. In both measures two educational indicators viz. ALR and CER were at maximum in early 1970s, however, improved significantly over decades. On the other end, the indicator that captures attainment in access to resources i.e. the income component of HDI was moderate in 1971, but worsened sharply in later periods. The overall composite index – HDI improved its coefficient of variation from

15.87 per cent in 1971 to 11.23 per cent in 2001 and Gini of concentration from 8.57 per cent to 6.34 per cent during the span of three decades. For both measures the decade of 1980s has been revealed as the best decade in terms of the reduction in disparity.

Table: 6.2.1
Simple Measures of Dispersion and Inequality

Indicators	Coefficient of Variation (CV)			
	1971	1981	1991	2001
Life Expectancy at Birth	0.1005	0.087	0.0759	0.0625
Adult Literacy Rate	0.3235	0.2823	0.2568	0.1774
Combined Enrolment Ratio	0.2377	0.1819	0.1527	0.1308
GSDP	0.2035	0.2671	0.3219	0.3669
HDI	0.1587	0.1443	0.1267	0.1123
NIHDI	0.2196	0.1825	0.1533	0.1172
	Gini Coefficient of Concentration (Gc)			
	1971	1981	1991	2001
Life Expectancy at Birth	0.055	0.0485	0.042	0.0349
Adult Literacy Rate	0.1657	0.1442	0.1326	0.0931
Combined Enrolment Ratio	0.1339	0.1035	0.087	0.0736
GSDP	0.1146	0.1464	0.1778	0.2097
HDI	0.0857	0.0794	0.0713	0.0634
NIHDI	0.1148	0.0971	0.0831	0.0646

Source: **Computed from Human Development Dimension Index (A.2.2 – A.2.5)**

Before turning into the measures of population-weighted inequality (dispersion) it is noteworthy in this connection that the variation of population share across included states has been significant enough. As a result the inclusion of population weights into the inequality measures might change the scenario perceptibly. The coefficient of variation (CV_p) over the decades is found to improve for non-income components as well as for HDI, but certainly deteriorates for income component. The overall composite index (HDI) improved its coefficient of variation from 16.26 per cent in 1971 to 11.68 per cent in 2001. The Gini Coefficient which measures inequality in terms of the ratio of the area between the Lorenz curve and the area under the line of equality was initially highest in case of ALR; followed by the CER i.e. the two educational indicators. On the other end, the unique health indicator shows least inequality in 1971. As time progressed inequality index of the non-income indicators improved consistently while the income component of HDI i.e. GSDP in PPP US $ deteriorated. Despite both composite indices (HDI and NIHDI) are found to improve over the decades. The General Entropy measures of

inequality give an interesting result. So far as the trend of index values is concerned there is no significant deviation from other measures of inequalities: non-income inequalities are improving over the decades whiles the income inequalities across the states are deteriorating, however, altogether we find an improving trend for the composite index (HDI). Both for income and non-income components of HD the measures of GE: $_{c=0}$ and GE $_{c=1}$ remained pretty close to each other over the years while GE: $_{c=2}$ which by formulation, more sensitive to the middle part of the distribution has been significantly higher, as compared to other two. In 2001 for instance the computed values of GE: $_{c=0}$ and GE: $_{c=1}$ for HDI remained close to .0068 while GE: $_{c=2}$ has been as high as .0136. Similarly, for the income component (GSDP) GE: $_{c=0}$ and GE: $_{c=1}$ were .095 and .086 respectively in 2001 while GE: $_{c=2}$ has been as high as .1680. Again in the same year GE: $_{c=2}$ for Non-Income Human Development Index is almost twice of other two.

6.3 Measures of Polarization

The recent literature on inequality is held to miss out key features of distributional change, which is better described as changes in polarisation. The measures of polarization emphasizes on the existence of some sort of clustering in the distribution. Polarization in our present context of Indian states may be taken as a phenomenon where there are emerging groups of states at the extremes of the distribution with high intra-group homogeneity coinciding with a high inter-group heterogeneity. The concept of polarization, hence, can run counter to the Pigou-Dalton axiom underlying the conventional inequality measures. The formulation of Esteban and Ray index (ER) has been given in Appendix: A.1.5. Table: 6.3.1 presents the index values for a number of HD indicators and composite indices. The polarization index of non-income indicators, like inequality measures, improves over decades, but deteriorates sharply in case of income. The polarization index for life expectancy happened to be the least in 1971, however, maximum in case of ALR. Interestingly, the polarization index NIHDI was more than that of HDI and even higher than income. The scenario changes over time. In 2001 income polarization supersedes all other indicators of our concern and polarization in HDI is higher than that of NIHDI.

Table: 6.2.2
Population-Weighted Measures of Dispersion and Inequality

Indicator/Index	Coefficient of Variation (CV)			
	1971	1981	1991	2001
Life Expectancy at Birth	0.0964	0.0829	0.0678	0.0541
Adult Literacy Rate	0.3126	0.2774	0.2499	0.177
Combined Enrolment Ratio	0.2525	0.1846	0.1646	0.1396
GSDP	0.1993	0.2569	0.3177	0.4099
HDI	0.1626	0.146	0.1278	0.1168
NIHDI	0.2236	0.1822	0.1495	0.1136
	Gini Coefficient (Gp)			
	1971	1981	1991	2001
Life Expectancy at Birth	0.1028144	0.091798	0.074337998	0.0613213
Adult Literacy Rate	0.3255879	0.2901283	0.259726962	0.1924924
Combined Enrolment Ratio	0.2788483	0.2052473	0.18676501	0.156816
GSDP	0.2159794	0.3056101	0.34968462	0.4659984
HDI	0.1788755	0.160863	0.143039503	0.1322845
NIHDI	0.2370979	0.1956545	0.159814318	0.1243563
	General Entropy (GE: α = 0)			
	1971	1981	1991	2001
Life Expectancy at Birth	0.0044997	0.0033422	0.002246687	0.0014398
Adult Literacy Rate	0.0424527	0.0339396	0.027774914	0.0149456
Combined Enrolment Ratio	0.0305265	0.0165057	0.013839698	0.0099036
GSDP	0.0195327	0.0313769	0.04976687	0.0945531
HDI	0.0125057	0.010238	0.007948326	0.0068017
NIHDI	0.0229468	0.0154422	0.010512101	0.0061808
	General Entropy (GE: α = 1)			
	1971	1981	1991	2001
Life Expectancy at Birth	0.004559	0.0033841	0.00227071	0.0014502
Adult Literacy Rate	0.044654	0.0355571	0.029045942	0.0151818
Combined Enrolment Ratio	0.0309401	0.0166838	0.013643561	0.0098032
GSDP	0.0195265	0.0317518	0.04905057	0.0861923
HDI	0.0127848	0.0104046	0.008036735	0.0067967
NIHDI	0.0236836	0.0158999	0.010791511	0.0063003
	General Entropy (GE: α = 2)			
	1971	1981	1991	2001
Life Expectancy at Birth	0.0092826	0.0068723	0.00459991	0.0029255
Adult Literacy Rate	0.0976741	0.0769697	0.062443489	0.0313179
Combined Enrolment Ratio	0.0637564	0.0501509	0.02709428	0.0194973
GSDP	0.0396391	0.065989	0.10084498	0.1680384
HDI	0.0264235	0.0213103	0.016337177	0.0136437
NIHDI	0.0499796	0.0331983	0.022350165	0.0129115

Source: **Computed from Human Development Dimension Index (A.2.2 – A.2.5**

Table: 6.3.1
Measure of Polarisation

	Esteban, Gradin, Ray (ER)			
	1971	1981	1991	2001
Life Expectancy at Birth	0.00296443	0.002657262	0.002013569	0.00165906
Adult Literacy Rate	0.00834858	0.007524465	0.006792532	0.005643336
Combined Enrolment Ratio	0.00743602	0.00536649	0.0055382	0.00479742
GSDP	0.00597948	0.007193778	0.009374976	0.013701112
HDI	0.00495131	0.004374211	0.003960447	0.003945217
NIHDI	0.006633	0.005304748	0.004337394	0.003573715

Source: **Computed from Human Development Dimension Index (A.2.2 – A.2.5)**

6.4 Evolution in Inequality and Polarisation

It then appears from the previous two sections that the measures of polarization in Indian context does not generate very different trend from the standard measures of inequality. In both measures we obtain an improving trend for non-income components as well as for overall HDI and a deteriorating trend for income component over time. Now we intend to capture the evolution of these measures for each of the indicator/index relative to their initial 1971 values. We have seen that in general all non-income indicators show a clear decreasing trend for all measures of dispersion, inequality and polarization; but interestingly the rates at which they decrease over time differ substantially. While in case of income the trends of dispersion, inequality and polarization increase sharply over time. Again, the rate of increase also differs across the measures. To capture the long-term behavior of the trend for each indicator we draw a set of graphs in Figure: 6.4.1where the evolution of these measures relative to their initial values is depicted for HDI, GSDP and NIHDI. In all cases Population-weighted Coefficient of Variation (CV_p), Gini of Concentration (G_c), Gini Coefficient (G_p), General Entropy Measures ($GE_{c=0}$, $GE_{c=1}$, $GE_{c=2}$), and Esteban and Ray index of polarization (ER) are plotted for all four years of our concern relative to their respective initial values of 1971. There always remains a sharp contrast between the figures of income and non-income indicators – the former shows a decreasing trend for inequality while the latter increases over the decades.

In case of HDI the evolution diagram suggests that both dispersion measures (population-weighted coefficient of variation, Gini of Concentration) along with the Gini had fallen almost at the same rate. Three General Entropy measures had improved more rapidly as compared to their initial 1971 values. The $GE_{c=2}$ which, by definition, is more

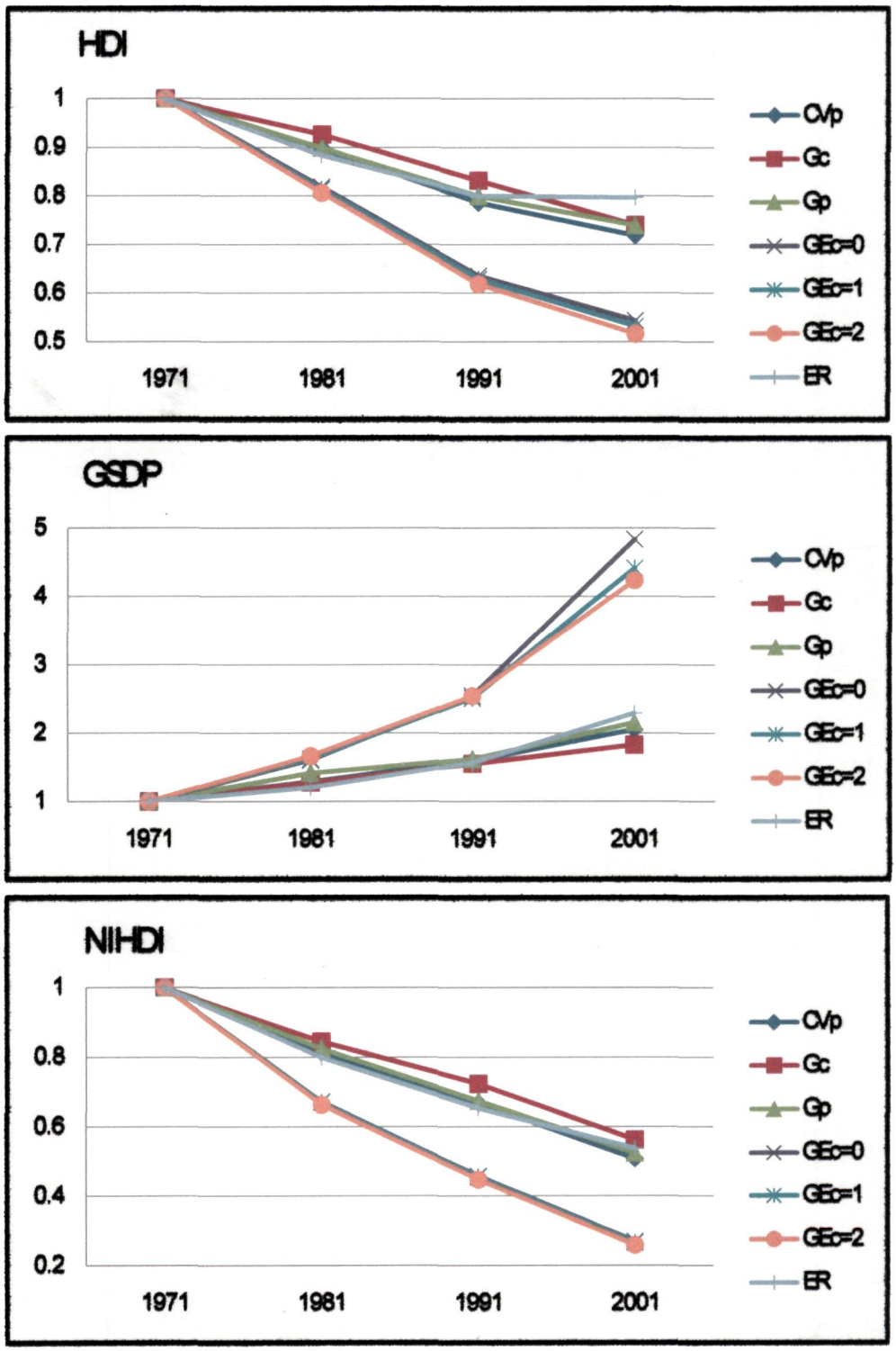
sensitive to the middle part of the distribution had improved sharply as compared to $GE_{c=1}$ and $GE_{c=0}$. The evolution in the polarization measure (ER) indicates that the relative improvement trend has suddenly received a dramatic break since 1991.The trend of GSDP for dispersion, inequality and polarization measures increases, but at substantially different rates during the period of our concern. Among three General Entropy measures $GE_{c=0}$ which is sensitive to the lower part of the distribution has been deteriorating more speedily, followed by $GE_{c=1}$ and $GE_{c=2}$ indicating that the low income states show comparatively high degree of divergence during the decade of policy reforms. During the same period the polarization measure also recorded a sharp deterioration. In case of the composite non-income index (NIHDI) three GE measures almost improved at similar rates. However, the polarization measure (ER) improved in the line of dispersion measures. If income inequalities across the states increases further the falling trend of non-income inequality may likely to be reinforced in near future, which in turn can call for an unwanted stagnation in the falling trend of overall HDI inequality.

6.5 Chapter Summary

This chapter quantitatively captured the levels of disparities and inequalities in income and a number of non-income indicators, also in composite indices like HDI and NIHDI across the states of India over a period of four decades. Placing each individual state in global scale we find that states are scattered over a range of 45 nations of the world. While the best performer Kerala's achievement in 2001 is equivalent to that of China – the 104^{th} nation of the world in terms of HDI the worst performer Bihar corresponds to Yemen – the 148^{th} nation in the list of 175 countries. The level of dispersion and inequality across the states, computed by a number of standard measures, indicates that there exists an alarming level of inequalities both for income and non-income aspects of human well-being. The income inequality has been worsening over the decades; however, the inequality for non-income indicators improves significantly. Although the inequality in the distribution of HDI has improved to a certain extent even their present level tells a story of deprivation. The measure of polarisation also generates very similar trend for both income and non-income aspects of human well-being.

Figure: 6.4.1

Evolution over Decades



Source: **Compiled from Tables: 6.2.1, 6.2.2 & 6.3.3.**

Chapter – VII

Economic Performance and Human Development: The Relationship

Chapter – VII

Economic Performance and Human Development: The Relationship

7.1 Expansion of Economic Opportunity and Human Capability

The records of the economies in enhancing human development over the decades reflect the differences not only in the levels of per capita income and growth achievements, but also the differences in the effectiveness of economic growth in enhancing human capability. Growth may not necessarily be the only factor that increases life expectancy, reduces illiteracy etc and, in addition, the effectiveness of growth to improve the well-being of the people depends upon several socio-cultural as well as socio-political factors, which could not be included in the present study.

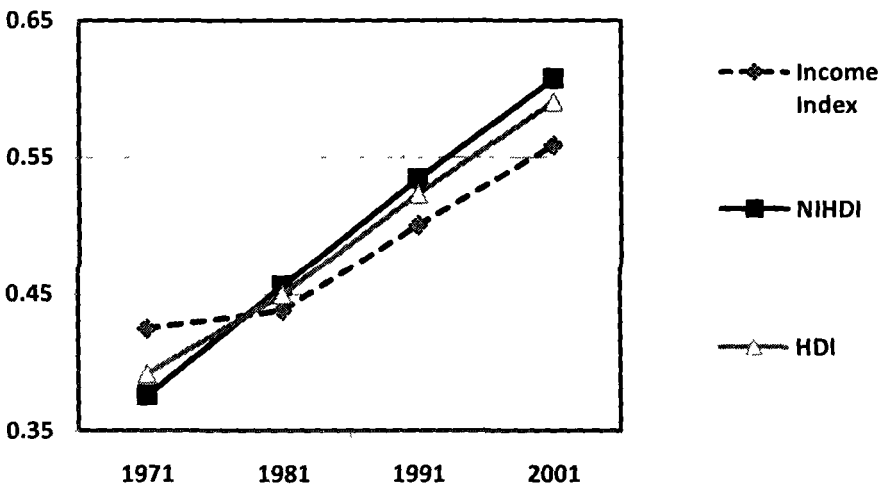
The relationship between income and HDI score in cross-country level has never been straightforward. Georgia (88th nation in HDI rank) and Swaziland (133rd nation) accounted for 90 per cent and 153 per cent of India's (127th nation) GDP per capita (PPP US $) in 2001 (HDR, 2003: 237-240). Across Indian states the relationship varies significantly. With equivalent GDP index the 83rd nation of the world Lebanon's HDI score (.752) is 1.13 times and 1.14 times of Maharashtra and Punjab respectively. Sri Lanka (99th nation) with 81 per cent GDP per capita achieves HDI score (.730) equivalent to 1.18 times of Haryana. On the other end, Kerala and China achieve equivalent HDI score while income index of Kerala has roughly been 70 per cent of China. Again, HDI score of Uganda is not much ahead of Bihar when Bihar accounts for 63 per cent GDP per capita of Uganda.

Economic expansion in India over last three decades has contributed remarkably to the improvement in average level of human development nationwide which is evident from the enhancement of Human Development Index (HDI) from .392 in 1971 to .591 in 2001. Figure: 7.1.1 suggests that in initial year of 1971 (national) income index was higher than other two indices. While with the passage of time the non-income composite index was moved upward as compared to other two. However, national average seems to

hide the wide-ranging disparities across the region. There are several possibilities in this context. Average improvements in human development indicator/index may conceal the relatively declined quality of life in backward states. But we have seen in previous chapters that despite significant divergences in economic performances the human development indicators are in converging over time. Although there is insignificant change in the rank order of states over the decades, and the rates of HDI-shortfall reduction in the states are on average related to their initial achievements.

Figure: 7.1.1

Trend of National Achievements



Source: **Elaborated from Human Development Dimension Index (A.2.2-A.2.5)**

Before entering into econometric analysis of the relationship between per capita income and HD indicator/index under the framework of two-way chain relationship we compute the rank correlation coefficient between them for four different years of four decades. The coefficients are presented in Table: 7.1.1. The First part of the table, marked as (a), depicts the rank correlation coefficients between per capita income (PCNSDP) [as depicted in Table: 4.3.2] and HDI [as depicted in Table: 5.3.2], while the part (b) between PCNSDP and Non- Income Human Development Index (NIHDI) [as depicted in Table: 5.3.3]. Both parts of the table can be viewed from three angles: first, Spearman's rank correlation coefficients in the shaded diagonal blocks which depict the rank order correlation coefficients between per capita income (NSDP) of a certain year and

HDI/NIHDI of the same year. Second, the coefficients in the left of the diagonal elements represent Spearman's rank correlation coefficients between per capita income of a certain year and HDI/NIHDI of past year(s). Finally, in the right we have coefficients between past rank orders in income and future rank orders in HDI/NIHDI. In all cases the coefficients are highly positive and statistically significant indicating that the states maintain a consistent ordering between per capita income and HDI, and between per capita income and NIHDI. This can be interpreted that both past income and past level of HD have positive influences to determine the future levels of HD and income respectively.

Table: 7.1.1

Rank Correlation Matrix

		1971	1981	1991	2001
Per Capita NSDP	1970-71		.806	.812	.829
	1980-81	.865		.835	.853
	1990-91	.779	.786		.806
	2000-01	.874	.838	.838	

		1971	1981	1991	2001
Per Capita NSDP	1970-71		.694	.679	.662
	1980-81	.764		.727	.750
	1990-91	.668	.971		.641
	2000-01	.809	.782	.718	

***Source*: Elaboration, Based on Present Dataset**

Note: All Coefficients are Significant at 1% Level (Two-Tailed)

7.2 Two Chains of Transformation

The framework under which the relationship between the economic performance and enhancement of HD is built upon argues that there exists a two-way relationship between them: first the transformation of achieved economic prosperity into HD (Chain-A), and the second, enhanced HD accelerates further economic affluence (Chain-B). Both chains take income and HD as variables, but their role changes significantly in

accordance to the chains. Chain-A set HD as dependent variable and income as explanatory one; however, the reverse is true for Chain-B, i.e.

Chain-A: $h = f(y)$

Chain-B: $y = \phi(h)$ where y and h are economic and HD variables respectively.

7.2.1 Chain-A: Economy to Human Development

To examine the existence of Chain-A in Indian sub-national context it becomes instructive to compare the simple association between per capita income (NSDP) and HD indicators/ indices. This is done here by pooling the data for four-periods of our study: 1971, 1981, 1991 and 2001. The comparison needs to be undertaken for all constituent indicators viz. life expectancy at birth, ALR and combined gross enrolment ratio as well as for the composite indices of HDI and NIHDI separately. In all cases we obtain a clear positive association between income and the concerned HD indicator/index, indicating that income is one of the factors that increase the level of HD. However, the relationships are not linear – the declining slope of the predicted lines in all five cases indicate that HD indicator/index increases faster at lower than at higher income levels.

The regression results for HD indicators – life expectancy at birth, ALR, CER and for two composite indices – HDI and NIHDI are summarised in Table: 7.2.1. Human development indicator/index (h) is taken as quadratic function of PCNSDP (y).

$$h = f(y) = b_0 + b_1(y) + b_2(y^2) + u$$

Life expectancy in India has improved remarkably from 48.9 years in 1971 to 63.4 years in 2001 i.e. an improvement of about 15 years over the period of three decades. In terms of the reduction of regional disparity the progress can also be marked. In 1971 the best performer state- Kerala had life expectancy of 61.7 years and the worst performer Uttar Pradesh 41.8 years – implying a difference of about 20 years. However, in 2001 the inter-state difference has reduced to about 15 years – the highest in Kerala at 73.1 years and lowest in Madhya Pradesh at 58.1 years. The simple coefficient of variation (CV) across included states has fallen down from 10.05 per cent in 1971 to 6.25 per cent in 2001 while the population-weighted coefficient of variation (CV_p) from about

9.64 per cent to 5.41 per cent in 2001. Interesting observation about the life expectancy is that Bihar – the worst performer in terms of PCNSDP, HDI etc has fared better in life expectancy than Madhya Pradesh, Assam, Uttar Pradesh and Orissa. The association between per capita income and life expectancy at birth in Figure: 7.2.1 (a) indicates clear influence of income to determine the life expectancy levels across included states - on average the states with better economic achievements fared better in life expectancy.

Table: 7.2.1

Regression Results: Chain A

Indicator/Index	R^2	$\bar{R}^2$	F	b_0	b_1	b_2
Life Expectancy at Birth	**.607**	**.594**	**47.11***	**32.73** [7.99]*	**.0054** [5.07]*	**-2.07E-7** [-3.503]*
Adult Literacy Rate	**.446**	**.428**	**24.59***	**1.16** [.113]	**.0098** [3.714]*	**-3.82E-7** [-2.59]*
Combined Enrolment Ratio	**.528**	**.513**	**34.18***	**6.65** [.949]	**.0087** [4.805]*	**-3.56E-7** [-3.52]*
Human Development Index	**.728**	**.719**	**81.51***	**.129** [2.73]*	**7.73E-5** [6.35]*	**-2.904E-9**
Non-Income Human Development Index	**.591**	**.578**	**44.06***	**.0796** [1.121]	**9.18E-5** [5.008]*	**-3.59E-9**

Notes 1.Figures in [ ] are t-statistic. 2 * implies significance at 1 per cent level

Adult literacy in national level has improved from 34.1 per cent in 1971 to 58.4 per cent in 2001. The regional disparity in terms of the differences between the best and worst performers has marginally come down from a wide range of 47.1 in 1970 to 46.5 per cent in 2001. However, there is a sharp decline in both measures of dispersion from 32.35 per cent to 17.74 per cent in case of simple coefficient of variation; and from 31.26 per cent to 17.7 per cent in case of population weighted coefficient of variation. Kerala remained the best performer in ALR over the period by a huge margin. The level of adult literacy that Kerala achieved in 1971 (69.1 per cent) except Maharashtra all states in the list of our included states is yet to reach even in 2001. The differences in the levels of achievement between Kerala and the second best performer – Maharashtra was as high as

24 per cent in 1971 and 20 per cent in 2001. The relationship between per capita income and ALR, depicted in Figure: 7.2.1 (b), established a positive association despite the unusually high peaks in the observed relationship due to unparallel achievements in Kerala.

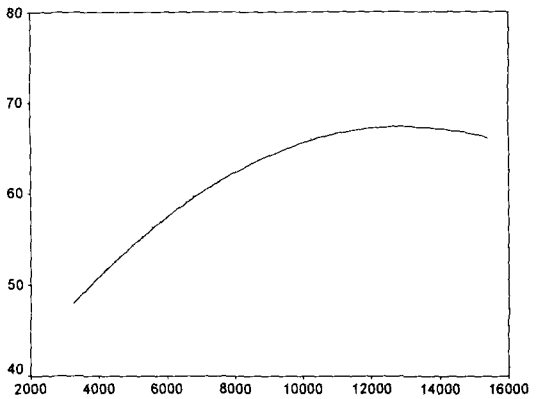
The improvement in other educational indicator - combined gross enrolment ratio has remained less impressive in national scenario – from 38 per cent in 1971 to 55.9 per cent in 2001. The regional disparity in terms of the simple difference between the best and worst performer has of course come down from over 30 per cent in 1971 to below 20 per cent in 2001. The simple coefficient of variation (CV) across included states has fallen down from 23.77 per cent in 1971 to 13.08 per cent in 2001 while the population-weighted coefficient of variation (CV_p) from about 25.25 per cent to 13.96 per cent in 2001. The estimated relationship between per capita income and combined gross enrolment ratio in Figure: 7.2.1 (c) indicates a strong positive association.

The estimated relationship between per capita income and the composite index – HDI across the states is plotted in Figure: 7.2.1 (d). The significantly high value of the coefficient of determination between these two variables, as reported in Table: 7.1.2, is duly justified in their scatter plot. Human Development Index at the national level has improved from .392 in 1971 to .591 in 2001. The regional disparity in terms of maximum HDI-shortfall has come down from 45.41 per cent in Uttar Pradesh during 1971 to 34.21 per cent in Bihar during 2001. Also, there is a clear decline in both measures of dispersion from 15.87 per cent to 11.23 per cent in case of simple coefficient of variation; and from 16.26 per cent to 11.68 per cent in case of population-weighted coefficient of variation. Kerala emerged as the best performer over the period by a huge margin. The level of human development (.566) that Kerala could achieve in 1971 as many six states - namely Assam, Bihar, Madhya Pradesh, Orissa, Rajasthan and Uttar Pradesh are yet to achieve even in 2001. The difference in levels of achievements between Kerala and the next best performer Maharashtra still remains comprehensively high. The HDI-shortfall in Maharashtra, Punjab and Himachal Pradesh are close to 8, 9 and 10 per cent respectively in 2001.

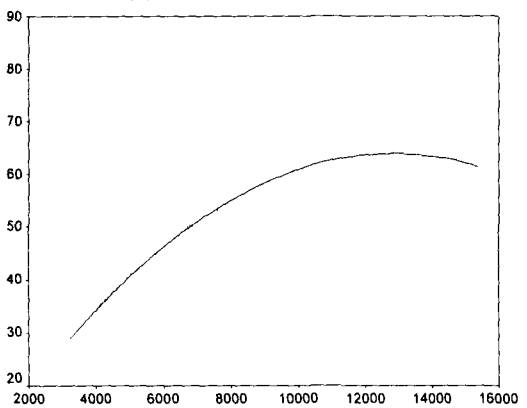
Figure: 7.2.1

Regression Scatter: Chain-A

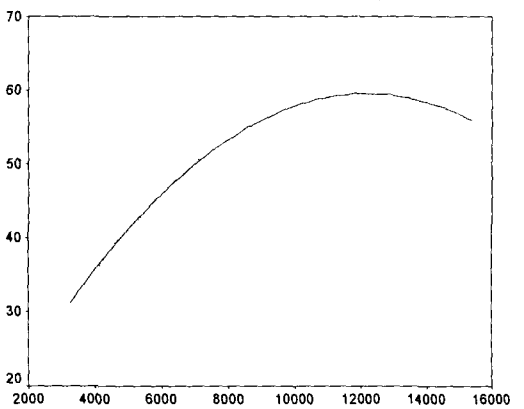
(a) Life Expectancy at Birth



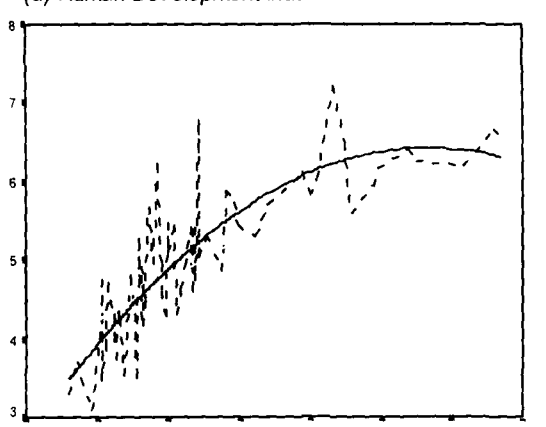
(b) Adult Literacy Rate (%)



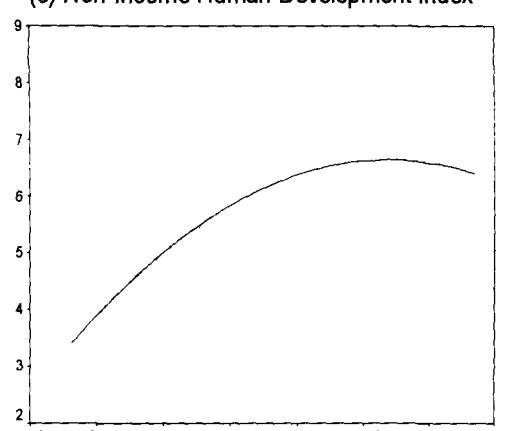
(c) Combined Enrolment Ratio (%)



(d) Human Development Index



(e) Non-Income Human Development Index



Finally, the relationship between per capita income and the composite index – NIHDI is captured in Figure: 7.2.1(e). This relationship has been very special in our present context as NIHDI takes all non-income components of human development into account. Since our ultimate aim of the present research is to establish the existing relationship between income and HD for all practical as well as empirical purposes this particular relationship will carry a special importance also in the following chapters. Non-Income Human Development Index at the national level has improved from .376 in 1971 to .608 in 2001. The regional disparity in terms of the differences between the best and worst performers has marginally come down. The maximum NIHDI-shortfall in 1971 was over 57 per cent in Uttar Pradesh which reduced to 53 per cent in Bihar in 2001. However, there is a sharp decline in both measures of dispersion from 21.96 per cent to 11.72 per cent and from 22.36 per cent to 11.36 per cent in case of simple and population-weighted coefficients of variation respectively. Kerala remained the best performer in Non-Income Human Development Index over the decades by a huge margin. The level of Non-Income Human Development Index (.627) that Kerala achieved in 1971 as many eight states - namely Andhra Pradesh, Assam, Bihar, Haryana, Madhya Pradesh, Orissa, Rajasthan and Uttar Pradesh are yet to reach that level even in 2001. The interesting point to be noted here that Himachal Pradesh always remained below Maharashtra and Punjab in HDI score, however, superseded comfortably in NIHDI.

7.2.2 Chain-B: Human Development to Economy

The above discussion on the relationship between the economy and human development is typically confined to capture the role of economic affluence in determining the level of HD in the context on Indian states. This transformation of economic prosperity into HD is referred in the literature as Chain-A. To examine the existence of Chain-A the influence of income (PCNSDP) on each of the HD indicators and composite indices are empirically tested. We find a concrete evidence of Chain-A in India's sub-national context. However, the other chain of the relationship argues strongly that levels of HD influence economic performance. Now we turn to check the existence

of Chain-B in Indian context. Using OLS method an attempt has been made here to capture the influence of two non-income indices of HD (health and educational indices) in determining the level of income (PCNSDP) we set the following linear equation where in contrast to earlier equations, the dependent variable (y) is taken as a linear function of health and educational indices.

Pooling the data set from four different years – 1971, 1981, 1991 and 2001 we carry out the regression to estimate the coefficients c_0, c_{Health} and $c_{Education}$.

$$y = \phi(h) = c_0 + c_{Health}\ (EI) + c_{Education}\ (HI) + v$$

Where as usual 'y' denotes the PCNSDP at constant prices and two explanatory variables are health and educational indices respectively. The coefficients c_0 and c_{Health} and $c_{Education}$ are to be estimated. The regression results appear in Table: 7.2.2 which the health index has been more influential as compared to educational index in determining the level of income. The scatter diagrams with an estimated trend of two HD indices are depicted in Figure: 7.2.2 where we find a positive relationship in both cases.

The present discussion of two-way relationship between the economy and HD indicates strongly that there exists a positive association between them in Indian sub-national context. The states with better performance in either of two aspects, on average, are likely to perform better in the other. However, the association between two variables does not necessarily mean that they are actually causing each other. Both of them may be associated with a third variable. To check the causality between economic performance and HD we undertake an analytical study in Chapter-VIII.

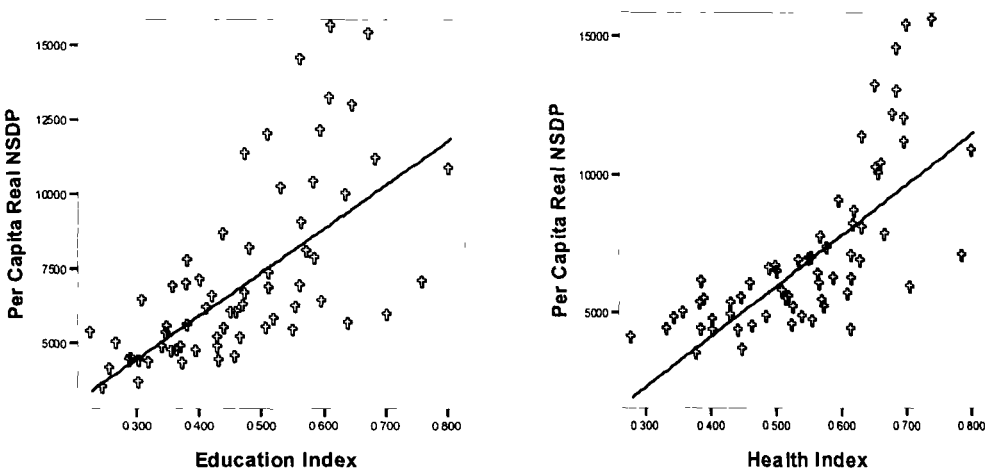
Table: 7.2.2

Regression Results: Chain-B

Explanatory Variable	Non-standardized Coefficients		Standardized Coefficients Beta	t	Significance
	B	Std. Error			
Constant	-3115.95	1266.525		-2.46	0.017
Health Index	15906.367	4135.115	.626	3.487	0.0001
Education Index	2699.276	3686.548	.119	.732	.467

Adjusted R^2 = .517; N = 64; F = 34.704

Figure: 7.2.2
Regression Scatter: Chain-B



7.3 Classification of States

In cross-country analysis of the relationship between economic performance and HD, the countries/economies according to their performances are usefully classified into four categories. Following the same principle Indian states are classified in four categories.

- **Virtuous:** This category of economies is on mutually reinforcing upward spiral; with high levels of HD leading to high EG and high growth, in turn, further enhancing HD.
- **Vicious:** In this group of economies, weak progress in HD results in low EG, and consequently poor progress towards enhancement of HD.
- **Human Development – Lopsidedness:** This group is characterized with high level of HD coinciding with poor expansion of economic opportunities.
- **Economic Growth Lopsidedness:** In a sharp contrast to the previous group here, economies with high EG failed to expand a parallel level of HD.

There are several ways of classifying the economies into these four categories. First classification is made here on the basis of performances of the states in per capita income and HDI over the years of our concern: 1971, 1981, 1991 and 2001. The bench mark for classification in both variables has been the national average i.e. the achievement in national level in per capita income and the index value of HD. Next we compare the decade-wise performance of the states in EG and the corresponding rates in HDI-shortfall reduction with the reference of average performance at the national level. Finally, a comparison of their performances in per capita income and HDI is drawn with the reference of average performance of 94 developing nations of the world. Here, each federal unit of India has been scanned in such a way that their performances in both economic opportunity and human capability are readily referred to the global axes.

7.3.1 Per Capita Income versus HDI

In Figure: 7.3.1 the states are classified on the basis of their achieved levels in per capita income (PCNSDP) and HDI scores. They are measured in the horizontal and vertical axes respectively. It is revealed that in 1971 altogether seven states namely Kerala, Punjab, Maharashtra, Haryana, Rajasthan, Himachal Pradesh and Tamilnadu had shown better performances in both fronts as compared to national average. They are placed in the virtuous cycle quadrant i.e. in the mutually reinforcing upward spiral. Two states – Karnataka and West Bengal had crossed the national average in HDI; however, failed to reach the threshold in per capita income. These states are classified in HD–Lopsided quadrant where comparatively high level of HD is not accomplished with parallel expansion of economic opportunities. Five states namely Assam, Andhra Pradesh, Orissa, Bihar and Uttar Pradesh remained below performers in both aspects, hence are classified in the vicious cycle quadrant. Again two states – Rajasthan and Madhya Pradesh had been in the category of Income–Lopsided quadrant where comparatively high economic opportunity failed to expand parallel level of HD. As most of the states are scattered in virtuous and vicious quadrants the link between Economy and HD is established once again.

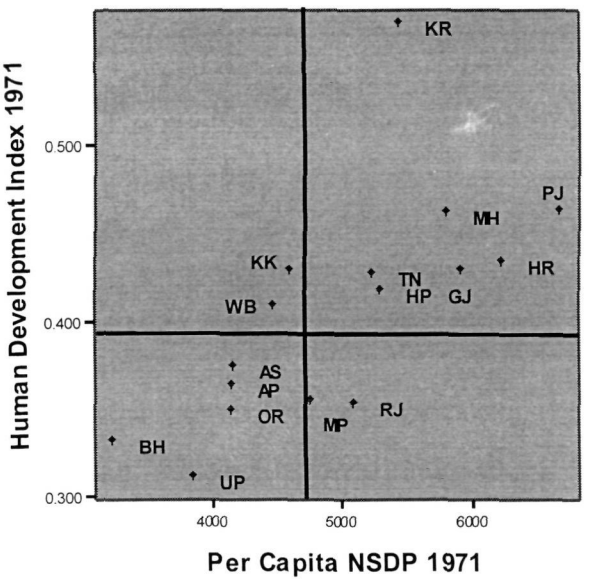
The situation remained almost unaltered in 1981. Only Rajasthan moved from income lopsidedness to vicious cycle. In 1991 Kerala shifted from the Virtuous to HD–Lopsided quadrant as the state falls short in terms of per capita income. In 2001 as Karnataka joins in the category of virtuous cycles states six states namely Maharashtra, Punjab, Haryana, Gujarat, Tamilnadu, Karnataka and Himachal Pradesh are placed in the virtuous cycle quadrant; two states of Kerala and West Bengal in HD–lopsided category. Again seven states namely Andhra Pradesh, Assam, Madhya Pradesh, Rajasthan, Orissa, Uttar Pradesh and Bihar are categorized in the group of vicious Quadrant. No state is in the income–lopsided quadrant. The movement of the states across the quadrants over the decades is summarised in the upper part of the Table: 7.3.1.

Figure: 7.3.1

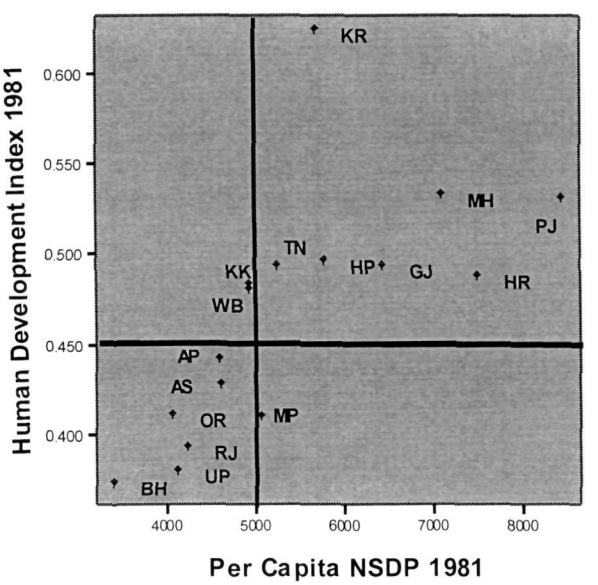
Classification of States:

Per Capita Income vs. HDI

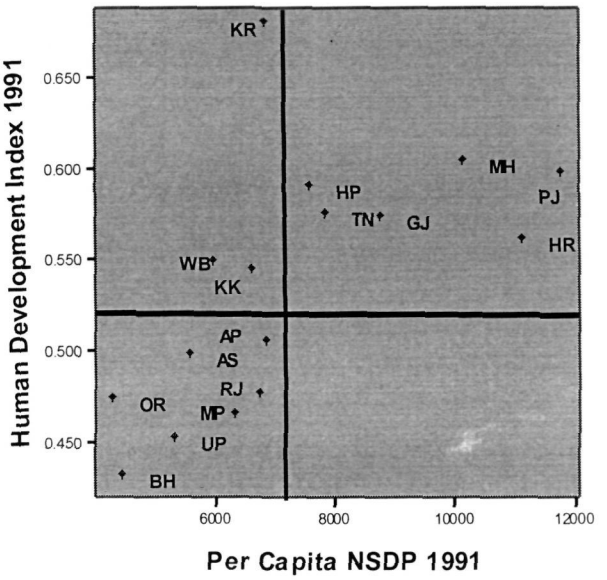
(a). 1971



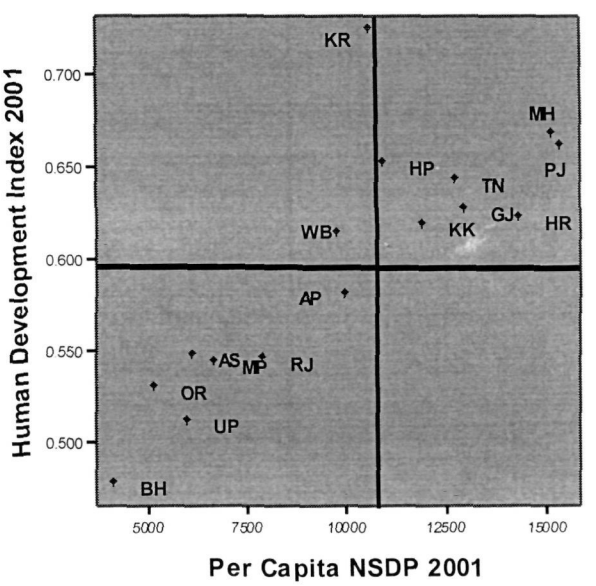
(b). 1981



(c). 1991


KR
MH
HP
PJ
TN
GJ
HR
WB
KK
AP
AS
RJ
OR
MP
UP
BH
0.650
0.600
0.550
0.500
0.450
6000
8000
10000
12000
Human Development Index 1991
Per Capita NSDP 1991

(d). 2001


KR
MH
HP
PJ
TN
GJ
KK
HR
WB
AP
AS
MP
RJ
OR
UP
BH
0.700
0.650
0.600
0.550
0.500
5000
7500
10000
12500
15000
Human Development Index 2001
Per Capita NSDP 2001

7.3.2 *Growth Rate versus HDI-Shortfall Reduction Rate*

Another way of classifying the states has been in terms of growth in per capita income and decade-wise rate of shortfall reduction in HDI. A state's achievement in reducing HDI-Shortfall reflects differences in both level of growth and in the effectiveness of this growth in reducing HDI-shortfall. It is revealed in Figure: 4.3.1 of Chapter-IV that in general, states with low initial incomes witnessed low growth rates. Exceptions in this regard, are Andhra Pradesh and Karnataka. In contrast, states with comparatively higher staring incomes experienced higher growth rates, with notable exceptions of Kerala. Also we have noticed in Figure: 5.3.4 of Chapter-V that on average, the states with less initial HDI-shortfall (i.e. better HDI values) has been more effective in reducing HDI-shortfall than the states with initially high HDI-shortfall (i.e. lower HDI values). Of course two exceptions of different extremes are Andhra Pradesh and Haryana. The former being the sixth worst state in terms of HDI-shortfall in 1971 has been able to reduce shortfall between 1971 and 2001 at the second best rate. In contrast, initially the third best state in HDI level - Haryana reduced its shortfall at the second worst rate, only ahead of Bihar. Combining these two achievements of a state in growth rate as well as in the rate of HDI-shortfall reduction we attempt in Figure: 7.3.2 to classify Indian states in above defined four categories. The horizontal axis measures the per capita income (PCNSDP) while the vertical axis the rate of HDI-shortfall reduction.

In 1970s the national income growth was very sluggish while the rate of HDI-shortfall reduction was better than moderate. The states that had better performances in both measures in 1970s are Maharashtra, Himachal Pradesh, Punjab, Andhra Pradesh, West Bengal, Tamilnadu and Gujarat. Two states of Uttar Pradesh and Orissa made better performance in HDI-shortfall reduction as compared to national average; however, their poor growth record in 1970s placed them into the upper left quadrant of the diagram. Four states Madhya Pradesh, Assam, Bihar and Rajasthan failed to catch up national average in both aspect of development. In Karnataka and Haryana the growth rate of PCNSDP was higher but failed to achieve parallel shortfall reduction. During 1980s the accelerated economic growth in national level was accomplished with sharp rate of HDI-shortfall reduction. The scenario in state level has changed dramatically. Only four states

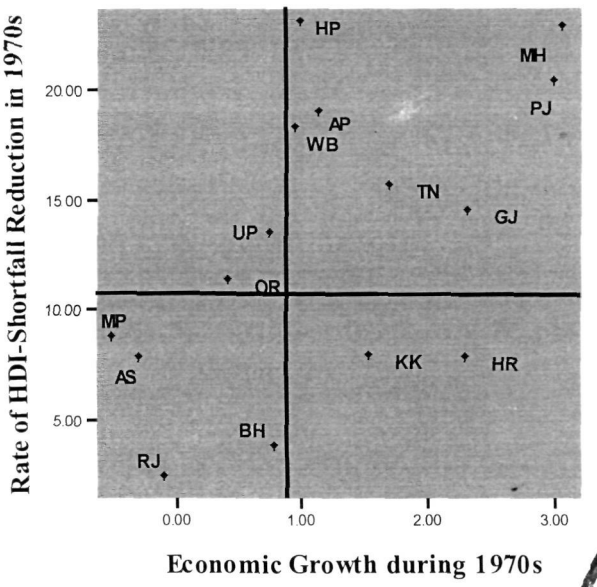
namely Maharashtra, Haryana, Rajasthan and Punjab could manage their placement in virtuous cycle quadrant. Himachal Pradesh, Tamilnadu and Gujarat were placed into HD–lopsided category. As many as seven states namely West Bengal, Assam, Uttar Pradesh, Orissa, Karnataka, Madhya Pradesh and Bihar failed to manage the national average in both aspects. Andhra Pradesh could achieve the growth rate but remained a below average performer in shortfall reduction. In 1990s India's growth rate has further accelerated and the rate of HDI-shortfall reduction remained highest as compared to last two decades. During 1990s five states namely Maharashtra, Tamilnadu, Karnataka, Himachal Pradesh and West Bengal have shown better performances in both economic growth and HDI-shortfall reduction and hence, are placed comfortably in the virtuous cycle. The states like Punjab, Andhra Pradesh and Madhya Pradesh witnessed below average growth rate; however, the rate at which they reduced their HDI-shortfall during 1990s was higher than national average. The performances of states like Haryana, Rajasthan, Uttar Pradesh, Orissa, Assam and Bihar had placed in the vicious cycle group. Interestingly Gujarat was placed in EG-lopsided quadrant since its rate of HDI-shortfall reduction was below average during 1990s. The movement of the states across the quadrants over the decades is summarised in the lower part of the Table: 7.3.1.

Classification of states according to their growth achievements and HDI-shortfall reduction reveals a volatile picture in the sense that movements of states from one quadrant to another have been frequent and unpredictable. Maharashtra is the only state that could manage a placement in the virtuous cycle quadrant in all three successive decades while there are a number of states that are permanently placed in the vicious cycle. It is then important here to scrutinize the states' performance in the same aspects during the entire period of three decades: 1971 – 2001. The states are classified into these four categories in Figure: 7.3.2 (d) for the period from 1971 to 2001. The states of Maharashtra, Tamilnadu, Punjab, Andhra Pradesh and Gujarat are the better performers in both aspects. Two more states – Haryana and Karnataka can also be included in this group. The states of Himachal Pradesh and West Bengal are clearly classified in the group of HD–lopsided category as their growth rates remained below national average. Six states namely Rajasthan, Uttar Pradesh, Madhya Pradesh, Orissa, Assam and Bihar witnessed below average performances in both aspects.

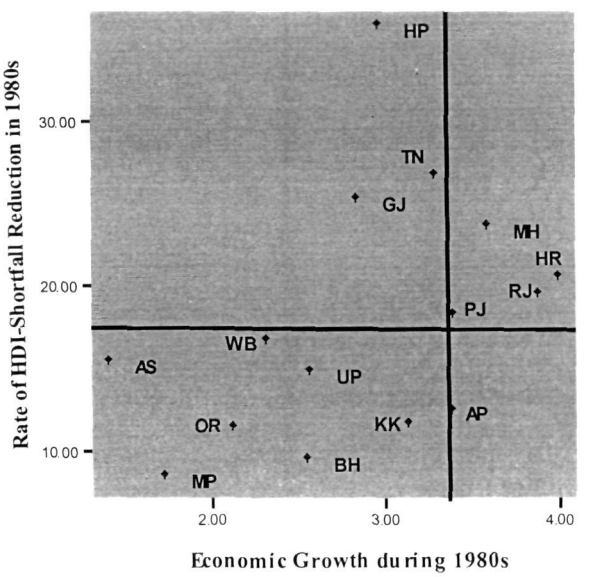
Figure: 7.3.2

Classification of States:
EG Rate versus Rate of HDI-Shortfall Reduction

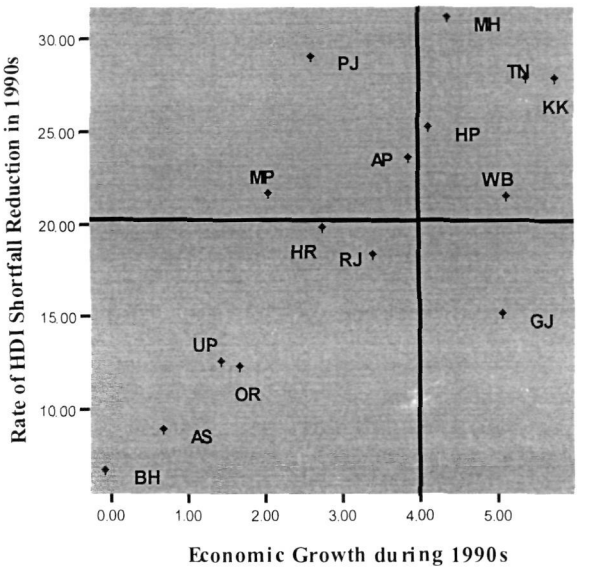
(a). 1970s



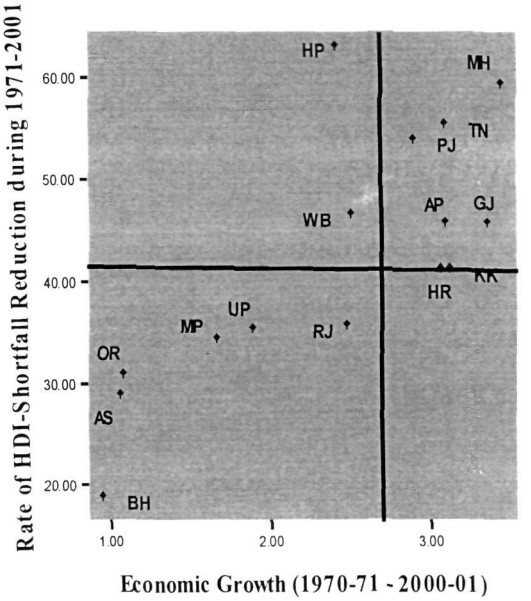
(b). 1980s



(c). 1990s



(d). 1971 -2001



7.3.3 Indian States in Global Scale

Computation of Human Development Index in our present study strictly follows the methodology provided by HDR (1999). The same has been used by UNDP to compute the levels of HD for the nations of the world. Hence the index values obtained by Indian states in 2001 are comparable to the values obtained by the countries in HDR (2003). It, therefore, yields an opportunity to classify Indian states in a global scale. Figure: 7.3.3 (a) and (b) scrutinize the achievements of Indian states in economic as well as in HD parameters with global perspective. HDR (2003: 247) provides the information of average performance levels of 94 developing states of the world in both per capita income and HDI. In the former diagram we measure the per capita GSDP of Indian state in PPP US $ and HDI in the horizontal and vertical axes respectively. However, the classification of states into four different categories is made on the basis of the average performances of 94 developing nations of the world in same two aspects. Only two states – Maharashtra and Punjab, according to their performance in per capita GSDP and HDI, are classified into the category of virtuous cycle group. Kerala comes under HD–lopsided category. Two states of Gujarat and Haryana enjoyed higher per income with lower index value in HD, and naturally placed into the income–lopsided quadrant. All the remaining states of India are scattered in the vicious cycle where weak progress in HD results in low EG, and consequently poor progress towards enhancement of HD.

In Figure: 7.3.3 the scale of classification is modified as the vertical axis measures the achievement of states in Non-Income Human Development Index when the horizontal axis still measures the per capita income in PPP US $. This modification of scale shifts the state of Punjab to income – lopsided quadrant implying that the state along with Gujarat and Haryana had higher income achievement coinciding with lower value of NIHDI. Himachal Pradesh shifts upward to the Non-Income HD–lopsided quadrant indicating higher value of NIHDI coinciding with lower income achievements. Maharashtra is the only state in virtuous quadrant. All remaining states are placed in the vicious quadrant. The classification of states in global scales is summarised in Table: 7.3.1.

Table: 7.3.1

Classification of Indian States

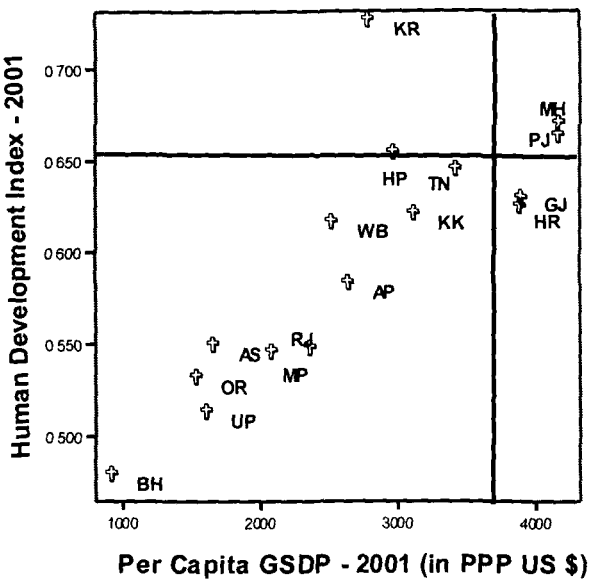
State			Per Capita NSDP versus HDI			
			1971	1981	1991	2001
1	Andhra Pradesh	AP	Vicious	Vicious	Vicious	Vicious
2	Assam	AS	Vicious	Vicious	Vicious	Vicious
3	Bihar	BH	Vicious	Vicious	Vicious	Vicious
4	Gujarat	GJ	Virtuous	Virtuous	Virtuous	Virtuous
5	Haryana	HR	Virtuous	Virtuous	Virtuous	Virtuous
6	Himachal Pradesh	HP	Virtuous	Virtuous	Virtuous	Virtuous
7	Karnataka	KK	HD-Lopsided	HD-Lopsided	HD-Lopsided	Virtuous
8	Kerala	KR	Virtuous	Virtuous	HD-Lopsided	HD-Lopsided
9	Madhya Pradesh	MP	Economy-Lopsided	Economy-Lopsided	Vicious	Vicious
10	Maharashtra	MH	Virtuous	Virtuous	Virtuous	Virtuous
11	Orissa	OR	Vicious	Vicious	Vicious	Vicious
12	Punjab	PJ	Virtuous	Virtuous	Virtuous	Virtuous
13	Rajasthan	RJ	Economy-Lopsided	Vicious	Vicious	Vicious
14	Tamil Nadu	TN	Virtuous	Virtuous	Virtuous	Virtuous
15	Uttar Pradesh	UP	Vicious	Vicious	Vicious	Vicious
16	West Bengal	WB	HD-Lopsided	HD-Lopsided	HD-Lopsided	HD-Lopsided
State			Growth Rate versus HDI-Shortfall Reduction Rate			
			1970s	1980s	1990s	1971 – 2001
1	Andhra Pradesh	AP	Virtuous	EG-Lopsided	HD-Lopsided	Virtuous
2	Assam	AS	Vicious	Vicious	Vicious	Vicious
3	Bihar	BH	Vicious	Vicious	Vicious	Vicious
4	Gujarat	GJ	Virtuous	HD-Lopsided	EG-Lopsided	Virtuous
5	Haryana	HR	EG-Lopsided	Virtuous	Vicious	Virtuous
6	Himachal Pradesh	HP	HD-Lopsided	HD-Lopsided	Virtuous	HD-Lopsided
7	Karnataka	KK	EG-Lopsided	Vicious	Virtuous	Virtuous
9	Madhya Pradesh	MP	Vicious	Vicious	HD-Lopsided	Vicious
10	Maharashtra	MH	Virtuous	Virtuous	Virtuous	Virtuous
11	Orissa	OR	HD-Lopsided	Vicious	Vicious	Vicious
12	Punjab	PJ	Virtuous	Virtuous	HD-Lopsided	Virtuous
13	Rajasthan	RJ	Vicious	Virtuous	Vicious	Vicious
14	Tamil Nadu	TN	Virtuous	HD-Lopsided	Virtuous	Virtuous
15	Uttar Pradesh	UP	HD-Lopsided	Vicious	Vicious	Vicious
16	West Bengal	WB	Virtuous	Vicious	Virtuous	HD-Lopsided

* Since the HDI-Shortfall Reduction estimates are based on the best performing state Kerala does not appear in the lower part of the Table

Source: **Compiled from Figures: 7.3.2 and 7.3.2**

Figure: 7.3.3
Classification of Indian States in Global Scale

(a). PCGSDP vs. HDI



(b). PCGSDP vs. NIHDI

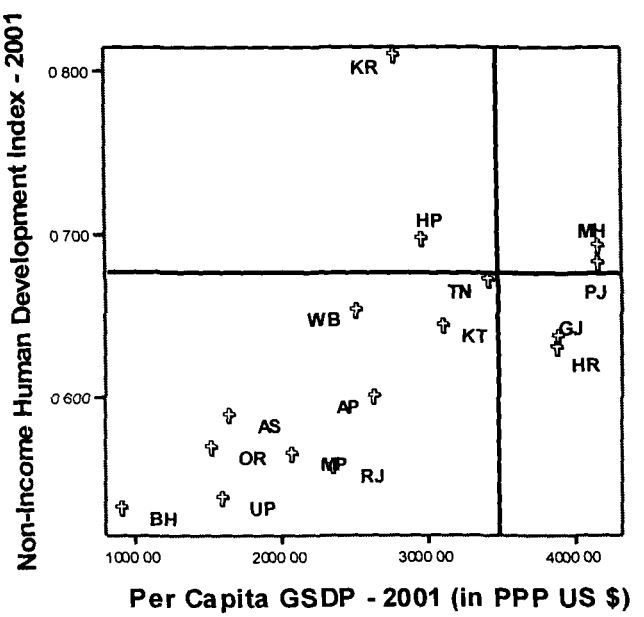


Table: 7.3.2

Classification of Indian States in Global Scale

State			Basis of Classification	
			PCGSDP vs. HDI 2001	PCGSDP vs. NIHDI 2001
1	Andhra Pradesh	AP	Vicious	Vicious
2	Assam	AS	Vicious	Vicious
3	Bihar	BH	Vicious	Vicious
4	Gujarat	GJ	Income-Lopsided	Income-Lopsided
5	Haryana	HR	Income-Lopsided	Income-Lopsided
6	Himachal Pradesh	HP	HD-Lopsided	HD-Lopsided
7	Karnataka	KK	Vicious	Vicious
8	Kerala	KR	HD-Lopsided	HD-Lopsided
9	Madhya Pradesh	MP	Vicious	Vicious
10	Maharashtra	MH	Virtuous	Virtuous
11	Orissa	OR	Vicious	Vicious
12	Punjab	PJ	Virtuous	Virtuous
13	Rajasthan	RJ	Vicious	Vicious
14	Tamil Nadu	TN	Vicious	Vicious
15	Uttar Pradesh	UP	Vicious	Vicious
16	West Bengal	WB	Vicious	Vicious

Source: **Compiled from Figure: 7.3.3. (a) and (b)**

7.4 Chapter Summery

This chapter finds a positive and significant relationship between economic opportunity and human capability across Indian states. The rank order correlation of the states in their relative positions on per capita income and levels of human development over the decades strongly indicates that these two aspects of human well-being are, in general, related to each other. The relationship is then scrutinized under the recent framework of two-way links. Applying the pooled data technique for four consecutive decades it is observed that both chains of transformation are supposedly operational in Indian context, which establish that economic prosperity influences the expansion of human development (Chain-A) and enhanced human capability on the other hand

accelerates economic growth (Chain-B). In both cases, a relatively weak association, however, has been obtained between income and educational indicator (index). The states are mostly scattered either in vicious or in virtuous cycle quadrants which reestablishes the two-way relationship between economy and human development. Classification of states on the yardstick of average performance of entire developing world indicates that many Indian states lag behind seriously in both the aspects of human well-being which results in an unimpressive national achievement.

Chapter – VIII

Causality Analysis

Chapter – VIII

Causality Analysis

A simple association between two variables does not necessarily mean that there exists a causal relationship between them. The apparent estimated association may be attributable to the common association of a third variable. That is why detecting the causal relationship among a set of variables is an important part of empirical research. In the Granger (1969) sense, a variable causes another if the current value of the second can be better predicted by using the past values of the first. Hence, a series is said to be 'Granger-Cause' another series if past values of the first are useful in predicting the second. The test is based on the assumptions:

- Future cannot cause the past, rather
- Past and present cause the future flow

8.1 Model Specification

The relationship between income and HD, in our present context, can be approximated as

$$h_{jt} = \kappa + \sum_{l=1}^{q} \theta_l h_{j(t-l)} + \sum_{l=1}^{q} \lambda_l y_{j(t-l)} + \nu_t \ldots\ldots (8.1.1.A) \text{ and}$$

$$y_{jt} = \alpha + \sum_{l=1}^{q} \beta_l y_{j(t-l)} + \sum_{l=1}^{q} \gamma_l h_{j(t-l)} + \mu_t \ldots\ldots (8.1.1.B)$$

The variables h and y denote levels of HD and real per capita income (NSDP) respectively, across which causal ordering are to be investigated. The variable h may be taken as individual indicator, taken as essential ingredient of HD, or the composite indices like HDI and NIHDI. The suffixes (j and t) differentiate between the values of two variables in jth state in period t; $\theta_l s, \lambda_l s, \beta_l s and\ \delta_l s$ are the impact of delay; the disturbance terms $\mu_t and\ \nu_t$ are assumed to be serially independent with zero mean

and finite covariance matrixes; and $\sum_{l=1}^{q} \theta_l$; $\sum_{l=1}^{q} \lambda_l$; $\sum_{l=1}^{q} \beta_l$ and $\sum_{l=1}^{q} \gamma_l$ are known as the long run multiplier.

The former equation postulates that the current level of HD is determined by the past levels of HD itself as well as by the past levels of income while the latter postulates that the current level of income is determined by the past levels of income itself as well as by the past levels of HD. The academic literature hypothesizes that an economy may be on a mutually reinforcing upward spiral with high levels of EG leading to decent level of HD (Chain-A) and enhanced human capability, in turn, promoting further income growth (Chain-B). Conversely, weak HD may result in low growth; and consequently poor progress towards HD. A closer look to these two equations reveals that the former is an econometric version of the Chain-A through which economic prosperity gets translated into HD; and the second of the Chain-B which postulates that HD, in turn, promoting further income growth.

8.2 Estimation Procedure

In our present case the two series are per capita income (y) and HD (h). Although per capita income data are readily available for all the years of our study period, human development data are available for 1971, 1981, 1991 and 2001. The length of the lag (q) in equations (8.1.1 A) and (8.1.1 B) can be chosen by some information criteria. Guilkey and Salemi (1982) advocated for setting a short period of q value in small sample test as it brings about a reliable causality analysis. The minimum time lags, we can set here, are 10 years, 20 years and 30 years and denoted by the suffixes 1991, 1981 and 1971. Hence, we redesign our model as level of HD in 2001 in a particular state is determined by its levels of HD in 1991, 1981 and 1971 as well as by the levels of income in 1991, 1981 and 1971. Similarly, the per capita income in 2001 is determined by the per capita income levels in 1991, 1981 and 1971 as well as by the levels of HD in 1991, 1981 and1971. The specific models in our present case are given by

$$h_{2001} = \kappa + \theta_1 h_{1991} + \theta_2 h_{1981} + \theta_3 h_{1971} + \lambda_1 y_{1991} + \lambda_2 y_{1981} + \lambda_3 y_{1971} + \nu_t \ldots\ldots (8.2.1.A) \text{ and}$$

$$y_{2001} = \alpha + \beta_1 y_{1991} + \beta_2 y_{1981} + \beta_3 y_{1971} + \gamma_1 h_{1991} + \gamma_2 h_{1981} + \gamma_3 h_{1971} + \mu_t \ldots\ldots (8.2.1.B)$$

Where

y_{j2001} = Per Capita NSDP of jth state in the year 2001 at 1993-94 prices

y_{j1991} = Per Capita NSDP of jth state in the year 1991 at 1993-94 prices

y_{j1981} = Per Capita NSDP of jth state in the year 1981 at 1993-94 prices

y_{j1971} = Per Capita NSDP of jth state in the year 1971 at 1993-94 prices

h_{j2001} = Level of HD (value of the indicator/index) of jth state in 2001

h_{j1991} = Level of HD (value of the indicator/index) of jth state in 1991

h_{j1981} = Level of HD (value of the indicator/index) of jth state in 1981

h_{j1971} = Level of HD (value of the indicator/index) of jth state in 1971

The equation (8.2.1 A) postulates that the current level of HD is determined by the past levels of HD itself as well as by the past levels of income. To establish the influence of income on HD we should get that the coefficients of lagged values of income in equation (8.2.1 A) are statistically different from zero as a group. In other words, the strength of Chain-A across Indian States would be established when $\sum \lambda_i \neq 0$ irrespective of $\sum \gamma_i \neq or = 0$. Similarly, the equation (8.2.1.B) postulates that the current level of income is determined by the past levels of income itself as well as by the past levels of HD. To establish the influence of HD on income we should get that the coefficients of lagged values of HD in equation (8.2.1.B) are statistically different from zero as a group. The strength of Chain-B requires that $\sum \gamma_i \neq 0$ irrespective of $\sum \lambda_i \neq or = 0$.

Combining these two propositions, the basic hypothesis (H_{03}), set in section 3.3, can be interpreted as:

$\mathbf{H_{03}}$	$\sum\lambda_i = 0$ and $\sum\gamma_i = 0$	There is no causal relationship between economic prosperity and human development **Neither Chain-A nor Chain-B works.**

The alternative hypothesis (H_{13}) interpret as:

$\mathbf{H_{13a}}$	$\sum\lambda_i \neq 0$ but $\sum\gamma_i = 0$	There is **unidirectional causality** from income (y) to human development (h) which means that y causes h but h does not cause y **Chain-A works, but not Chain-B.**
$\mathbf{H_{13b}}$	$\sum\gamma_i \neq 0$ but $\sum\lambda_i = 0$	There is **unidirectional causality** from human development (h) to income (y) which means that h causes y but y does not cause h. **Chain-B works, but not Chain-A.**
$\mathbf{H_{13c}}$	$\sum\gamma_i \neq 0$ and $\sum\lambda_i \neq 0$	There is **bilateral causality (feedback)** from income (y) to human development (h) as well as from human development (h) to income (y) which means that h causes y as well as y causes h **Both Chain-A and Chain-B work.**

To estimate the causal relationship between per capita income and HD Granger-Causality Tests are carried out for each of the constituent indicators of HDI i.e. life expectancy at birth, ALR and CER as well as for the composite indices of NIHDI and HDI. The basic model, specified in equations (8.2.1 A) and (8.2.1 B) remains unaltered – only the variable h has been defined differently in different occasions. In the test where causality between income and life expectancy are examined h is defined as the life expectancy at birth in years. The same procedure is repeated for ALR and CER. The tests through which the causality between income and composite indices (NIHDI and HDI) are carried out the variable 'h' is defined accordingly and in these cases the index values are considered. A number of steps are involved to decide about H_{03}.

First, we obtain the regression of the equation (8.1.A) in a restricted form: the current non-income human development index (h_{2001}) is regressed on all lagged terms of

non-income human development indices (h_{1991}, h_{1981}, h_{1971}) – not including the lagged per capita income terms. This restricted form of equation is denoted by the suffix R.

Next, the unrestricted regression of the equation (suffixed as UR) is obtained involving the lagged terms of both non-income and income variables i.e. (h_{1991}, h_{1981}, h_{1971}) as well as (y_{1991}, y_{1981} and y_{1971}). From the unrestricted regression the sum of the coefficients of the lagged values of income (y) is computed to check whether their combined effect is other than zero.

Finally, from these two regressions we compute the value of F as $F = \frac{(R^2_{UR} - R^2_R)/q}{(1 - R^2_{UR})/N - k}$ where, q is the number of lagged terms in y, k is the number of parameters to be estimated in the unrestricted regression and N is the total number of observations. This has the F-distribution with q and (N-k) degrees of freedom. If the computed 'F' value exceeds the critical value for a certain level of confidence the inference of rejecting the null hypothesis can be drawn. The same procedure is repeated on the equation 8.1.B to test whether human development causes income. Combining these results the nature of causality is decided.

8.3 Empirical Results

Table: 8.3.1 and 8.3.2 depict the results obtained from the causality tests of chain-A and Chain-B respectively i.e. the transformation of economic prosperity into human development and that of human development into economic prosperity. The first columns of these two tables indicate the constituent indicators of HD viz. life expectancy at birth, ALR and CER, and the composite indices viz. NIHDI and HDI with respect to what the causality tests are conducted. Columns (2) and (3) represent the sum of the standardized regression coefficients of lagged values of HD indicators (h) and income (y) in the unrestricted (UR) equation. Columns (4) shows the adjusted coefficient of determination ($_{R^2}$) in unrestricted (UR) regression. In Column (5) the F-ratio is computed applying $F = \frac{(R_{UR}{}^2 - R_R^2)/q}{(1 - R^2_{UR})/(N - k)}$ while in column (6) corresponding probabilities are depicted.

Table: 8.3.1

Results of Causality Test (Economy to Human Development)

Indicator/ Index	**Sum of Standardized Coefficient (UR)**		$\bar{R}^2_{UR}$	$F=\frac{(R^2_{UR}-R^2_R)/q}{(1-R^2_{UR})/(N-k)}$	**Probability**
	$\sum \theta_i$	$\sum \lambda_i$			
1	2	3	4	5	6
Life Expectancy at Birth	.609	.381	.993	4.51	.034126
Adult Literacy Rate	.673	.308	.924	2.91	.09338
Combined Enrolment Ratio	.888	.097	.971	1.94	.193735
Non-Income HDI	.702	.289	.987	3.37	.068364
Human Development Index	.652	.341	.985	3.67	.056366

The selection of suitable level of confidence to draw the inference on the set hypothesis has always been a crucial issue in empirical research. Considering the robustness of present dataset we cannot expect that all relationships tested above are likely to be significant at 1 or 5 per cent level of confidence. Table: 8.3.2 provides a simple characterization of combined test outcomes of Chain-A and Chain-B for each constituent indicator of HD at three different levels of confidence. Life expectancy at birth is the lone indicator where both chains of transformation are found to be operational even at 5 per cent level in Indian sub-national context which means the rejection of Hypothesis H_{03} and acceptance of the alternative Hypothesis H_{13c}. If we stick further to 5 per cent level neither adult literacy rate nor combined enrolment ratio show any indication on mutual interdependence i.e. we cannot reject H_{03}. Same inference can be drawn for the composite Non-Income Human Development Index. However, in case of overall Human Development Index the transformation of economic prosperity into human development is found to be insignificant where as the reverse is operational i.e. the rejection of H_{03} and acceptance of H_{13b}.

Table: 8.3.2

Results of Causality Test (Human Development to Economy)

Indicator/ Index	**Sum of Standardized Coefficient (UR)**		$\bar{R}^2_{UR}$	$F=\frac{(R^2_{UR}-R^2_R)/q}{(1-R^2_{UR})/(N-k)}$	**Probability**
	$\sum \beta_i$	$\sum \gamma_i$			
1	2	3	4	5	6
Life Expectancy at Birth	.681	.309	.892	4.5	.03432
Adult Literacy Rate	.842	.143	.924	1.56	.26567
Combined Enrolment Ratio	.549	.443	.971	3.18	.077573
Non-Income HDI	.764	.221	.987	3.375	.067917
Human Development Index	.603	.319	.985	4.0	.04598

Table: 8.3.3

Inference on the Direction of Causality

Indicator/ Index	**Level of Significance**		
	5 per cent	**10 per cent**	**20 per cent**
Life Expectancy at Birth	**Both Chains work**		
Adult Literacy Rate	Neither Chain works	Chain-A works but not Chain-B	
Combined Enrolment Ratio	Neither Chain works	Chain-B works but not Chain-A	**Both Chains work**
Non-Income HDI	Neither Chain works	**Both Chains work**	
Human Development Index	Chain-B works but not Chain-A	**Both Chains work**	

If we liberalize the level of significance at 10 per cent there is a significant change in the inference on causality. In case of adult literacy rate rejecting H_{03} we should accept H_{13a}, for combined enrolment ratio; however, the reverse is found to be true i.e. we should accept H_{13b}. Both composite indices indicate the rejection of H_{03} and acceptance of H_{13c}. When we further liberalize the level of significance at 20 per cent we need to revise our inference only in case of combined enrolment ratio for which both chains are found to be operational.

8.4 Chapter Summary

To examine the causality between economic standard and human development level the Granger Causality Tests are carried out for each of the constituent indicators of Human Development Index as well as for the two composite indices. The results from the test suggest rejecting the Hypothesis (H_{03}) for all constituent indicators/indices; however, the directions of causality vary across the indicators/indices. For the health attainment (life expectancy at birth) as well as for the two composite indices viz. NIHDI and HDI we accept the alternative hypothesis H_{13c} as significant (at 10 percent level) bidirectional relationships are found in theses cases. On the contrary, for adult literacy rate we accept H_{13a} while for combined enrolment ratio it is H_{13b} as significant (at 10 percent level) unidirectional relationships are found in theses cases. As such Chain-B is found to be stronger as compared to Chain-A in Indian sub-national context.

Chapter – IX

Conclusion

Chapter – IX

Summary and Conclusion

This chapter reviews the key findings of the previous chapters and suggests certain policy measures. It also points out the limitations that remained in the present study and provides a broad view of the future researches in the relevant fields. This study is motivated to detect the causal relationship between economic performance and human development in Indian regional levels. Section 9.1 reviews the key results obtained from the analytical discussions and empirical works. Policy suggestions are provided in Section 9.2.The limitations of the study and the scope for future research are indicated in Sections 9.3 and 9.4.

9.1. Summary of Findings

This section summarises the major findings of the present study. In first two sub-sections, we present the economic interpretations of the results, obtained in the chapters detecting the trends in economic performance and human development across included states over the study period of three decades. Next, we review the relationship between economic performance and human development in Indian sub-national level. Finally, the causality between economic performance and human development that we inferred in the present study is interpreted with economic sense and social implications.

9.1.1. *Trend in Economic Performance*

The real per capita income in national level has increased nearly threefold during the latter half of twentieth century. However, a perceptible acceleration was observed since 1980s. During the first three decades (1950-51 – 1980-81) per capita income had increased by 1.4 times while in the next two decades (1980-81 – 2000-01) it has doubled further. The acceleration in per capita income growth can be attributed to two factors: significant acceleration in national income and nominal reduction in population growth.

National achievements get clearly reflected into state-level performances. Very few states namely Maharashtra and Punjab, and to a certain extent, Gujarat and Haryana could achieve impressive growth rates during 1970s. The decade of 1980s can be marked as the decade of acceleration for many states. There is overwhelming evidence of moderate level of dispersion in economic growth across the states. During 1990s States like West Bengal, Kerala, Karnataka and Tamil Nadu showed a real turn around and States like Maharashtra, Himachal Pradesh and Gujarat maintained the momentum received in the previous decades. However, the traditionally backward states of Bihar, Orissa and Uttar Pradesh; and Assam, Rajasthan and Madhya Pradesh witnessed poor growth. As a result, the regional disparity has reasonably widened in the decade of policy reforms.

The level of regional disparity in income levels has widened over our study period. At the initial year of the present study considerable regional disparity in per capita income levels existed, and aggravated further during the final three decades of the last century. The gap between richer and poorer states has widened at an alarming rate. The poorest state – Bihar which accounted for 48 per cent of the richest state – Punjab in 1970-71 fell down sharply to 27 per cent in 2000-01.

Both concepts (β and σ) of convergence analysis provide a clear evidence of income divergence during the study period of three decades (1970-71 – 2000-01). Richer states of early 1970s, on average, have grown more speedily, with notable exception of Kerala. In contrast, the states with low initial income witnessed low growth during our study period, of course with exceptions of Andhra Pradesh and Karnataka. The necessary condition of weak β-convergence – i.e. mean reversion is violated. The degree of dispersion, which is taken as the sufficient condition for convergence, has increased considerably over time and is marked during the post-reform period.

The rank-order correlation ratifies the diverging trend of per capita income. The top ranking states of 1970-71 retain their position uninterruptedly in the following years of 1980-81, 1990-91 and 2000-01. This confirms that initially poor performers could not

improve their relative position over three decades. High degree rank-order stability in per capita income levels confirms that there is no sign of convergence.

Present finding with regard to the economic performance of Indian states has been very similar in the line of observations, documented in Ghosh et al. (1998), Dasgupta et al. (2000), Baddeley et al. (2006) and Purfield (2006) and others; however, in many ways contrasts with those of the theoretical neoclassical convergence literature which postulates that initially poor states are to grow faster than the richer ones.

9.1.2. *Trend in Human Development*

The level of human development in national context, measured by HDI, has reasonably increased from .392 in 1971 to .591 in 2001. This achievement in composite index HDI is attributable to the hikes of income index from .425 to .559 and non-income index from .376 to 608. The country emerged as a medium human development nation in 1991 when the index value crossed the threshold of .5 mark.

The movements of states from low to medium human development levels narrate altogether a different story. Kerala was the only state in 1971; and Kerala, Maharashtra and Punjab were the three states in 1981, which could overcome the threshold of low human development. In 1991 ten states in the list of 16 included states and in 2001 five more states entered into the group of medium human development level. Bihar is the only state in 2001 which failed to cross the threshold.

Levels of human development also suffer from acute regional disparity. HDI score of Uttar Pradesh (the then lowest in the country) was equivalent to 55 per cent of Kerala (the highest) in 1971; however, in 2001 the lowest score of Bihar rose to 67 per cent of the best performer.

The formal tests of convergence provide evidence of converging trend for all non-income indicators of human development despite the strong evidence of diverging trend for income indicator. The necessary condition of mean reversion is satisfied, and the degree of dispersion has fallen considerably over the study period. Both composite indices (HDI and NIHDI) imply convergence.

However, the rank-order stability of HDI and NIHDI fails to ratify the converging trend of human development across the states. The initially top ranking states in terms of both HDI and NIHDI scores retain their positions in later years of our study. This confirms that poor performers could not improve their relative position over three decades.

Moreover, in a sharp contrast to the converging trend of human development, we find in the present study that the HDI-shortfall reduction rate has been, on average, higher for the states, which have lower shortfall in initial period. This implies that initially backward states, in general, reduced their HDI-shortfall at comparatively slower rate, indicating they are likely to take more time to catch up.

The inference of converging trend of human development is drawn in most of the earlier studies. However, we find here that the apparent converging trend is mainly due to the existence of acute diminishing returns in case of human development indicators. For the states that have already achieved a decent level of human development it is far more difficult to enhance the present level by a smaller unit, as compared to the states that have a very poor record. Of course, it is more important for the backward states to improve the present level to a decent one.

Placing each individual state in global scale we find that Indian states are scattered over a range of 45 nations of the world. While the best performer Kerala's achievement in 2001 is equivalent to that of China – the 104^{th} nation of the world in terms of HDI the worst performer Bihar corresponds to Yemen – the 148^{th} nation in the list of 175 countries.

The regional inequalities in economic and human development indicators across included states over the study period are empirically measured by a number of standard measures. The inequality measures indicate clearly that unless the diverging trend of income levels could not be controlled to a certain extent, the overall composite index (HDI) is likely to diverge in near future. The inequality measures that are more sensitive to the middle part of the distribution are pretty high as compared to the measures that are,

by formulations, sensitive to the upper and lower parts of the distribution. The measure of polarization generates very similar results.

9.1.3. *Economic performance and Level of Human Development*

There is clear evidence of transformation of economic prosperity into human development and that of from human development to income level. There is a strong positive association between economic and non-economic attainments of human well-being.

Per capita income levels of the states in past three decades are found to have statistically significant influence to improve the non-income attainments of human development. However, the declining slope of the predicted relationship indicates that human development increases faster, at lower than at higher income levels. Per capita income and life expectancy at birth are positively related. In addition, per capita income has been found influential to determine the adult literacy rate and combined enrolment ratio. States with poor economic record generally witnessed moderate to low expansion of human development. However, income is found to be more influential to determine the health attainment as compared to educational attainment.

The other chain of transformation – from human development to economic standard is also in existence. Both non-income attainments are positively associated with per capita income. States with better expansion of human capability are in general found to be better performer in economic front. Again, the health attainment is found to be more influential as compared to education in determining the level of income.

The links between economic performance and human development are also evidenced from the classification of the states, according to their performances in these two aspects. Most of the states are found to be scattered either in virtuous or vicious cycle quadrants indicating that the long-run economic performance and achieved level of human development are certainly coherent in Indian sub-national context.

The classification of states, based on the per capita income levels and HDI scores, reveals that while five states namely Andhra Pradesh, Assam, Bihar, Orissa and Uttar

Pradesh have chronically been placed in the vicious cycle quadrant as many as six states namely Gujarat, Haryana, Himachal Pradesh, Maharashtra Punjab and Tamil Nadu have been in the virtuous cycles for all the year of our concern. Few states are, of course, in the realm of lopsided realities: initially income-lopsided states of Madhya Pradesh and Rajasthan move towards vicious cycle quadrant, Karnataka succeeded to move from HD-lopsidedness to virtuous cycle. West Bengal is permanently place in HD-lopsided quadrant while Kerala moved to that quadrant in early 1990s.

The classification of states, based on the states' performances in economic growth and HDI-shortfall reduction rates during the span of three decades (1971-2001) generates almost same results except Andhra Pradesh and Himachal Pradesh. The better performance of Andhra Pradesh in both aspects has placed the state in virtuous cycle while comparatively poor performance in economic front during 1970s and 1980s placed Himachal Pradesh in the HD- lopsided quadrant. The classification of states in global scale narrates that most of the states are seriously lagging behind in both the fronts.

9.1.4. *Causality between Economy and Human Development*

Granger Causality Test results reveal that in general there is a bidirectional causal relationship between economic performance and human development. Both composite indices of HDI and NIHDI are found to be both-way related to per capita income level.

In case of health attainment we find clear evidence of bidirectional causal relationship. Economically affluent states are better performer in health aspect, and states with higher life expectancy are likely to perform better in economic aspect.

In case of educational attainments at most unidirectional causality is established. The adult literacy rate is found to be influenced clearly by income levels; however, combined enrolment ratio influences the latter. Economic prosperity encourages literacy while the reverse flow is not found significant. Combined enrolment ratio precedes income levels, but not influenced by income levels.

As such we find the transformation of human development into economic prosperity (Chain-B) is more significant in Indian context as compared to the transformation of economic achievements into human development (Chain-A). This implies that the states with fair achievements in human development have shown better performances in economic front. The economic interpretation of comparatively weak Chain-A indicates a poor income elasticity of human development, which in turn implies that the increased economic opportunity in the country has not certainly been inclusive in character. An inclusive expansion of economic choices within the states will be needed to improve the strength of Chain-A.

9.2. Policy Recommendations

The findings of this study have important policy implications. Understanding the trends of economic performance and human development, and the direction of causality between them has been crucial for formulating effective policies. The policy suggestions arising out of the present study intend primarily to draw an outline for evolving an inclusive & even as well as balanced & sustainable development path for India. For inclusive growth and even development it is important that all regions of the country should have similar expansions in economic attainment and human capability. In addition, the achieved level of development would be balanced and sustainable only when there is a strong feedback between economy and human development.

An unprecedented effort will be needed to halve the disturbing level of regional disparities in both income and non-income dimensions of human development. The present level of regional disparity, if not arrested and reversed fast, will have serious adverse implications for the national economy, society and polity. For evolving an inclusive development path it is important to review the disparities beyond the regional level – the existing level of disparities within a region needs to be addressed. The policies should cover the backward states, the rural areas, the marginalized social classes and very importantly the women. Planning Commission (2006) correctly prioritises the national strategies by setting the target of *Bridging Divides: Including the Excluded*. However, the implementation has always been a greater challenge than setting the goal.

In Indian context, we find comparatively stronger existence of Chain-B i.e. the transformation from human capability to economic opportunities is more certain than the transformation from the economic opportunity to human capability. Therefore, we reject the strand of neoliberal paradigm of *Washington Consensus* which has been encouraging economic growth as a prerequisite for investment in human development and argues that human development may be postponed until economic resource expansion makes it affordable. Instead, we recommend a consistent strategy of promoting both objectives simultaneously, and supporting key issues such as social justice, female literacy, equity in income distribution and investment in education and heath sectors are taken care of. There are enough evidences that indicate clearly the two-way causal links between economic performance and human development. Therefore, a planned initiative is needed to improve the performances in both aspects of human well-being to achieve sustainable growth and even development.

There is a need to channelize further the strength of both chains of transformation – especially in case of educational aspect of human development. The current causal structure between income and education is not satisfactory. Educational policies in the country need to be redesigned in such a manner that a feedback effect between economic choices and educational achievements can be restored. The study records that economic standard of the states has positive and significant influence to determine the literacy level, but not *vice versa*. On the other end, the income level does not significantly influence higher education while the latter influences the former. However, it is extremely important, in a country like India, that increased economic opportunities should promote educational levels – both elementary and higher education. Similarly, achieved level of educational opportunities should be effectively translated into parallel economic opportunities. A planned initiative is recommended here to make elementary education inclusive and higher education job-oriented and professional so that by any means, the linkage between economy and education can be channelized further.

A number of states namely Bihar, Orissa, Uttar Pradesh and Assam, and also Andhra Pradesh, Madhya Pradesh and Rajasthan are chronically placed in vicious cycle quadrant for successive decades. A special effort will be needed for promoting the both

objectives simultaneously in a planned manner. These poor performers in both fronts ought to elaborate state development strategies, predicted on the concept of socially inclusive, environmentally sustainable and steady development trajectory. A comprehensive central policy for moving these states along these lines will be needed to loosen the grip of the vicious cycle trap for these states. At the same time, the policy makers of those states that are already out of the trap in Indian standard should be aware of the fact that their positions in global scale are not only unimpressive, it narrates a story of long journey of tough commitments.

9.3. Limitations

Due to lack of consistent time series data all federal units of Indian Union could not be included in this study. The inclusion of more number of economic units in this framework could perhaps provide better results and accurate evidences to explore the causal relationship between economic performance and human development in Indian sub-national context.

This study measures the economic performance of the states using a simple growth accounting for the state economy as a whole. However, the growth accountings of three major sectors of the economy viz. agriculture, industry, and services are likely to provide more pragmatic result in this regard. The separate analytical discussion of causal links between sectoral achievements and human development would have provided a better understanding. Due to lack of consistent time series data this study is typically confined to explore the causality between aggregate economic performance and human development.

There lies another limitation in the computation of income index of the states, which is reflected in the overall scores of HDI. The income index of HDI in Chapter-V is calculated using an adjusted GDP per capita (PPP US $). The corresponding state level indicator is GSDP per capita in PPP US $ which is derived in the present study from the per capita GSDP of a particular state in rupees (at constant Prices) multiplying with the ratio of per capita GDP in PPP US $ in India and per capita GDP in rupees in India. A drawback of using the same conversion factor for all Indian states is that the

inter-state differences in PPP of rupee do not get due weightage. In other words, the difference between Rs. 100/ in Assam and Uttar Pradesh, between Andhra Pradesh and Haryana in PPP terms could not be taken into consideration as we have no such information to support or refute of the differentials across Indian states.

The Granger testing, we have used in this study for investigating the causal relationship between economic performance and human development, has been described as imperfect in recent literature such as Hood III et al. (2008), De Jager, P (2008) and others. Aside from the fact that no technique can fully ascertain the nature of a causal relationship between two sets of variables, the Granger procedure is a simple bivariate model. The development of multivariate vector autoregressive (VAR) Granger models, developed in Hurlin (2005), has been a significant response to problems associated with bivariate Granger models. However, due to certain technical constraints we could not extent our present study into VAR models.

9.4. Future Scope

The present research offers a framework under which a number of issues, with regard to national capacity building, can be studied. One of the important areas of concentration for future research may be the measurement of Human Poverty & Gender Development Indices, and Gender Empowerment Measure for Indian states. If these indices are obtained, following standard UNDP formulations, the position of Indian states can be judged in global perspectives. The level of regional disparities in HPI, GDI and GEM can provide a potential base of future studies. Even HD can further be measured beyond HDI – involving many other dimensions of human well-being. In a very similar fashion of the present study the causal relationships between the economic performance and human poverty situation as well as gender conditions can be explored in Indian sub-national context. This study focuses the interaction between economic performance and human development across the states. The other possible way of making the underlying concept of HD more policy oriented and operational is to undertake research studies which intend to explore the role of policies, adapted by different State Governments in past decades to enhance the present level of human development.

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Appendix

A.1 Statistical Tools and Methods

A.2 Supplementary Statistical Tables

Appendix

A.1. Statistical Tools and Methods

In the present study three major steps are involved to establish the dynamic link between economy and human development: detecting the trend of economic performances of the states during the study period; secondly evaluating the levels of human development across the states for the same period; and finally, examining the causal relationship between economic performance and enhancement of human development. In doing so a number of statistical tools and mathematical formulations are used. This section, in nutshell, discusses those tools for a ready reference.

A.1.1. Growth Rate

In Chapter IV annualized growth rates of per capita income are often referred with regard to the nation as a whole as well as for the states. The average annual growth rates of PCNSDP for the entire study period or for a particular decade are obtained from each economic unit's (country as a whole or a particular state) estimated log-linear trend. Therefore, the annualized PCNSDP growth rate (g) is estimated by regressing the equation: $LogY_t = a + bt$ which is equivalent to the logarithmic transformation of the compounded growth equation:

$Y_t = Y_0 B^t = Y_0(1+g)^t$ where Y is the variable denoting PCNSDP; t is time.

The two parameters $a = LogY_0$ and $b = LogB = Log(1+g)$ are to be estimated. If b* is the OLS estimate of b, the average annual growth rate of PCNSDP, (g) is obtained as [exp (b*) – 1] and is multiplied by 100 for the expression on percentage.

A.1.2. Convergence Analysis

To examine the convergence hypothesis two concepts of convergence are generally tested in growth literature: weak (β) and strong (σ) convergence. The distinction between these two concepts was clearly drawn in Barrow and Sala-i-Martin (1995). The weak (β) convergence implies mean reversion – a negative association between growth rates and initial (log) income while the strong (σ) convergence implies declined dispersion as well as means reversion of per capita income levels in the long-run. The β - convergence is, however, not a sufficient condition for σ - convergence. The condition of strong convergence is violated when different group of regions fall within or outside a convergence club (Baddeley et al. 2006). Both these concepts are considered in two flavours: absolute and conditional convergences. When all regional economies show a tendency to converge towards a common steady state with passage of time the situation is referred to as absolute convergence. In contrast, the case of conditional convergence occurs when regional economies converge on different steady state depending upon the inherent regional differences.

The relationship between weak (β) and strong (σ) convergences are drawn in mainstream economic literature. Following the notations of Young et al. (2008) and Higgins et al. (2006), let us consider an economy with

j = 1, 2, …, N number of regional units for which condition of β-convergence is satisfied. Logarithm (natural) of per capita income of the j^{th} economy at period t (= 1, 2, …., T) can be summarised as:

$$\log(y_{jt}) = a + (1-\beta)\log(y_{j,t-1}) + u_{jt}$$ where β, the speed of income convergence is such that 0< β<1 and the disturbance term u_{jt} has a mean zero; finite variance σ_u^2 , and is independent over t and j.

After slight algebraic modification the above equation takes the form:

$$\log(\frac{y_{jt}}{y_{j,t-1}}) = a - \beta\log(y_{j,t-1}) + u_{jt} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Thus, $\beta > 0$ implies a negative correlation between growth and initial log income.

Again, the sample variance of log income in t is given by

$$\sigma_t^2 = (\frac{1}{N})\sum_{J=1}^{N} [\log(\ y_{jt}) - \mu_t]^2 \text{..... ....(2)}$$

Where μ_t is the sample mean of log income.

The sample variance is close to the population variance when N is large, and the equation (1) can be used to derive the evolution of σ_t^2 :

$$\sigma_t^2 \cong (1-\beta)^2 \sigma_{t-1}^2 + \sigma_u^2 \text{.....(3)}$$

Only when the condition of β-convergence is satisfied i.e. only if $0<\beta<1$ the difference equation in the equation (3) is stable. So β–convergence is necessary condition for σ–convergence. If $\beta \leq 0$ the variance σ_t^2 increases over time. If $\beta = 1$, the variance σ_t^2 is constant. If $\beta > 1$, the partial correlation between (log) income and its previous-period value would be negative and the series would oscillate, potentially from positive to negative values and back.

Given $0<\beta<1$, the steady state variance is

$$(\sigma^2)^* = \frac{\sigma_u^2}{[1-(1-\beta)^2]} \text{.....(4)}$$

Thus, the cross-sectional dispersion falls with β , but rises with σ_u^2. Combining (3) and (4) we arrive at,

$$(\sigma_t^2) = (1-\beta)^2 \sigma_{t-1}^2 + [1-(1-\beta)^2](\sigma^2)^* \text{.....(5)}$$

The equation (5) is a first-order linear difference equation with constant coefficients. Its solution is given by,

$$(\sigma_t^2) = (\sigma^2)^* + (1-\beta)^{2t}[\sigma_0^2 - (\sigma^2)^*] + c(1-\beta)^{2t} \ldots\ldots\ldots\ldots (6)$$

where c is an arbitrary constant.

Thus, as long as $0 < \beta < 1$; we have $/(1-\beta)/ < 1$, which implies that

$$\lim_{t\to\infty}(1-\beta)^{2t} = 0 \ldots\ldots\ldots\ldots (7)$$

This ensures the stability of σ_t^2 because it implies that

$$\lim_{t\to\infty} \sigma_t^2 = (\sigma^2)^* \ldots\ldots\ldots\ldots (8)$$

Moreover, since $(1-\beta) > 0$, the approach to $(\sigma^2)^*$ is monotonic.

Therefore, it follows that the variance will increase or decrease towards its steady-state value depending on the initial σ_0^2. In other words; β–convergence is a necessary, but not a sufficient condition for σ–convergence. This is because theoretically it is possible that once initially poor performers overtake the strong performers to an extent that the spread of the distribution increases. In real economies, σ–convergence would depend on whether or not the disturbances are correlated, and have constant variances, across time and economies (Young et al. 2006).

A.1.3. Computation of Human Development Index

Chapter V computes the HDI for the nation as a whole as well as for the individual states for the years of 1971,'81, '91 and 2001. It is a fact that the formulation of HDI has taken the present shape through evolution. HDR (1990) was constructed from a deprivation perspective. The educational attainment considered adult literacy as the single indicator, and income was logged at all levels. An observed maximum and minimum for each indicator were used as goalposts, but changes in the goalposts made comparisons across time impossible. HDR (1991) revised the method of calculation to give HDI a positive twist, mean years of schooling was added as a second component together with adult literacy to capture educational attainment. Also, a cut-off income of US $ 5,000 per capita per year, based on the world average, was introduced. HDR (1994) introduced fixed minima and

maxima on the basis of the trends of indicators and their probable values in the next 25 years. HDR (1995) replaced the mean years of schooling with combined gross enrolment at the primary, secondary and tertiary levels because the data on the former did not necessarily reflect reality. Finally, HDR (1999) introduced the formulation of logging income throughout because the adjustment introduced in HDR (1991) was so drastic that middle-income countries were unjustifiably penalized. Hence, the treatment of income in the HDR (1999) was designed in such a fashion that as income increases, its value is adjusted downwards through mathematical discounting before it enters the HDI (UNDP, 2007: 37). The present formulation for obtaining the HDI for j^{th} country (state/province in a country) is as follows:

$$HDI = \frac{1}{3}\sum_{i=1}^{3}\left[\frac{X_{ij} - Min.F_i}{MaxF_i - MinF_i}\right] \text{ where,}$$

X_{ij} = The actual value attained by j^{th} country in i^{th} attainment

Max. F_i = The maximum value fixed for i^{th} attainment

Min. F_i = The minimum value fixed for i^{th} attainment

However, the methodology to measure the capability in economic attainment is altogether different from other two attainments. It is argued in HDR literature that to achieve a decent level of human development does not require unlimited income. To reflect this HDR (1999) introduces a modified methodology where discounting of income has been made more gradual by taking the logarithm of income through i.e.

$$w(y) = \left[\frac{Log(Y_j) - Log(Y_{min})}{Log(Y_{max}) - Log(Y_{min})}\right] \quad \text{where,}$$

$W(y_j)$ = Index for income component for j^{th} country.

Y_j = Actual Income (GDP per capita in PPP$) of j^{th} country

Y_{max} = Maximum Income Fixed

Y_{min} = Minimum Income Fixed

The fixed values (*goal posts*) set for different indicators by HDR (1999), are as follows:

Indicator	Min	Max
Life Expectancy	25 years	85 years
Adult Literacy	0%	100%
Combined Enrolment Ratio	0%	100%
Per Capita GDP	PPPUS$100	PPPUS$40,000

Following HDR (1999) methodology we compute Human Development Indices for India and all 16 included states [details are given in Appendix:] in UNDP format. Additional information, we have computed is Non-income Human Development Index (NIHDI) which is simply obtained as the mean of health as well as educational index of the concerned region. Hence, for the jth region

$$NHDI_j = \frac{1}{2}[LifeExpec\tan cyIndex_j + EducationalIndex_j]$$

A.1.4. Measures of Dispersion and Inequality

To find out regional inequalities in income, HDI and its components across Indian states we employ two sets of measure of disparities in Chapter VI. First set of measures in which we work out Simple Coefficient of Variation (CV) and Gini coefficient of Concentration (G_c) does not take the population share of each state into account. The other set of inequality measures such as population-weighted Coefficient of Variation (CV_p), Lorenz-consistent Gini Coefficient (G_p), General Entropy (GE) and Bourguignon Inequality Index (L) takes population share of each state into account.

The Coefficient of Variation (CV) takes the ratio of simple standard deviation and the mean of the sample. Among all dispersion measures CV is considered as simplest and widely used in research studies as the primary tool of testing σ - Convergence. The vantage point of Coefficient of variation over Standard Deviation as a measure of dispersion is that the latter would work if mean remains unchanged over time. When mean changes the Standard Deviation has been bigger in absolute term. Coefficient of Variation, however, rectifies this problem by normalizing the variable of interest to facilitate comparison of the same variable at different means. It is defined as

$$CV = \frac{\sigma_y}{\bar{y}} = \frac{\sqrt{[\sum_{j=1}^{N} (y_j - \bar{y})^2]}}{\sum_{j=1}^{N} y_j}$$

The Gini coefficient of concentration (G_C) from individual data is derived in Pyatt et.al. (1980) as

$$G_C = \frac{2\,Cov\ (y, R_y)}{N\ \bar{y}}$$ where $Cov\ (y, R_y)$ is the covariance between the value of the indicator in question (y) and the rank of the individual (R_y) according to the value of y; N is the total number of individual and $\bar{y}$ mean value of the indicator y. Milanovic (1997) demonstrates that G_C is approximately equal to the following expression:

$$G_C = \frac{1}{\sqrt{3}}(\frac{\sigma_y}{\bar{y}})\rho(y, R_y)\frac{\sqrt{(N^2 - 1)}}{N}$$

However, for a significantly large N the term $\frac{\sqrt{N^2 - 1}}{N}$ will be equal to 1. Thus, finally, Gini Coefficient of Concentration (G_C) reduces to the product of three elements: a constant, Coefficient of Variation of y and the Coefficient of Correlation between the value of the indicator in question (y) and the rank of the individual (R_y) according to the value of y i.e.

$$G_C = \frac{1}{\sqrt{3}}(CV_y)\rho(y, R_y)$$

Since in our present case N=16; the term $\frac{\sqrt{N^2 - 1}}{N} = .998$ we have taken the term into account.

The population-weighted inequality measures capture the spread of the distribution of the indicator/index and put rigorous emphasis on the deviation of the sample values from the overall population-weighted mean. The typical motivation behind the formulation of inequality measure is so-called Pigou-Dalton principle along with other desirable properties such as anonymity, population, relative achievement principles. The principle of anonymity of any inequality measure requires that the measure should be insensitive to permutations of (y_1, y_2 ..... y_N) among individuals {1, 2 .... N). Population principle assures that population does not matter – only the proportions of people achieved different levels of achievements in the indicator under consideration. Relative Income (achievement) principle asserts that absolute levels of achievements do not influence the measure i.e. I (y_1, y_2 ..... y_N) = I (λy_1, λy_2 ..... λy_N). Pigou-Dalton principle assures that any progressive transfer of the indicator/index i.e. from rich to poor, ceteris-paribus, always decreases inequality i.e. I (y_1, y_2 ..... y_N) < I ($y_1, y_j-\lambda$, ... , $y_k+\lambda$, ..., y_N), whenever $y_j < y_k$.

There are several standard measures of inequality. The population-weighted Coefficient of Variation (CV_p) for any indicator/index take the ratio of standard deviation and mean and hence, gives higher weight to deviations further away from mean. This measure satisfies all four desirable properties – anonymity, population, relative achievement and Pigou-Dalton principles. The measure is given by

$$CV_p = \frac{\sigma_p(y)}{\bar{y}_p} = \frac{\sqrt{[\sum_{j=1}^{N} p_j (y_j - \bar{y}_p)^2]}}{\sum_{j=1}^{N} p_j y_j}$$

Where p_j is the population share of jth state such that $\sum_{j=1}^{N} p_j = 1$, $\bar{y}_p = \sum_j p_j y_j$ is population-weighted mean of the indicator/index under consideration.

The population-weighted Lorenz-consistent Gini Coefficient (G_p) is defined as the ratio of the area between the Lorenz curve and the area under the 45° line (i.e. the line of perfect equality). The measure takes the total of population-weighted absolute difference between all pairs of incomes and normalizes by dividing the obtained total by the mean.

This measure of inequality satisfies all four principles and in addition, it is consistent with Lorenz curve. The measure of inequality amongst the states is given by

$$G_p = \frac{1}{\mu}\sum_{j=1}^{N}\sum_{k=1}^{N} p_j p_k \left| y_j - y_k \right|;$$

Where p_j is the population share of jth state and μ represents the population-weighted mean for the whole sample of the indicator/index (y) under consideration.

The General Entropy (GE) measure of inequality can be written from Shorrks (1984) and Zhang and Kanbur (2001) as

$$I(y)_{c=0} = \sum_{j=1}^{N} p_j \ln\left(\frac{\mu}{y_j}\right)$$

$$I(y)_{c=1} = \sum_{j=1}^{N} p_j \{\left(\frac{y_j}{\mu}\right) \ln\left(\frac{y_j}{\mu}\right)\}$$

$$I(y)_{c\neq 0,1} = \sum_{j=1}^{N} p_j \{\left(\frac{y_j}{\mu}\right)^c - 1\}$$

All variables are defined as before. For **c = 0** we will have the mean logarithm deviation which is more sensitive to lower values of the index i.e. the bottom part of the distribution. This version is actually the Theil's Entropy Index which is often used in research studies. For **c = 1** the measure reduces to Theil Entropy Measure and is sensitive to all parts of the distribution. And finally, setting $c \neq 0,1$ makes the measure sensitive to the middle part of the distribution. For convenience, we assign **c = 2** here.

Bourguignon Inequality Index (L) is obtained from the natural logarithm of the ratio between the populations weighted Arithmetic Mean and Geometric Mean of the index. L is the population weighted additively decomposable inequality measure that satisfies Pigou-Dalton condition and in fact same as Theil's population weighted inequality index. This measure is used in several studies such as Ram (1992 and 2006), Pillarisetti (1997), Chelliah and Shanmugam (2000). L is given by

$$L = \ln[\frac{\sum p_j y_j}{\prod y_j^{p_j}}]$$

A.1.5. Measures of Polarisation

In Chapter VI the measures of polarisation are employed. The most popular measure of polarisation that has been used in the studies of similar context is Esteban and Ray (ER) Index of Polarisation which is built on two behavioral functions: identification and alienation. The former is an increasing function of the number of individuals in the same income class of that individual. The latter characterizes the antagonism, caused by the income difference. The measure was derived in Esteban and Ray (1994) as

$$ER = A\sum_{j=1}^{N}\sum_{k=1}^{N}\pi_j^{1+\alpha}\pi_k|y_j - y_k|$$

A is the normalizing scalar, generally taken as equal to $A = \frac{1}{\mu}$ (or $A = \frac{100}{\mu}$) i.e. normalizing by population-weighted mean (and multiplying by 100); N the number of states; π_j *and* π_k the population size of j^{th} and k^{th} states respectively; y_j and y_k the values of the indicator/index under consideration for j^{th} and k^{th} states respectively. This index of polarisation satisfies certain desirable axioms and some additional ones when the degree of polarisation sensitivity parameter (α) lies between 0 and 1.6. Either of the following two cases (i) $\alpha = 0$ i.e. the degree of polarisation sensitivity parameter is zero

(ii) $\pi_j = 1$ i.e. each state has only one individual or has equal number of population this index of polarisation collapses to Gini Coefficient of inequality index (G_p). For computational conveniences and to impose a high weight to polarisation α is conventionally set at 1.5.

A.2. Supplementary Tables

Table: A.2.1: Estimated Log-Linear Growth Trend of PCNSDP [Constant 1993-94 prices]

State	1970-71 - 2000-01			1970s		
	Initial Income	Growth Factor	R^2	Initial Income	Growth Factor	R^2
AP	3549.44	1.030978	0.936	4041.07	1.01138	0.343
AS	4365.92	1.010669	0.863	4652.3	0.997141	0.091
BH	3191.07	1.009582	0.652	3144.08	1.007949	0.431
GJ	4674.99	1.033592	0.899	5124.05	1.021318	0.33
HR	5450.2	1.030742	0.966	5723.93	1.023057	0.611
HP	4619.37	1.024183	0.879	5213.44	1.099581	0.362
KK	3805.71	1.031276	0.91	4348..47	1.015431	0.526
KR	4601.9	1.0218334	0.765	5507.78	1.000609	0.012
MP	4222.96	1.0168175	0.803	4843.93	0.994978	0.049
MH	5072.72	1.034375	0.945	5399.99	1.030678	0.864
OR	3702.82	1.010949	0.681	3884.64	1.004221	0.034
PJ	6359.01	1.028961	0.992	6300.49	1.030068	0.919
RJ	3738.11	1.0248	0.786	4507.45	0.999104	0.001
TN	4340.02	1.030953	0.879	5112.4	1.010703	0.221
UP	3379.21	1.0190196	0.929	3598.47	1.007459	0.145
WB	3868.19	1.025136	0.893	4394.25	1.009629	0.478

State	1980s			1990s		
	Initial Income	Growth Factor	R^2	Initial Income	Growth Factor	R^2
AP	4515.21	1.0339	0.731	6418.78	1.03881	0.945
AS	4889.52	1.01139	0.587	5535.08	1.00692	0.648
BH	3376.12	1.02558	0.854	4017.85	0.99946	0.491
GJ	6382.47	1.02845	0.582	8364.56	1.05071	0.808
HR	6936.9	1.0399969	0.879	10274.14	1.02755	0.799
HP	5290.12	1.029675	0.718	6957.12	1.04125	0.974
KK	4748.75	1.0313872	0.927	6251.18	1.05736	0.856
KR	5229.25	1.0170933	0.536	6523.06	1.04562	0.975
MP	4835.43	1.01733	0.571	5918.22	1.0207	0.731
MH	6498.94	1.0360446	0.859	9783.3	1.04373	0.941
OR	3834.63	1.021257	0.476	4429.47	1.0168	0.712
PJ	8260.17	1.03401	0.979	11391	1.02623	0.976
RJ	4030.37	1.03889	0.661	6054.64	1.03423	0.731
TN	5229.75	1.0328688	0.819	7334.21	1.0536	0.985
UP	3936.57	1.025754	0.903	5099.08	1.01433	0.795
WB	4669.25	1.023186	0.917	5605.49	1.05126	0.994

Table: A.2.2. Human Development Dimension Index 1971

State	Code	Life Expectancy at Birth (yrs.)	Life Expectancy Index	Adult Literacy Rate (%)	Adult Literacy Index	Combined Gross Enrolment Ratio (%)	Combined Gross Enrolment Index	Education Index	Real GSDP Per Capita (PPP US$)	Income Index	HDI	NIHDI
		1	2	3	4	5	6	7	8	9	10	11
1 Andhra Pradesh	AP	48.3	0.388	28.3	0.283	30.7	0.307	0.291	1122	0.404	0.361	0.34
2 Assam	AS	45.9	0.348	36.5	0.365	36.9	0.369	0.366	1120	0.403	0.372	0.357
3 Bihar	BH	47.8	0.38	23.5	0.235	27.1	0.271	0.247	870	0.361	0.329	0.314
4 Gujarat	GJ	48.3	0.388	42.1	0.421	40.5	0.405	0.415	1750	0.478	0.427	0.402
5 Haryana	HR	55.2	0.503	29.7	0.297	33.8	0.338	0.31	1783	0.481	0.431	0.407
6 Himachal Pradesh	HP	51.9	0.448	32.3	0.323	41	0.41	0.352	1430	0.444	0.415	0.4
7 Karnataka	KK	54.3	0.488	35.9	0.359	40	0.4	0.372	1243	0.421	0.427	0.43
8 Kerala	KR	61.7	0.612	69.1	0.691	54.6	0.546	0.642	1440	0.445	0.566	0.627
9 Madhya Pradesh	MP	46.6	0.36	26.6	0.266	27.6	0.276	0.269	1286	0.426	0.352	0.315
10 Maharashtra	MH	52.8	0.463	45	0.45	48.3	0.483	0.461	1520	0.454	0.459	0.462
11 Orissa	OR	45.1	0.335	31	0.31	29.6	0.296	0.305	1112	0.402	0.347	0.32
12 Punjab	PJ	57.2	0.537	35.2	0.352	37.9	0.379	0.361	1799	0.482	0.46	0.449
13 Rajasthan	RJ	48.2	0.387	22	0.22	24.3	0.243	0.227	1370	0.437	0.35	0.307
14 Tamil Nadu	TN	48.5	0.392	43	0.43	46.7	0.467	0.442	1409	0.442	0.425	0.417
15 Uttar Pradesh	UP	41.8	0.28	25.5	0.255	26.6	0.266	0.258	1036	0.39	0.309	0.269
16 West Bengal	WB	49.3	0.405	40.2	0.402	39.2	0.392	0.398	1209	0.416	0.406	0.402
All India	AI	48.9	0.398	34.1	0.341	38	0.38	0.354	1279	0.425	0.392	0.376

Table: A.2.3. Human Development Dimension Index 1981

State	Code	Life Expectancy at Birth (yrs.)	Life Expectancy Index	Adult Literacy Rate (%)	Adult Literacy Index	Combined Gross Enrolment Ratio (%)	Combined Gross Enrolment Index	Education Index	Real GSDP Per Capita (PPP US$)	Income Index	HDI	NIHDI
		1	2	3	4	5	6	7	8	9	10	11
1 Andhra Pradesh	AP	57.5	0.542	32.5	0.325	37.7	0.377	0.342	1340	0.433	0.439	0.442
2 Assam	AS	51	0.433	41.6	0.416	46.3	0.463	0.431	1180	0.412	0.425	0.432
3 Bihar	BH	52	0.45	29.3	0.293	33.09	0.331	0.305	853	0.358	0.371	0.378
4 Gujarat	GJ	55.1	0.502	48.3	0.483	45.9	0.459	0.475	1960	0.497	0.491	0.489
5 Haryana	HR	59.2	0.57	39.2	0.392	36.7	0.367	0.383	2031	0.503	0.485	0.477
6 Himachal Pradesh	HP	59.1	0.568	43.7	0.437	48.6	0.486	0.453	1580	0.461	0.494	0.511
7 Karnataka	KK	59.6	0.577	43.1	0.431	43.1	0.431	0.431	1347	0.434	0.481	0.504
8 Kerala	KR	67.5	0.708	78.1	0.781	55.6	0.556	0.705	1519	0.454	0.622	0.707
9 Madhya Pradesh	MP	51	0.433	35.6	0.356	33.6	0.336	0.349	1386	0.439	0.407	0.391
10 Maharashtra	MH	59.8	0.58	51.8	0.518	51	0.51	0.515	1969	0.497	0.531	0.548
11 Orissa	OR	51.7	0.445	38.7	0.387	35.2	0.352	0.375	1132	0.405	0.408	0.41
12 Punjab	PJ	62.3	0.622	42.66	0.427	46.9	0.469	0.441	2302	0.523	0.529	0.532
13 Rajasthan	RJ	53	0.467	28.2	0.282	31.5	0.315	0.293	1159	0.409	0.39	0.38
14 Tamil Nadu	TN	56.1	0.518	50.4	0.504	52.2	0.522	0.509	1436	0.445	0.491	0.514
15 Uttar Pradesh	UP	49.3	0.405	30.8	0.308	34.5	0.345	0.32	1143	0.407	0.377	0.363
16 West Bengal	WB	56.8	0.53	48.1	0.481	44.5	0.445	0.469	1350	0.434	0.478	0.5
All India	AI	55	0.5	40.8	0.408	42.1	0.421	0.412	1377	0.438	0.45	0.456

Table: A.2.4. Human Development Dimension Index 1991

State	Code	Life Expectancy at Birth (yrs.)	Life Expectancy Index	Adult Literacy Rate (%)	Adult Literacy Index	Combined Gross Enrolment Ratio (%)	Combined Gross Enrolment Index	Education Index	Real GSDP Per Capita (PPP US$)	Income Index	HDI	NIHDI
		1	2	3	4	5	6	7	8	9	10	11
1 Andhra Pradesh	AP	62.1	0.618	38.5	0.385	44.2	0.442	0.404	1851	0.487	0.503	0.511
2 Assam	AS	55.7	0.512	49.6	0.496	57.6	0.576	0.522	1525	0.455	0.496	0.517
3 Bihar	BH	58.5	0.558	35.1	0.351	37.2	0.372	0.358	942	0.374	0.43	0.458
4 Gujarat	GJ	60.9	0.598	55.9	0.559	58.3	0.583	0.566	2665	0.548	0.571	0.582
5 Haryana	HR	62.9	0.632	48.9	0.489	44.5	0.445	0.474	3046	0.57	0.559	0.553
6 Himachal Pradesh	HP	65.1	0.668	57.3	0.573	62.1	0.621	0.588	2092	0.508	0.588	0.628
7 Karnataka	KK	62.8	0.63	50.9	0.509	52.7	0.527	0.515	1791	0.482	0.542	0.573
8 Kerala	KR	72.2	0.787	88	0.88	52.6	0.526	0.761	1847	0.487	0.678	0.774
9 Madhya Pradesh	MP	54.5	0.492	40	0.4	47.2	0.472	0.424	1715	0.474	0.463	0.458
10 Maharashtra	MH	64.7	0.662	60.4	0.604	55.3	0.553	0.586	2807	0.557	0.602	0.624
11 Orissa	OR	56.6	0.527	46.1	0.461	45.8	0.458	0.46	1285	0.426	0.471	0.494
12 Punjab	PJ	66.9	0.698	52.9	0.529	47.6	0.476	0.511	3181	0.577	0.595	0.605
13 Rajasthan	RJ	58.4	0.557	35.5	0.355	43.3	0.433	0.381	1825	0.485	0.474	0.469
14 Tamil Nadu	TN	62.9	0.632	57	0.57	59	0.59	0.576	2130	0.511	0.573	0.604
15 Uttar Pradesh	UP	56.3	0.522	38.6	0.386	37.8	0.378	0.383	1441	0.445	0.45	0.453
16 West Bengal	WB	62.1	0.618	56.2	0.562	55.1	0.551	0.558	1615	0.464	0.547	0.588
All India	AI	60.1	0.585	48.5	0.485	47.9	0.479	0.483	2004	0.5	0.523	0.534

Table: A.2.5. Human Development Dimension Index 2001

State	Code	Life Expectancy at Birth (yrs.)	Life Expectancy Index	Adult Literacy Rate (%)	Adult Literacy Index	Combined Gross Enrolment Ratio (%)	Combined Gross Enrolment Index	Education Index	Real GSDP Per Capita (PPP US$)	Income Index	HDI	NIHDI
		1	2	3	4	5	6	7	8	9	10	11
1 Andhra Pradesh	AP	64.3	0.655	53.9	0.539	52.4	0.524	0.534	2655	0.547	0.579	0.595
2 Assam	AS	59	0.567	58.2	0.582	63.1	0.631	0.598	1676	0.471	0.545	0.583
3 Bihar	BH	62.1	0.618	42.8	0.428	44.6	0.446	0.434	937	0.374	0.475	0.526
4 Gujarat	GJ	64.1	0.652	59.7	0.597	64.4	0.644	0.612	3919	0.612	0.625	0.632
5 Haryana	HR	66.1	0.685	59.8	0.598	49.7	0.497	0.564	3905	0.612	0.62	0.625
6 Himachal Pradesh	HP	66.9	0.698	68.9	0.689	68.2	0.682	0.686	2988	0.567	0.65	0.692
7 Karnataka	KK	65.8	0.68	59.7	0.597	59.9	0.599	0.597	3135	0.575	0.617	0.639
8 Kerala	KR	73.1	0.802	89.3	0.893	63.6	0.636	0.806	2812	0.557	0.722	0.804
9 Madhya Pradesh	MP	58.1	0.552	57.3	0.573	55.2	0.552	0.565	2102	0.508	0.542	0.559
10 Maharashtra	MH	67.1	0.702	69.2	0.692	64.1	0.641	0.674	4189	0.623	0.666	0.688
11 Orissa	OR	59.4	0.573	56.7	0.567	52.9	0.529	0.554	1548	0.457	0.528	0.564
12 Punjab	PJ	69.4	0.74	63.4	0.634	57.3	0.573	0.613	4185	0.623	0.659	0.677
13 Rajasthan	RJ	62.2	0.62	48.4	0.484	48.3	0.483	0.483	2377	0.529	0.544	0.552
14 Tamil Nadu	TN	66.1	0.685	65.6	0.656	63.7	0.637	0.649	3437	0.59	0.641	0.667
15 Uttar Pradesh	UP	60.4	0.59	47.9	0.479	46.3	0.463	0.473	1619	0.465	0.509	0.532
16 West Bengal	WB	64.5	0.658	64.1	0.641	63.4	0.634	0.638	2542	0.54	0.612	0.648
All India	AI	63.4	0.64	58.4	0.584	55.9	0.559	0.575	2840	0.559	0.591	0.608