Economic Growth and Human Development: An Indian Case Study

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CERTIFICATE

This dissertation entitled **'Economic Growth and Human Development: An Indian Case Study'**, submitted by **Sharmistha Maitra** in partial fulfilment for the M.Phil degree of this University has not been previously submitted for any other degree of this University and is her original work.

We recommend that the dissertation be placed before the examiners for evaluation.

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Dedicated

to

Dadubhai

CONTENT

Chapter1

INTRODUCTION

1.1Background

Right from his inception man has strived to make his life better. If we trace the evolution of prehistoric man to the modern day man, we can see how man has progressed through successive stages of development. Marx in his *dialectical materialism* has shown the different stages through which primitive man has transformed himself from a food gatherer to a capitalist. Each stage of his development is marked by economic growth.

Many theories have been offered by the economists to explain economic growth. Conventional growth theories attempted to model and explain the growth process of the present day developed countries. However the picture changed in the post-second world war period, when the less developed countries (LDCs) became independent from their colonial rulers. These LDCs inherited a weak and impoverished economy from their colonial masters and the governments of these countries embarked on projects that would lead to higher per capita gross domestic product (GDP). The focus was on the growth of per capita income because it was believed that such growth would have a *trickle down* effect to benefit even the lowest stratum of the society. At that time growth and development were believed to be synonymous.

This myth was broken during the middle of the twentieth century, when it was found that though the per capita GDP of some of the developing countries was almost same as that of the average growth rates of the developed countries, in some cases even higher, yet income inequalities of these developing countries increased[1]. As a result poverty and unemployment levels remained high.

Viner (1953) was probably the first economist to argue that it was not correct to claim that a country was achieving economic progress as long as the incidence of poverty in that particular country had not diminished. It was then realized that growth and development may not always go hand in hand. This led to the search for a new concept, which would capture the essence of both economic growth and development. The result was the emergence of a concept called *economic development.*

In a pioneering study to conceptualize economic development Seers (1969) raised some basic questions. According to him, in order to assess a country's development one should see what is happening to the country's poverty, unemployment and inequality levels. If all these three indicators decline from a higher level during the period of study then it can be said with conviction that development has taken place in that particular country. If one, two, or all three indicators have grown worse while the per capita income might have doubled, it will be wrong to interpret the result as *development.*

Different economists have defined economic development in different ways. For instance Kindleberger and Herrick (1977) asserted[2]: "*Economic development is generally defined to include improvements in material welfare, especially for persons*

[1] Kuznets, (1955)
[2] Kindleberger and Herrick (1977) p.1

with the lowest incomes, the eradication of mass poverty with its correlates of illiteracy, disease and early death; changes in the composition of inputs and outputs that generally include shifts in the underlying structure of production away from agricultural towards industrial activities; the organization of the economy in such a way that productive employment is general among the working age population rather than the situation of a privileged minority; and the correspondingly greater participation of broadly based groups in making decisions about the directions, economic and otherwise, in which they should move to improve their welfare."

Seers, Kindleberger and Herrick have defined economic development in purely economic terms. However economists like Todaro (1993) defined economic development as[3] "*Multidimensional process involving major changes in social structure, popular attitudes and national institutions, as well as the acceleration of economic growth, the reduction of inequality and eradication of absolute poverty. Development, in its essence, must represent the entire gamut of change by which an entire social system, tuned to the diverse basic needs and desires of individuals and social groups within that system, moves away from the condition of life perceived as unsatisfactory and towards a situation or condition of life regarded as materially and spiritually better*".

The discussion of economic development would remain incomplete without acknowledging the contributions of Sen (1999)[4]. According to him "*Development requires the removal of major sources of unfreedom: poverty as well as tyranny, poor*

[3] Todaro (1993) p.88.
[4] Sen (1999) p.3-4.

economic opportunity as well as systematic social deprivation, neglect of public facilities as well as intolerance or over activity of repressive states. Despite unprecedented increase in overall opulence, the contemporary world denies elementary freedom to vast numbers – perhaps even the majority of people. Sometimes the lack of substantive freedoms relates directly to economic poverty, which robs people of the freedom to satisfy hunger, or to achieve sufficient nutrition... In other cases, the unfreedom links closely to the lack of public facilities and social care...."

Sen (1999) did not consider people as the only means of production. From his writings it is clear "*that people are both the means and the end of economic development.*"[5] According to him the goal of any society should be development rather than economic growth. Sen's work on famines and poverty led first to a theory of entitlements and then to a notion of capabilities. It is from this twenty-year-old literature on inequality and poverty and especially the notion of capabilities that the concept of human development traced one of its strongest roots

From the definitions of economic development we can see that it can be divided into two components: economic growth and human development. The human dimension of development considers human being as the principal object in contrast to economic development, where man was treated as the means of achieving development. In this context Haq (1996) has said that human beings have finally

[5] Haq, (1996). p.3.

become "*a living, operational reality, not helpless victims or slaves of the very process of development they have unleashed, but its masters.*"[6].

This idea of human development is not altogether new. It dates back to as early as the days of Aristotle (384-322 B.C.), who believed that a successful political arrangement in a country was the one that enabled the citizens to lead "flourishing lives." The idea that man is not only a means to achieve the end but an end in him has been reflected in the writings of several early philosophers and economists like Adam Smith, Immanuel Kant, Robert Malthus, Karl Marx, and John Stuart Mill.

1.2 Economic Growth And Human Development

In the previous paragraphs we have mentioned that economic growth and human development are two constituents of economic development. The basic difference between economic growth and human development is that the first concept emphasizes only on income while the second concept considers enlargement of people's choice set. This choice set incorporates all the elements of social, cultural, political or economic sectors. One might argue that if income increases then the choice set also enlarges. But this is not always true because of several reasons:

- First, the income distribution within the country may be highly skewed. This implies that only few people in the society enjoy very high income while the majority lives either in the subsistence level or below it. Therefore in such a situation when economic growth takes place income of only a few rich people increases and hence their choice set enhances

[6] ibid, p.12

leaving the choice set of the majority unaltered and in some cases diminished.

- Second, policies chosen by the states may not be conducive for human development – "*... guns or butter, an elitist model of development or an egalitarian one, political authoritarianism or political democracy, a command economy or participatory development.*"[7]

Thus, it can be said that though an increase in income enlarges an individual's choice set, it does not necessarily enhances the human development of that individual. Human development increases when an individual spends more on inputs[8] such as knowledge, health, political freedom, and clean physical environment. Consumption of these inputs depend more on utilization of income rather than the magnitude of income.

Though economic growth and human development are two distinct concepts, yet they are dependent on one another. If there is only economic growth and no human development then the growth will not sustain for a longer period of time. This is because productivity of low skilled and unhealthy work force is very low. On the other hand if there is only human development and no economic growth then the situation cannot persist for long because economic growth provides the opportunity to utilize the human capabilities. These opportunities may be in the form of employment, productive activities, political affairs and leisure. If this balance between economic growth and human development is not maintained then it may lead

[7] ibid, p. 14
[8] Here by 'inputs' we mean those things that raise human development.

to serious social tension and economic backwardness and ultimately the country lands into a vicious cycle.

So, for a sustainable growth of the economy both economic growth and human development are needed. In this context we can cite the example of many East Asian societies where growth has been accelerated through maximum investments in human capital. The concept of human capital is not something new in economics. Adam Smith in his *Wealth of Nations* identified the improvement of worker's skill as a fundamental source of economic progress and increasing economic welfare. Then this concept receded to the background only to reemerge in the sixties.

There is a difference between human capital and human development. Human capital refers to the capacity of human beings to enhance the production capacity of the economy. Human development is a broader concept than human capital. Human capital recognizes the increase in income resulting from an increase in labour productivity, which in turn is linked to expansion of educational facilities and health care. The latter may increase the longevity of human beings; make them healthier and happier without changing labour productivity or increasing commodity production. Human capital fails to acknowledge such achievements. To capture these outcomes we introduce the concept of human *development*.

According to Haq (1996), human development is defined as a mechanism, which builds human capabilities and provides a framework for use of the same. If the balance between investment in people, creation of capabilities and absorption of these capabilities in employment in productive channels, is disturbed then it can result in a

tremendous upheavel. Thus human development is "... a process of widening people's choices as well as raising the level of well-being achieved".[9]

1.3 Objective And Scope

Not much work has been done to explore the symbiotic relationship between economic growth and human development. The primary objective of this dissertation is to examine the two-way relationship between economic growth and human development in the context of the Indian states. For this purpose fifteen major states of India for the period 1981-1997 have been considered. We develop several hypotheses[10] in this regard, to econometrically model the relationship between human development and economic growth using panel data techniques.

The dissertation is divided into five chapters. After this introductory chapter we present a review of the existing literature to establish the symbiotic relationship between economic growth and human development, in chapter 2. In Chapter 3, we examine the relationship between economic growth and human development using the tools of applied econometrics. Chapter 4 classifies the states into different categories like virtuous, vicious, and two types of lopsidedness, i.e. lopsided with strong human development and weak economic growth (HD-lopsided); and lopsided with weak human development and strong economic growth (EG-lopsided) on the basis of their performance in economic growth and human development sectors. This is essential for adopting appropriate policies. For this purpose human development

[9] United Nations Development Programme, *Human Development Report 1997* (New Delhi: OUP 1997) p.15

[10] The hypotheses have been discussed in detail in Chapter III.

Index (HDI)[11] for the years 1981 and 1997 and economic growth during the same period is constructed. States will also be classified according to their performance on human development into different categories and the ranks of the states on the basis of state domestic product (SDP) per capita and Human Development Index of the states will be taken to see the correlation between human development and economic growth. Chapter V summarises and concludes.

[11] It is an index developed to capture the concept of human development. Detailed discussion on this index is done in Chapter IV.

CHAPTER-2

A Survey of Literature

2.1 INTRODUCTION

The question that the growth theories have tried to answer is why are some countries rich and others remain poor. Most of the growth theories have tried to explain economic growth, by focusing more on physical capital. Gradually this perception changed. Economists realized the potential of human capital in bringing about economic growth. In this chapter our aim is to examine the relationship between economic growth and human development as it has evolved in the theoretical and empirical literature.

The fact that human capital is an important determinant of economic growth has emerged from the theoretical models in the macroeconomic growth literature. We begin our discussion with the review of this literature in 2.2. In 2.3 we present some of the empirical literature, analyzing how education and health (two important components of human development) influence productivity of labour, which in turn influences economic growth. An obvious question that arises at this point is what drives the decision to acquire human capital at micro level. Section 2.4 reviews the literature on human capital acquisition from micro perspective, which enables us to understand the links between human capital and earnings from the point of view of an individual. We conclude the discussion in 2.5.

2.2: REVIEW OF THEORETICAL LITERATURE

Let us begin our discussion by writing the production function:

$$Y = F(K, L, \theta),$$

where Y denotes output produced; K represents the capital stock; L stands for the labour and θ captures the technological progress.

Economic growth occurs when national output or national income of the economy increases either in aggregate or in per capita terms. Therefore in terms of the above equation we can say that if Y increases then economic growth will occur. Y is affected by three components K, L and θ. So, economic growth will also be governed by these three factors.

According to conventional growth models beginning with Harrod (1939) and Domar (1946), physical capital was believed to be the main source of growth. The role of technology in augmenting growth was not denied, but neither it was formally incorporated in growth models prior to Solow (1956). It was Solow (1956) who brought to the fore the importance of technological progress as the ultimate driving force behind sustained economic growth. Later Arrow (1962) and Uzawa (1965) developed growth models where once again emphasis was placed on technological progress. Thereafter theoretical explorations of technological change remained suspended for a while. It was only in the 1980s, Romer (1986) and Lucas (1988) reignited interests of macroeconomists in economic growth, emphasizing on the concept of 'ideas' and of human capital[1]. The following discussion will reveal how

[1] It will be seen in the following discussion that "ideas" and human capital affect economic growth via technological changes. See Jones (2001).

the attention in modeling economic growth gradually shifted from physical capital to human capital.

We begin our discussion with the Harrod[2] (1939) model, which seeks to explain economic growth solely in terms of accumulation of capital stock. According to him increase in capital stock has a dual effect. On one hand net investment creates income and thereby creates demand for output and on the other hand it raises productive capacity of the economy, which leads to an increase in output. There are three concepts of growth in this model. The first is *'actual growth'* (G), which captures the change in aggregate output that finally materializes. The second is the *'warranted rate of growth*[3]*'* (G_W), which refers to that rate of growth at which *"... if it occurs will leave all parties satisfied that they have produced neither more nor less than the right amount."* [4] The third, *'natural rate of growth'* (G_N), *"... is the maximum rate of growth allowed by the increase in population, accumulation of capital, technical improvement, and the work/leisure preference schedule, supposing that there is always full employment in some sense"*. [5]

In this model two problems are seen to arise in the growth pattern. The first concerns the relationship between warranted and natural growth rate and the second between actual and warranted growth rate. If the economy grows along warranted growth path then it will be stable, otherwise not. Slight deviation from the equilibrium growth path will take the system away from the long-run equilibrium

[2] Domar (1946) developed a model, which has the same substance as that in Harrod's model. Therefore the model that has been described here is often known as Harrod-Domar growth model.
[3] s/v =warranted rate of growth, where s denotes fraction of income which the individual and corporate bodies choose to save and v is capital-output ratio. It is that growth rate which if occurs will have all parties satisfied.
[4] Harrod (1939), p.16.
[5] Ibid, p.30.

growth path and the system will never return to the same. This is the so-called *knife-edge problem.* The second problem deals with the relationship between warranted rate of growth and natural rate of growth. According to Harrod, there is no reason for the two to be equal. If the warranted rate of growth is greater than the natural rate of growth, the unemployment rate will grow larger and larger. If the warranted growth rate is below the natural growth rate then the opposite happens. Thus it can be said that even in the long run, Harrod's model is, at best, balanced on knife-edge equilibrium. If any of the parameters like the saving ratio, the capital-output ratio, and the rate of increase of the labour force deviates from their optimal value then the result will be either growing unemployment or prolonged inflation.

The knife-edge equilibrium in Harrod model was mainly because of the assumption of fixed co-efficient production function. Therefore, when Solow's (1956) growth model replaced the fixed co-efficient production function of Harrod model by a variable coefficient production function, "... *the knife-edge notion of unstable balance seems to go with it*".[6] Let us explain this. If $G_W > G_N$, then $\dot{K}/K > \dot{L}/L$. This will generate a situation of excess supply of capital and excess demand for labour. Therefore relative price of labour will increase and that of capital will decrease. Now if technology is assumed to be flexible then factor prices will induce change in techniques. So, production will become capital intensive. Thus capital-labour ratio increases, which implies an increase in capital-output ratio. This will lower the warranted growth rate and finally bring the system to a stable equilibrium.

The production function in Solow's model exhibits constant returns to scale. The population growth is assumed to be exogenous; therefore labour force increases

[6] Solow (1956), p.65.

at a constant rate. The solution of the model gives the time path of the capital stock that will fully utilize the available labour force. Once the time path of capital stock and that of the labour force are known one can easily compute the corresponding time path of real output. Capital and labour maintain a constant long run balance that is known as the steady state of capital stock.

The basic equation of the Solow model is $dk/dt = sf(k,1) - nk$.

where $k = K/L$; $f(k,1) = Y$ is the production function; n = rate of growth of labour force; s = fraction of output saved.

This equation says that a change in capital per worker in each period is determined by two terms: investment per worker and population growth rate. According to the equation, investment per worker $sf(k)$ increases capital per worker while population growth reduces it. If there is no new investment then capital per worker will decline because of the increasing labour force.

When dk/dt is zero, the capital - labour ratio is constant, and the capital stock must be expanding at the same rate as the labour force, i.e at the rate 'n'. From this it can be said that there will be no per capita growth of output in this version of Solow model. This shortcoming has been overcome by introducing technological progress into the model. Technological progress can offset the tendency for the marginal product of capital to fall and in the long run, countries exhibit per capita growth of output at the rate of technical progress. When technical progress is introduced then output per worker and capital per worker both grow at the rate of exogenous technical change.

In a subsequent paper, Solow (1957) performed a simple accounting exercise to decompose growth in output into growth in capital, growth in labour, and growth in technological change. He posited a Cobb-Douglas production function $Y = BK^{\alpha}L^{1-\alpha}$ where B is a Hick's neutral productivity term and α (lying between zero and one) is the elasticity of output with respect to capital. Applying his model to US data on 1909-1949, Solow (1957) found that the "*gross output per man has doubled over the interval with 87.5% of the increase attributable to technical change and the remaining 12.5% to the increased use of capital*". [7]

Solow's contribution clearly established that technical progress is an important determinant of economic growth. This technological advancement can be achieved through acquisition of knowledge, which grows over time.

Arrow (1962) was the first to propose "*an endogenous theory of the changes in knowledge which underlie intertemporal and international shifts in production function.*"[8] There are two generalizations about learning in Arrow's paper – First, learning is the product of experience and can take place during activity. Second, "*learning associated with repetition of essentially the same problem is subject to sharply diminishing returns*"[9]. In this model cumulative gross investment has been taken as an index of experience because "*Each new machine produced and put into use is capable of changing the environment in which production takes place, so that learning is taking place with new stimulus*"[10]. He then developed a vintage model in

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[7] Solow (1957), p.320.
[8] Arrow (1962), p.155.
[9] Ibid
[10] Ibid, p.157. This process is known as learning by doing. Valdes (1999) has termed this as "learning-and-inventing by investing –and –doing". He has coined this term because people learn a new technique when they use it in actual production. This is the learning side. Repeated use of the

which the number of workers employed in successive vintages decline. According to Arrow, this reduction in employment of labour depends on time, as well as on the amount of cumulative gross investment G, which has occurred from the beginning of time. The basic conclusion in this model is that an economy with a static labour force could not grow in the long run. This is because of the diminishing marginal product of capital owing to constant labour force. The model is interesting because of the idea that investment itself leads to growth of knowledge and so makes further profitable investment possible.

Romer's contribution in this area of endogenous growth theory is largely drawn from Arrow (1962). He introduced the assumptions of instantaneous and costless 'spillover' of knowledge into this model.

The model introduced by Romer (1986), is essentially a competitive equilibrium model with endogenous technological change. In the Solow model we have seen that in the absence of technological change, per capita output does not grow. In Arrow's model also we have seen that without growth in the labour force it is not possible to raise the rate of economic growth. Romer (1986) by contrast pushed a model where "*in a fully specified competitive equilibrium per capita output can grow without bound, possibly at a rate that is monotonically increasing over time*".[11] The factor that drives the long run growth is accumulation of knowledge by 'forward-looking, profit-maximizing agents'. Here knowledge has been assumed to be a capital good with an increasing marginal product. The production of consumption good has been assumed to be globally convex and it is a function of stock of knowledge *ceteris*

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technique enables individuals to improve upon the existing technique itself. This is the inventive side of the process.

[11] Romer (1986), p.1003.

paribus. In this model a finite–valued social optimum exists because of diminishing returns in the research technology. This implies existence of a maximum, technologically feasible rate of growth for knowledge. This in turn leads to the existence of a maximum feasible rate of growth for per capita output which may be monotonically increasing over time, but cannot exceed this upper bound.

From the papers by Arrow (1962) and Romer (1986) it can be said that knowledge is the result of everyday learning and research and development activities. These learning and research and development activities augment quality of labour and raises its productivity level, which leads to an increase in output. Labour acquires the capability to enhance productivity and promote growth through exhibiting this in learning and research and development and it may then be treated as a capital, popularly known as *'Human Capital'*. There are two effects of human capital: '*internal effects*', which affect the individual's own productivity and '*external effects*' that contribute to the productivity of all factors of production and augment overall growth[12].

Introducing the concept of human capital in the Solow model, Lucas (1988), obtained the same results as those of the Solow (1956). In this model the general skill level of the worker captures human capital. This means a "*worker with human capital h(t) is the productive equivalent of two workers with ½h(t) each or a half – time worker with 2h(t)*" [13]. In his paper he assumed that individual spends time accumulating skill much like a student going to school and learning new skills instead

[12] See Lucas (1988).
[13] Ibid, p.17.

of working. Lucas in his paper has shown that human capital is an important engine of growth. He has supported his theory with empirical evidence[14]

In one sense this model is an improvement over the neo-classical model. One major drawback of the neo-classical growth model was that it did not explain the cross-country differences in the growth rate. Lucas has tried to rectify this shortcoming by introducing the concept of human capital in the neo-classical model. For this purpose he has taken human capital accumulation to be specific to the production of particular goods and is acquired on the job through learning-by-doing. He has assumed that different goods have different potentials for human capital growth. "*Then the same considerations of comparative advantage that determine which goods get produced where will also dictate each country's rate of human capital growth*"[15]. According to him if a country starts with a low level of human and physical capital then it will permanently remain below an initially better endowed economy. In this way the model explains the possibility of wide and sustained differences in growth rates across countries.

So far we have seen that human capital is an important determinant of economic growth. Human capital influences technological change[16]. This technological change is the result of research and development that have been undertaken by a profit-maximizing firm. Once a technological breakthrough is achieved other firms can easily copy it for their own benefit. Therefore no private firm will undertake the pain of research and development unless the technology it invents can be patented. Once patented, other firms cannot use the technology without

[14] We will talk about this evidence in the next section.
[15] Lucas (1988) p.40.
[16] See Lucas (1988)

paying royalty to the inventor. This makes technology a non-rival[17] and partially excludable[18] good. Arrow (1962), Romer (1986), and Lucas (1988) assumed technology to be non-rival and non-excludable good in their respective models.

Romer (1990) developed another model where he assumed technology to be non-rival but partially excludable good. Here no longer a competitive equilibrium is obtained. Instead the equilibrium is one with monopolistic competition. In this model human capital is measured by the "... *cumulative effect of activities such as formal education and the on-the-job training*".[19] He endogenised the technological progress by assuming that researchers quest for new ideas in order to make profits from their innovations. In this model, knowledge enters the production function in two distinct ways – first, a new design enables the production of a new good that can be used to produce output, and second, new design increases the stock of knowledge and thereby increases the productivity of human capital in the research sector. According to Romer, technological progress is the engine of growth. The basic conclusion of this model is that the growth rate of world technology is tied to the growth rate of the population. A large number of researches can create a large number of ideas and it is this general principle that augments per capita growth of output. An interesting implication of this model is that an economy with larger stock of human capital can experience faster growth.

[17] A purely *rival* good is one, which when used by one firm or person forbids its use by another. On the other hand a purely *non rival* good has the property that its use by one firm or person in no way limits its use by another. *Rivalry* is a purely technological attribute.
[18] *Excludability* depends on technology and legal system. A good is said to be *excludable* if the owner prevents others from using it. *Non-Excludable* goods are just the opposite of *excludable* goods.
[19] Romer (1990) p. S 79.

With the introduction of the concept of human capital as a key determinant in economic growth the conventional production function can be rewritten as:

$Y = F(K, L, H, \theta)$, where Y, K, L, θ have their same meaning and H captures the human capital component in the input set.

Indeed it has been emphasized that investments in human capital rather than physical capital, have spill over effects that raise the level of technology, which in turn enhances economic growth[20].

Thus from the foregoing analysis it can be concluded that increase in human capital, which is a subset of human development leads to an increase in economic growth.

2.3: REVIEW OF EMPIRICAL LITERATURE

The above discussion has theoretically shown that human capital enhances growth. Now we will review some empirical literature on this.

Lucas (1988) has empirically shown that under certain parametric specifications if U.S economy devotes three times as much effort to human capital accumulation as it does then its per capita consumption will be around two percentage points higher than that of the past. In his paper he has concluded that if a country enhances the stock of human capital then growth will occur.

Mankiw, Romer and Weil (1992) evaluated the empirical implications of the Solow model and came to the same conclusion that it performed very well. They also noted that the fit of the model could be improved even more by extending the model

[20] Lucas (1988), Romer (1986), (1990), (1994), Uzawa (1965).

to include human capital – i.e., by recognizing that labour in different economies may possess different levels of education and different skills. In this model human capital is measured by the working age of the population that attends secondary school.

So far we have seen that economists have defined human capital almost as synonymous to educational[21] achievement. Education can be of primary, secondary and tertiary levels. Additional primary education improves the capabilities of farmers and unskilled workers; additional secondary education creates more skills to handle sophisticated equipments and better supervisory personnel and at the tertiary level, the impact of education is on research and development. Finally it can be said that education improves human capacity, which means better governance, better choice of foreign technology and better adaptation of such technology. All these things are conducive to economic growth.

But making human capital synonymous to education has made the concept narrow. Human capital basically captures the power of labour to enhance the output. No doubt that education enhances this power, but if the labour has poor physical health then his capacity to increase output is restricted to a great extent. Therefore it can be said that only when the labour is educated and at the same time healthy his productive capacity increases. In our earlier discussion we have seen many instances where education raises labour's productivity. Now we will see certain empirical evidences where good health increases labour's productivity.

Health can affect productivity in three ways: -

[21] From the discussion of the growth theories it can be said that human capital is accumulated through learning by doing and research and development, both of which add to the individuals knowledge stock. In this sense human capital and education is treated as synonymous.

1) Basic nutrition level below subsistence: - In this case workers suffer from weakness and it adversely affects their productivity. This has been shown by Strauss (1986) in his study. He has used household level data from Sierra Leone to test whether high calorie intake enhances family farm labour productivity. The result showed a highly significant effect of calorie intake on labour productivity (output elasticity was 0.34) providing solid support for the nutrition–productivity hypothesis. As the levels of calorie intake reaches 4500 per day, which is roughly the average intake of the upper third of the sample, the output elasticity falls to 0.12. However, at a daily intake of 1500 calories, which is the average intake of lower third of the sample, the output elasticity rises to 0.4. Thus, it is seen that the effect of calorie intake on labour productivity is very high at a low intake level, dropping off substantially as intake levels rise, but still with same effect at moderate intake level.

2) Deficiency disease: - When workers suffer from deficiency diseases like aneamia their productivity goes down. Basta et al (1979) in their study of 302 male rubber tree tappers and weeders in Indonesia found that about half of the workers were anaemic. The baseline productivity[22] of anaemic workers was about twenty percent lower than that of the non-anaemic workers. When sick workers were treated with medicines, and once they were

[22] Productivity is measured in terms of the basis of the amount of sugarcane cut in a day.

completely cured their productivity level increased nearly to the levels of non-anaemic workers.

3) Effect of specific disease on productivity: - Fenwick and Figenschow (1972) tried to measure the effect of a specific disease on output. They carried out their study on sugarcane workers working on an irrigated estate of Tanzania. It was found that some of the workers were suffering from schistosemiasis[23]. It was observed that productivity[24] of those suffering from schistosemiasis was lower than those who were not infected. Once treated and cured, the earning of the previously infected workers increased but not to the level of the uninfected group. The study clearly suggests that schistosemiasis does affect productivity.

The above three case studies refer to some particular aspects of health. Bloom, Cannig and Sevilla (2001) have tried to find out the relationship between health in general and productivity. For this purpose, the production function model of economic growth has been extended to account for two additional variables – work experience and health. In their study they have found that health has a positive and statistically significant effect on economic growth. It was found that if a person's life expectancy increases by one year then his contribution to output increases by four percent.

[23] Parasitic worms that live in slow moving water cause Schistosemiasis and repeated exposure can result in fever, aches and often fatigue.
[24] Is measured by the kilogram of latex collected by tappers per day and the average trenches dug by weeders.

Several other empirical studies were carried out to test the relationship between health and productivity. One such study by Margo and Steckle (1982) showed that sales values of slaves in Mississippi were influenced by height and also weight. Height was important probably because it was found that height reflects benefits of longevity (Friedman (1982), John (1988)).

We conclude that if an individual is skilled, (as measured by his education level) and healthy then his productivity increases, which in turn contributes to economic growth.

2.4: ACQUISITION OF HUMAN CAPITAL: A MICROECONOMIC PERSPECTIVE.

So, far we have seen that increase in human capital leads to faster economic growth. Human capital is embodied in individuals. The question that now arises is why should an individual acquire human capital. In this section we will try to answer this question.

Let us begin our discussion with the objective function of an individual. An individual tries to maximize his utility level. He derives utility from the consumption of goods and services. Here we assume that the consumption set of an individual comprises of only good. So, more an individual consumes, higher will be his satisfaction. To exercise greater command over goods and services consumers need higher income, which can be acquired by supplying labour to the producers. In this context we can refer to the *Efficiency Wage Hypothesis* (Stiglitz (1976)). According to this hypothesis a service rendered by a labourer is a function of the wage he receives. So if the wage is higher then more service is rendered. This hypothesis also

says that if the wage is above the subsistence level, then with increase in wage, labour supply increases, although eventually diminishing returns set in. Therefore we can say that labourer will supply more labour if they receive higher wages.

Supply of labour in the market is not enough. There should be demand for such labour. From our earlier analysis it has been seen that labours with skill and good health have higher productivity. Profit maximizing producers will employ only such labours. Therefore consumers will try to be skillful and healthy.

Skill is acquired through education. According to Schultz (1988) education is both demanded as a consumption good that yields direct utility and as a producer good that is expected to enhance the future productivity of the educated individuals.)

Studies by Psacharopoulos (1985), Blaug (1976) and Jamison and Lau (1982) have shown that more educated men and women receive more earnings and produce more output than the less educated in a wide range of activities. This empirical regularity was first examined in high-income countries such as the US and subsequently in other countries. The conventional economic interpretation is to assume that wages measure labours' marginal productivity and that, persons acquire education as they do vocational training at a cost in times of foregone opportunities that is repaid by future streams of enhanced earning.

According to Schultz (1988) if education increases the productivity and income of labour, then it is well understood why parents spend on their children's schooling, foregoing the productive contribution the children would have made to family income had they not attended the school. This microeconomic perspective explains the motivation of an individual to supply resources to provide schooling

services on the expectation that the money invested today will yield the desired rate of return tomorrow.

In the last three decades there has been a rapid expansion in world demand for education. It is broadly consistent with apparent high social and private rates of return on investments in schoolings.

Several studies have indicated that there exists a positive relationship between education and income. Schultz (1988) in his study has assumed real wage as a function of schooling, such that as schooling increases real wage increases. Welch (1975) has verified the assumptions of Schultz in his empirical study. In his study he has shown that income-schooling association is not spurious.

This relationship between schooling and income is also conditioned by one's parental influence. One of the conventional assumptions in this regard is that parents choose the schooling of their children according to the parents' endowments and preferences but these parental attributes do not affect their children's earnings except to that extent that they influence the children's schooling[25].

It is often assumed that wealthy and powerful parents secure for their off springs both education and a well-paying job. Carnoy (1967) examined this hypothesis with intergenerational data from Mexico, conditioning wages on various characteristics of the parents as well as on the workers' education, age etc. In his result Carnoy, states that fathers' occupation is strongly related to the child's wages, but contrary to expectation, that much of this 'effect' of parent background is intermediated through the child's educational attainment. Thus "increasing the

[25] See Schultz (1988) for detailed discussion.

average skill level of the father has only a small effect on one's son's income given the sons' schooling"[26].

So far we have seen that income acts as an incentive for acquiring higher education. Bhagwati and Srinivasan (1977) in their study have viewed how education acts as an instrument for job competition in a distorted labour market. They have developed a model where if wages are not flexible downward and an excess supply of educated labour exists for the available jobs requiring a specified level of education, then the employer is assumed to clear the market by raising the educational standard for the job until the supply of educationally qualified job applicants no longer exceeds the respective demand for labor. The rationing of jobs by education, if wages are not flexible downwards, provides a second best economic outcome in the presence of labour market distortions and leads to the employment of overqualified workers. An inefficient match of workers and jobs occur in this formulation.

Thus it can be said that higher education not only enables an individual to earn higher income but also enables him to get a job in a distorted labour market. Now the question that is raised is how much to invest in education. The investment in education is governed by the rate of return obtained from it. According to Schultz (1988), the optimum level of attending school is that which equates the opportunity cost of attending school to the discounted value of the lifetime gain obtained from the increment to schooling.

From the above discussion it can be said with conviction that since higher education leads to higher wages therefore individuals will invest in education.

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[26] Carnoy (1967) p.418

Let us now discuss the relationship between health and income. We have already seen that skill of the labour alone cannot raise the output if his health is poor. Therefore along with skill, the health of the labour has to be improved to increase his efficiency. This will in turn lead to an increase in income of the labour. The productivity of a well-paid worker is higher than a poorly paid worker.

Empirical evidence of a positive relationship between health and income is found in many studies. Wheeler (1980) estimated a GDP production function in which a percentage change in GDP is a function of percentage change in calorie availability, adult literacy, life expectancy, percentage change in labour and capital stock – all treated as endogenous variables. In this study he found a significant positive effect of life expectancy and calorie availability on output, with elasticities of output for the two inputs being 1.7 and 2.7 respectively (compared to output elasticities of 0.2 for labour and capital). He therefore concluded that better health and nutrition in a country significantly increase the growth of income.

Strauss and Thomas (1998) have also discovered the relationship between health and income. According to him better health results in higher productivity and thus higher income. This higher income in turn is invested in health by spending more on inputs that enhance health. The workers may either buy more inputs or buy higher quality inputs. Strauss in his paper has done utility maximizing exercise, subject to a budget constraint. In his model he has assumed utility to be a function of individual's consumption of goods, labour supply, health output, schooling, tastes (unobserved), socio – demographic characteristics such as gender and family background. In his

exercise he found that the shadow price of health-augmenting inputs[27] declined if the inputs raise wages by improving the health outcomes, thus inducing greater use of these inputs. He also found that the shadow price for health inputs decline more for those in worse health. In Strauss's paper we find that people invest in inputs that enhances growth. This may be because workers who are physically more healthy and mentally more energetic and robust are more productive. They usually earn higher wages. It is less likely for them to absent from work because of illness. Illness and disease reduce hourly wage substantially, with the effect especially strong in developing countries. Health, like schooling, will affect labour supply by influencing offered wages, with resulting substitution and income effects, and also by affecting the marginal rate of substitution between goods and leisure. Employers will not be interested in employing people from very poor family because such people are so unhealthy that they are too costly to be employed.

Improvements in health not only increases productivity of labour and hence his income, it also reduces fertility. This point was made by Behrman and Deolalikar (1988) in their study. If health of mother and infant both are improved then there will be a decline in the infant mortality rate. In their article they have referred to two terminologies - "replacement effect" and "hoarding effect". The first signifies that when the infant mortality rate is high the parents usually replace a dead infant with a fresh childbirth. The second refers to a situation where the parents in the anticipation of the death of a child bear more children. Apart from this effect the breast fed infants can delay subsequent births by lengthening the duration of postpartum amenorrhea.

[27] Health augmenting inputs are those inputs, which improve health of an individual, such as better nutrition and health care.

From this study it can be said that if health and nutrition improves then the population growth rate will be lowered in future, thereby enhancing per capita income.

Therefore from the foregoing discussion it can be said that an individual will spend on education and health care in order to raise his productivity and thereby his income. He can undertake such expenditure only when his income goes up, which is possible through economic growth.

2.5 CONCLUSION

Let us now conclude the literature survey. Our purpose is to examine the symbiotic relationship between human development and economic growth. Human development takes place when an individual's educational achievement, health condition, and income increases. From 2.2 and 2.3 we have seen that as labour productivity increases economic growth takes place. Improvement in health, and educational achievements lead to an increase in productivity of labour. From Section 2.4 it has been established that as the productivity increases an individual's income rises. Therefore we can say that as the labour becomes more productive his education, health and income level improves. So, it is evident that as the three factors of human development increases economic growth results. On the other hand human development is possible only when consumers have enough money to invest in inputs[28] that enhances human development. We have seen that the augmentation of lifetime earnings will create positive incentive for an individual to make explicit investment on education and health care. In order to make such investment one needs adequate income. Economic growth leads to higher private disposable income. So it

[28] By inputs we mean education, nutrition and health care.

can be said that when economic growth takes place an individual's income increases and therefore he can afford to spend more on inputs, which raises human development. Thus, we can say that economic growth promotes human development.

CHAPTER 3

ECONOMIC GROWTH AND HUMAN DEVELOPMENT: AN EMPIRICAL ASSESSMENT

3.1 INTRODUCTION

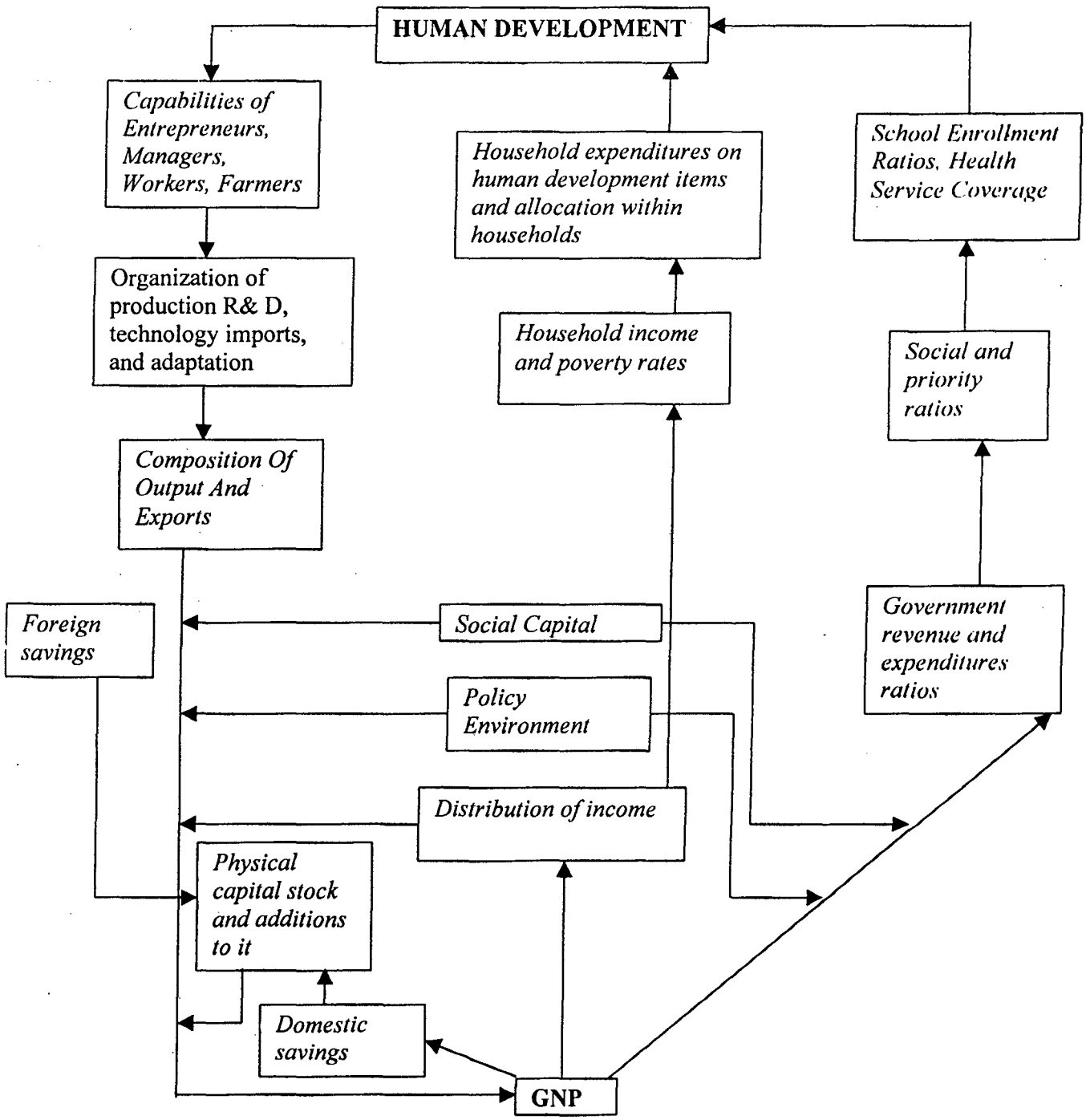
From the survey of literature presented in the earlier chapter it can be argued that there exists a two-way symbiotic relationship between economic growth and human development. In this chapter we intend to examine this relationship in the case of Indian states, using tools of applied econometrics. For this purpose we develop two models: Model A, shows how economic growth leads to human development and Model B indicates the relationship between human development and economic growth. We carry out the econometric analysis using Panel Models in order to estimate the above two-way relationship.

The chapter is organized in the following manner. The section 3.2 describes the testable hypotheses. It is largely drawing upon Ranis, et al (2000). The section 3.3 presents the econometric specifications of the models. 3.4 describes the data base. 3.5 describes the variables. 3.6 deals with econometric methodology. 3.7 presents the results and its interpretations and 3.8 concludes.

3.2 TESTABLE HYTPOTHESES

In order to formulate the two models mentioned above we develop two sets of hypotheses. One set of hypotheses is developed for Model A and the other set for

Model B. both sets of hypotheses are derived from the schematic diagram presented in the following figure, cited from Ranis etal (2000)



HUMAN DEVELOPMENT - GNP CYCLE

MODEL A

We begin our discussion with the first set of hypotheses pertaining to Model A. This model intends to capture the link from economic growth to human development. The following hypotheses essentially attempt to identify factors - economic and institutional - that facilitate or strengthen this link.

HYPOTHESIS A1.

The first hypothesis pertains to income distribution.

It is well established that the level of poverty affects human development. When poverty level is high, it is obvious that people's expenditure on food and education is bound to be low, which in turn lowers human development. A study by Strauss and Thomas (1995) has shown that if poor households receive extra income, they increase their food expenditure and calorie consumption significantly. Several studies, Alderman et al (1995, 1996); Behrman and Wolfe (1987a,b); Birdsall (1985); Deolalikar (1993); King and Lillard (1987), have empirically established a positive impact of family income on child schooling.

Poverty level in a particular country depends on the national income and its distribution. With rise in the national income the poverty level is expected to go down provided the income distribution is fair. Fields (1989) and Deininger and Squire (1996), in their studies have found that, though poverty reduces with economic growth, extent of poverty reduction depends greatly on the distribution of income and its change over time. Hence the distribution of income through its effect on poverty is likely to act as an important determinant of human development along with economic growth.

We therefore hypothesize that:

A1: ***The lower the percentage of population living below the poverty line for a given level of GNP per capita, stronger will be the link between economic growth and human development.***

One drawback of this hypothesis is that it is difficult to measure. Various measures of income distribution can be taken, to test this hypothesis. But unfortunately state wise data on income distribution in case of India is not available. One can, of course, use poverty as a proxy for income distribution. If percentage of poor living below poverty line goes down then human development is likely to improve. But the definition of poverty line has also been changing over time making intertemporal comparisons difficult. Moreover, it is impossible to get time series data on poverty.

HYPOTHESIS A 2.

The second hypothesis relates to the household's allocation decision, which in turn depends on female education.

According to Ranis et al (2000), when women controls the cash income of the family then relatively more income is spent on human development inputs like food and education. In this context they have referred to the work of Garcia (1990) and Hoddinott and Haddad (1991), where it has been shown that families' calorie consumption increases with the share of income accruing directly to the woman.

Therefore we hypothesize:

A2: ***the more income households allocate to human development at a given income levels, the stronger will be the link between economic growth and human***

development. This may be related both to the level of female education and to female control over income within the household

HYPOTHESIS A 3

The third hypothesis pertains to public expenditure on the social sector.

Government is an important agent, influencing human development. By adopting an appropriate policy framework, it can be instrumental in improving the country's income distribution and thereby lowering the poverty level, which in turn will result in better human development. Apart from this indirect channel the government can also influence human development directly by spending more on human development inputs. In fact it can influence human development directly by spending more on social welfare projects. Government's role in improving human development can be expressed as a "*function of total public sector expenditure, of how much this flows to the HD sector, and of the way in which it is allocated within these sectors*". [1]

We therefore hypothesize:

A 3: ***the higher the proportion of GNP devoted to priority social expenditure by the government the greater will be the impact of economic growth on human development.***

Following Human Development Report 1991, published by UNDP, Ranis et al (2000) has expressed public expenditure in social sector in the form of three ratios "*the public expenditure ratio, defined as the proportion of GNP spent by the various levels of government; the HD-allocation ratio, defined as the proportion of total government expenditure going to the HD sectors; and finally, the HD priority ratio,*

[1] Ranis et al,(2000) p 198.

defined as the proportion of total HD-sector expenditure going to the 'priority areas'"[2]. Priority areas are those, which are considered to have more effect on human development than others like basic education and health. Actually what will constitute a priority area should depend upon the country's stage of development. Therefore it varies from country to country. The above-mentioned three ratios are determined by factors such as tax capacity of the country, the demand for military expenditures and other non-human development priorities of the government. These in turn are influenced by bureaucratic forces and populist pressures.

HYPOTHESIS A 4

The fourth hypothesis pertains to the role of non-governmental organisations (NGOs).

A large number of NGOs in developing countries are oriented towards human development enhancing activities. Their funds constitute mostly of donations from private and government, in each case including both domestic and foreign sources. NGOs are promoting human development in two distinct ways. First, they are doing it objectively by providing better health care facilities, education and different financial supports. Second, the effectiveness of NGOs' lies in their role of building awareness. They are supposed to reach the weaker section of the population and educate them with a sense of development. The advantage of NGOs in many developing countries lies in the fact that they are channeling huge international aid for social services and thus supplementing government's effort (at times this foreign aid is equal or even greater than the government spending).

So, it can be hypothesized:

[2] Ibid, p.199.

A 4: ***the more effective the contribution of social capital, including community organization and other NGOs stronger will be the relationship between human development and economic growth.***

Unfortunately the role of NGOs cannot be properly incorporated in our formal analysis because information on this sector is scattered and not well documented.

HYPOTHESIS A 5

The fifth and the final hypothesis pertains to the effectiveness of expenditure on human development inputs.

While spending on items of human development one should see how effective the spending are in raising human development. Unplanned spending will lead to wastage of resources without fulfilling the objective. Country's stage of development should be considered while planning such expenditure. If the country is passing through the initial stage of development, then spending in primary education will be more helpful than spending on tertiary education. Tertiary education requires more expenditure than basic education but contribution of basic education in enhancing human development is more than that of tertiary education. To capture these effectiveness Ranis et al (2000) have developed the concept of **HUMAN DEVELOPMENT IMPROVEMENT FUNCTION (HDIF)**. HDIF is like any production function, which shows the maximum amount of human development output that can be obtained by combining different human development enhancing inputs[3]. The relationship embodied in the HDIF depends on the behaviour of individual family and community, the existence of local knowledge about relevant

[3] Like education, food, better health care.

technologies, and the complementarity or competitiveness among various inputs, such as preventive health, nutrition and education.

Therefore we postulate:

A 5: the effect of economic growth on human development will be more pronounced if the HDIF is more efficient.

Though some aspects of this production function have been explained by detailed empirical work, it is still poorly understood.

So far we have defined the hypotheses that strengthen the link between economic growth and human development. We have noted that it is not possible to test all the hypotheses either because of conceptual problems or data constraint. We, therefore, restrict our analysis to hypotheses A2 and A3 only.

MODEL B

In the previous chapter with the help of different studies we have shown how human development can lead to economic growth. If the human development level of a country is high i.e., if people are better nourished, healthier and better educated then their productively increases. This in turn enhances the economic growth of the county[4]. In this model there are three hypotheses.

HYPOTHESIS B 1

The first hypothesis pertains to the gross domestic investment.

Normally a positive relationship is observed between investment and economic growth. A country rich in human development will draw not only domestic investment but can also lure foreign investment. This is because with high human

[4] For detailed analysis refer to Chapter 2.

development, quality of labour improves and hence productivity of labour increases which in turn enhances economic growth.[5]

Therefore we assume:

B1: ***if the investment rate is higher then the link between human development and economic growth will be strengthened.***

Hypothesis B 2

The second hypothesis deals with income distribution.

We have seen that income distribution is also an important component of Model A but with a slightly different connotation. In Model A, better income distribution implies better nutrition and a stronger demand for education, thereby raising productivity. In Model B however income distribution enters with a political angle. To understand this point better we refer to the work of Alesina and Rodrik (1994). They have shown that improved income distribution leaves the median voter satisfied with government policy, which brings about political stability that in turn induces economic growth. Therefore it can be concluded that fair income distribution promotes required economic growth. On the other hand if the income distribution is highly skewed then unhappy median voter can cause greater political instability, which will hamper growth.

We therefore hypothesize:

B2: the more equal the income distribution greater will be the effect of human development on economic growth.

Hypothesis B 3

The third hypothesis pertains to economic policy framework.

[5] Ranis (2000).

The variation of economic growth from country to country is not only due to the level of inputs but also due to the economic policies adopted by the government of the country. Poor economic policies of the government can hamper investment decisions of the entrepreneurs and thereby retard growth; on the other hand if the opposite happens then the same can enhance growth.

So, we postulate:

B3: the more appropriate the economic policy setting the stronger is the relationship between human development and economic growth.

It is difficult to test hypotheses B 2 and B 3 because of problems in quantifying the appropriateness of economic policies of the government and income distribution. In measuring B 2 we face the problem that has been mentioned while defining the hypotheses of Model A. Therefore we will restrict ourselves to the testing of B1.

3.3 THE ECONOMETRIC SPECIFICATION

To test the above hypotheses we specify the following econometric models for estimation. As mentioned before there are two models: Model A runs from economic growth to human development and Model B runs from human development to economic growth. The models that we will use utilize both cross-section and time series data. Therefore we will use Panel Model for our econometric analysis.

Now let us specify the models.

Model 1 – Economic growth leading to human development: -

$$Y = \beta X + \xi$$

Where, Y: nt x 1 vector of dependent variables that measures human development.

X: nt x k vector of explanatory variables.

β: k x 1 vector of explanatory variables.

ξ: nt x 1 vector of error term

n: number of cross section units.

t: time

k: number of explanatory variables.

Model B is the replica of the former model, where the dependent variable is economic growth.

3:4 DATA BASE

We have used state level secondary data for our analysis. For the study the data have been taken from the following sources: -

1. Selected Educational Statistics, GOI, New Delhi, Ministry of HRD. (1981-82-1996-97).
2. Office of Central Statistical Organisation in Sardar Patel Bhavan, At Parliament Street, New Delhi.
3. E.I.S, State Profiles, Published by C.M.I.E. Various Volumes
4. Selected Socio Economic Statistics, GOI, New Delhi, Ministry of HRD.
5. Annual Survey of Industries 1973-74- 97-98 A database of the industrial sector in India. Published by EPW.
6. Education in India, GOI, New Delhi, Ministry of HRD.

3.5 DESCRIPTION OF VARIABLES

We will be testing two models. For each model there will be different sets of variables.

3.5.1 VARIABLES USED IN MODEL A

3.5.1.a Dependent Variable

Human Development.

The best proxy for achievement in human development is life expectancy shortfall reduction from a maximum of 80 years[6]. But data on life expectancy is available at intervals of five years and therefore cannot be used in our panel model. Therefore, we take infant mortality rate (imr) as a proxy for human development. The higher the value of imr, the lower is the level of human development. To capture the improvement in human development we take year-to-year absolute difference in the value of imr and the ratio of imr of two successive periods, i.e.,

$$IMR1 = imr_{t-1} - imr_t$$

$$IMR\ 2 = imr_{t-1} / imr_t$$

where imr_t implies imr in the t-th period.

A fall in imr implies that IMR1 and IMR2 should be rising.

3.5.1.b Explanatory Variables

Growth Rate of State Domestic Product (SDP) Per Capita

As a measure of economic growth we introduce SDP per capita at constant prices. Economic growth is calculated by using the following formula: -

[6] In the Human Development Report published by Planning Commission, GOI, the maximum value for life expectancy for calculation of Human Development Index has been taken to be 80 years.

$$EG = [(Y_t - Y_{t-1})/Y_{t-1}] * 100$$

where Y_t = State Domestic Product (SDP) per capita at constant price for the period t.

It is expected that growth rate of SDP will affect human development with a lag. Here we introduce a lagged value of SDP. With trial and error we have found that a two period lag provides the best result.

Percentage of Female Enrolled in Primary School.

This variable captures the household's allocation of income in human development inputs, which is related to the level of female education. In 3.2 we have mentioned that if the expenditure of the household is under the control of female then it tends to improve the human development. Percentage of female enrolled (i.e, female enrollment ratio) in primary school is taken as a proxy for the change in the stock of educated females. It is expected that female education will affect human development with a lag. Therefore we introduce a lagged value of the variable. With trial and error we have found that a two period lag provide the best result.

Social Expenditure by Government as a Percentage of SDP.

Social expenditure is defined as public expenditure on education and health. This variable is taken under the assumption that increased expenditure on education and heath by government will enable individuals to acquire higher education and better health, which in turn enhances human development. This spending of government and human development improvement does not take place in the same period. It occurs with a lag. That is why two periods lags are taken.

3.5.2 VARIABLES USED IN MODEL B

3.5.2.a Dependent Variable

Economic Growth

As a measure of economic growth we are taking the growth rate of per capita SDP at constant prices. Here the same formula has been used to calculate economic growth as has been done in Model A.

3.5.2.b Explanatory Variables

SDP Per Capita

SDP per capita, which is the per capita income of a state, is one of the variables, which captures human development. If per capita income increases, then human development occurs. From the cross- country studies it has been observed that per capita income varies from country to country. On the basis of per capita income the countries are classified as rich and poor. It has been observed that there exists a large gap between rich country and poor country[7]. Therefore immediately the question that arises is whether there are any theoretical and (or) empirical reasons to believe that the "automatic forces" of the market economy will lessen this gap or tend to widen it instead? The neo-classical economists believed that the per capita growth rates settle down to the rate of technological progress. This has led to the idea of *convergence.* This idea of convergence suggests that real income difference must die away in long run, which implies that countries with lower per capita income will have to grow at a faster rate. We have used a lagged value because it is expected that the level effect of per capita income will determine economic growth with a lag. With trial and error it has been observed that one period lag provides the best result.

[7] See Valdes (1999).

Total Enrollment Ratio

Literacy rate is another variable that captures human development. If adult literacy rate of a country increases, then human development of that country will also increase. From our literature review in chapter 2, we've seen that if people are educated then their productivity increases which in turn raises economic growth of the country. But since we are using panel model therefore we need literacy data for each year from 1981 to 1997-98. Unfortunately literacy data are available from Census Report, which is published very ten years. In the past NSSO has also published literacy data but only for few years, which did not serve our purpose. Therefore we have taken total enrollment ratio at the primary level as a proxy for literacy rate. Total enrollment ratio is defined as the percentage of total enrollment at the primary level to the total population in the age group 6-11 years. This is a very crude proxy because this only measures the number of literate stock of a particular age group. It ignores the total literate stock of the country. Inspite of this drawback we are still taking it as an explanatory variable because it captures the trend of the literacy rate in a country. It is expected that total enrollment ratio will influence economic growth with a lag. With trial and error method one period lag is taken.

Infant Mortality Rate

A third indicator of human development is taken as infant mortality rate, which reflects the quality of life. From the survey of several literature in the previous chapter it can be said that if the quality of life increases then the productivity of labour force in the country increase and hence economic growth increases. But the

effect of improvement in quality of life on economic growth occurs with a lag. With trial and error one period lag is taken.

Gross Domestic Investment as a Percentage of SDP.

We have already argued that investment will affect economic growth. Investment influences economic growth with a lag. With trial and error method one period lag is taken because it gives the best result.

3.5.3 Symbols Used To Denote Different Variables

Variables	Symbols
IMR differences from year to year	IMR1
IMR ratio	IMR2
Female enrollment ratio with two period lags.	FER 2
Economic growth rate at constant prices with two period lags.	GR2
Investment as a percentage of SDP at current prices with one period lag.	INV1
Log SDP per capita at constant prices with one period lag.	SDPPC1
Social expenditure as a percentage of SDP at current prices with two period lags.	SCEXP2
Economic growth rate at constant prices.	GR
Infant mortality rate with one period lag	IMR L_1
Total enrollment ratio with one period lag.	TER1

3.6 ECONOMETRIC METHODOLOGY

The objective of our analysis is to examine whether there exists a two-way relationship between economic growth and human development in the case of Indian states. For this purpose fifteen major states of India for the period 1981-1997-98 are considered. These states are Andhra Pradesh, Assam, Bihar, Gujarat Haryana,

Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal. We have ignored Jammu and Kashmir, Himachal Pradesh, Arunachal Pradesh, Sikkim, Manipur, Meghalaya, Mizoram and Nagaland because they are hill states and data are not always available for these states. We have ignored Goa because it did not attain the statehood status in 1981. For the same reason Utttaranchal, Chattisgarh and Jharkahand are ignored.

We estimate two models to reach our goal.

Model A: Economic growth will lead to human development

This model can be estimated in two ways: first, by taking the difference between the infant mortality rates in two successive years as the dependent variable, we will call this as Model A.a; second, by taking the ratio of infant mortality rate in two successive years as the dependent variable, this will be called as Model A.b

Therefore **Model A.a** will be like as follows: -

$$IMR1 = \beta_0 + \beta_1 FER\ 2 + \beta_2 SCEXP\ 2 + \beta_3 GR\ 2 + \xi_1$$

Model A.b is as follows: -

$$IMR2 = \gamma_0 + \gamma_1 FER\ 2 + \gamma_2 SCEXP\ 2 + \gamma_3 GR\ 2 + \xi_2$$

Model B: Human development will lead to economic growth

In this model SDP per capita growth rate at constant prices is taken as the measure of economic growth. The model can be written in the following way:

$$GR = \lambda_0 + \lambda_1 SDPPC\ 1 + \lambda_2 INV\ 1 + \lambda_3 IMRL_1 + \lambda_4 TER\ 1 + \xi_3$$

We shall use panel data technique to estimate the models.

The data on different variables can be arranged in the following way: -

The data on different variables, can be arranged in the following way

$$Y_i = \begin{pmatrix} Y_{i1} \\ Y_{i2} \\ . \\ . \\ Y_{iT} \end{pmatrix} \qquad X_i = \begin{pmatrix} X_{i1}^1 & X_{i1}^2 \ldots\ldots\ldots X_{i1}^k \\ X_{i2}^1 & X_{i2}^2 \ldots\ldots\ldots X_{i2}^k \\ . & \\ . & \\ X_{iT}^1 & X_{iT}^2 \ldots\ldots\ldots X_{iT}^k \end{pmatrix} \qquad \xi_i = \begin{pmatrix} \xi_{i1} \\ \xi_{i2} \\ . \\ . \\ \xi_{iT} \end{pmatrix}$$

Y= Dependent variable

X= Explanatory variable

ξ= Error terms

Y_{it} = observation on i-th unit at time t

X^K_{it} = observation on k-th explanatory variables for i-th unit at time t.

ξ_{it} = disturbance term for the i^{th} unit at time t.

The data can be stacked to form

$$Y = \begin{pmatrix} Y_1 \\ Y_2 \\ . \\ . \\ . \\ Y_n \end{pmatrix}_{nT \times 1} \qquad X = \begin{pmatrix} X_1 \\ X_2 \\ . \\ . \\ X_n \end{pmatrix}_{nT \times K} \qquad \xi = \begin{pmatrix} \xi_1 \\ \xi_2 \\ . \\ . \\ \xi_n \end{pmatrix}_{nT \times 1}$$

In our model, n =15 and T =17

The standard model can be expressed as $Y = X\beta + \xi$

Where $\beta = \begin{pmatrix} \beta_1 \\ \beta_2 \\ . \\ . \\ \beta_K \end{pmatrix}$

The starting point of the model is $Y_{it} = X_{it}\beta + \xi_{it}$

The structure of the error term can be specified in the following way: -

$$\xi_{it} = \alpha_i + \eta_{it},$$

where it is assumed that η_{it} is uncorrelated with X_{it}. The first term of the decomposition α_i, is called an individual effect. In this formulation the first part varies across individuals or the cross section unit but is constant across time; this part may or may not be correlated with the explanatory variables. The second part varies unsystematically across time and individuals. ξ_{it} is defined in such a way that it captures the notion that two observations from the same individual will be more like each other than observations from two different individuals.

The empirical applications involve one of the following assumptions about the individual effect:

1. *Random Effect Models:* α_i is uncorrelated with X_{it}.
2. *Fixed Effects Model:* α_i is correlated with X_{it}.

Random Effect model

In this case the following model is used.

$Y_{it} = X_{it}\beta + \alpha_i + \eta_{it}$

Cov $(\alpha_i, X_{it}) = 0$.

The following assumptions are made: -

$E(\eta) = 0$

$E(\eta\eta') = \sigma^2\eta I_{nt}$; $E(\alpha_i \alpha_j) = 0$ for all $i \neq j$; $E(\alpha_i \alpha_i) = \sigma^2_\alpha$; $E(\alpha_i)=0$; $E(\alpha_i\eta_{jt}) = 0$;

Here OLS is not used because: -

1. OLS will produce consistent estimates of β but standard error will be understated.
2. Ordinary Least Square is not efficient compared to Feasible Generalised Least Square method.

So, Feasible Generalized Least Square Method is used to estimate the model.

Fixed Effect model

The structure of the model is written as $Y_{it} = X_{it}\,\beta + \alpha_i + \eta_{it}$

where, $Cov(\alpha_i, X_{it}) \neq 0$

Following assumptions are made to estimate the model:

$E(\eta)=0$; $E(\eta\eta') = \sigma^2_{\eta} I_{nt}$; $E(\alpha_i \alpha_j) = 0$ for all $i \neq j$; $E(\alpha_i \alpha_i) = \sigma^2_{\alpha}$; $E(\alpha_i)=0$;

$E(\alpha_i \eta_{jt}) = 0$; and $E(\alpha_i) = 0$

This model can be estimated by Least Square Dummy Variable Method.

Which model to use?

Having developed two estimators that have different properties depending on the correlation between α_i and the regressors the question that arises is which estimator to use. Here two points should be made clear.

"(i) If the effects are uncorrelated with the explanatory variables, the random effects (RE) estimator is consistent and efficient. The fixed effect (FE) estimator is consistent but not efficient.

(ii) It the effects are correlated with the explicatory variables, the fixed effects (FE) estimator is consistent and efficient but random effect is now inconsistent" [8].

Hausman test is used to check which estimator is more efficient. The Hausman test statistic is given as $H = (\beta_{RE} - \beta_{FE})' (\Sigma_{FE} - \Sigma_{RE})' (\beta_{RE} - \beta_{FE})$.

The Hausman test statistic (H) will be distributed asymptotically as χ^2 with k degrees of freedom. The Null hypothesis in this test is that the random effect is correct.

We have used the software STATA 7 to carry out the econometric exercise

[8] Johnston & DiNardo (1997) pp 403-404.

3.7 RESULTS AND INTERPRETATION.

Model A.: Effect of Economic Growth on Human Development

Model A.a.

The result of Model A.a is reported in Table: 3.1 and 3.2. The tables are given at the end of this chapter. In Table 3.1, we have run fixed effect regression on differences in infant mortality rate (imr) in successive years ($IMR1=imr_{t-1}-imr_t$). The faster reduction in IMR1 indicates better quality of life. Table 3.2 reports the random effect regression results on the same dependent variable IMR1. The Hausman test[9] shows that fixed effect model is more efficient, so we have considered the fixed effect specification.

The results (Table3.1) clearly indicate SDP per capita growth rate at constant prices significantly affect IMR1. It implies higher growth rate accelerates imr reduction and improves the quality of life. Therefore, we predict higher growth is favorable for achieving better quality of life.

Social expenditure ratio, i.e., the percentage of government expenditure devoted to human development related activities, is also significant. An increase in social expenditure ratio raises the quality of life. If the government spends more in social sector, there will be greater impact on betterment of quality of life in the successive periods.

However, the female enrollment rate is not coming significant. It means that educated female's control over family expenditure has no effect on quality of life.

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[9] The result of the Hausman Test shows that null hypothesis is rejected at 10% level of significance. (chi2 (3) = 5.35 and Prob>chi2 = 0.1041)

This makes sense because of patriarchal nature of Indian society. In India, the decision maker of the family is a male, no matter how educated the female is.

Model A. b

Here, the dependent variable IMR 2 is the ratio of infant mortality rate in successive years ($IMR2=imr_{t-1}/imr_t$). Like the previous model, here also we have used fixed effects (Table 3.4) and random effects regression (Table 3.5). However, the Hausman[10] test indicates that the Random Effect Model is more efficient. Therefore we have chosen random effect regression results that have been reported in Table 3.5.

In this case also, SDP per capita growth rate and social expenditure, as a percentage of SDP are highly significant. This implies that as SDP per capita growth rate increases the ratio of infant mortality rate also rises. Same thing happens when social expenditure of the government as a percentage of SDP increases. Hence it is clear that there is an improvement in human development achievement due to higher share of social expenditure to state domestic product by the government. Interestingly, in this case also female enrollment rate is coming insignificant.

Thus from the discussion of Model A, it can be concluded that economic growth leads to human development. The importance of social expenditure is also crucial for human development, which implies that if government expenditure (as a percentage of SDP) in social sector increases, then the link between economic growth and human development will be strengthened.

[10] The Hausman test shows chi2 (3) = 1.65 and Prob>chi2 = 0.6477. Hence random effect model is correctly specified as we can't reject the null hypothesis (see the details about Hausman test in section: 3.6)

Model B.: Effect of Human Development on Economic Growth

The results of Model B are reported in Table: 3.7 and 3.8. In Table 3.7, we have run fixed effect regression on the dependent variable SDP per capita growth rate at constant prices. Table 3.8 reports the random effect regression results on the same dependent variable. We have conducted Hausman test[11] which tells that fixed effect model is more efficient, so we will interpret from the results of the fixed effect model (Table 3.7):

The initial level of SDP is significant with a large coefficient. This variable carries with it a negative sign, thus indicating the existence of strong convergence, i.e., the lower the initial value; the faster catch up can be expected. The total enrollment ratio (that is taken as a proxy for total literate stock of the country) is significant with a positive sign. Thus increase in total enrollment ratio can increase economic growth. Therefore it can be said that if the human skill[12] increases then economic growth will take place. Infant mortality rate, which captures the quality of life, is also found to be significant. It carries a negative sign with it, this means, higher growth can be achieved through reduction in infant mortality rate. As expected, the present domestic investment rate is significantly and positively related to the next year growth rate.

From the foregoing discussion of the results of Model B it can be deduced that human development enhances economic growth significantly. The link between

[11] The result of the Hausman Test shows that null hypothesis is rejected at 99% level of significance. (chi2 (3) = 20.25and Prob>chi2 = 0.0004)

[12] Total enrollment ratio is a proxy for literacy rate and skill (as we have already discussed in chapter 2) increases with education.

human development and economic growth is further strengthened through positive impact of gross domestic investment on economic growth.

3.8: CONCLUSION

From the econometric exercise it can be concluded that when the two models are considered as a whole the results indicate a significantly positive effect of economic growth on human development and a significantly positive effect of human development on economic growth. When specific links in each of the models are considered our results confirmed the hypotheses except for female enrollment ratio in primary education in Model A.

Finally it can be concluded from the empirical analysis that the fifteen major states of India supports the two-way relationship between economic growth and human development. Thus our findings are in consonance with the results obtained from the cross-country study of Ranis etal (2000).

Tables

Table 3.1 Panel model estimate with dependent variable Infant mortality rate differences (IMR1) in successive years with Fixed Effects

Variable	Coefficient	t-value
FER2	0.004	0.03
SCEXP2	1.451**	2.01
GR2	0.142***	2.79
Constant	-5.472	-0.63
Number of Observations	225	
R^2: within	0.047	
R^2: between	0.099	
R^2: overall	0.009	
F (3,207)	3.400	
Prob > F	0.019	

Note:
*** 1% level of significance
** 5% level of significance

Table 3.2 Panel model estimate with dependent variable imr differences (IMR1) in successive years with Random Effects

Variable	Coefficient	z-value
FER2	-0.061	-0.99
SCEXP2	0.121	0.37
GR2	0.117***	2.38
Constant	3.614	1.15
Number of observation	225	
R^2: within	0.032	
R^2: between	0.008	
R^2: overall	0.028	
Wald chi2	6.440	
Prob > chi2	0.092	

Note:
*** 1% level of significance

Table 3.3 Result of Hausman Test	
Chi 2 (3)	5.35
Prob>Chi 2	0.1041

Table 3.4 Panel model estimate with dependent variable infant mortality rate ratio (IMR2), i.e the ratio of previous period imr to present period imr with fixed effects

Variable	Coefficient	t-value
FER2	0.001	0.37
SCEXP2	0.019*	1.94
GR2	0.002***	2.57
Constant	0.890***	7.21
Number of observation	225	
R^2 :within	0.041	
R^2: between	0.181	
R^2: overall	0.035	
F (3,207)	2.960	
Prob > F	0.034	

Note:
*** 1% level of significance
*10% level of significance,

Table: 3.5 Panel model estimate with dependent variable (IMR2), i.e the ratio of previous period imr to present period imr with Random Effects

Variable	Coefficient	z-value
FER2	0.001	1.00
SCEXP2	0.009**	1.92
GR2	0.002***	2.38
Constant	0.945***	21.17
Number of observation	225	
R^2: within	0.037	
R^2: between	0.214	
R^2: overall	0.041	
Wald chi2(3)	9.330	
Prob > chi2	0.025	

Note:
*** 1% level of significance
** 5% level of significance

Table: 3.6 Result of Hausman Test

Chi 2 (3)	1.65
Prob>Chi 2	0.6477

STable 3.7: Panel model estimate with dependent variable SDP per capita growth rate at constant prices (GR), with Fixed Effects		
Variable	**Coefficient**	**t-value**
SDPPC1	-61.90***	-4.12
TER1	0.15**	1.98
$IMRL_1$	-0.20**	-2.97
INV1	0.54*	2.17
Constant	124.800***	3.92
Number of observation	255	
R^2: within	0.140	
R^2: between	0.019	
R^2: overall	0.009	
F (3,237)	6.320	
Prob > F	0.0002	

Note:
*** 1% level of significance
** 5% level of significance
*10% level of significance

Table 3.8: Panel model estimate with dependent variable SDP per capita growth rate at constant prices (GR), with Random Effects		
Variable	**Coefficient**	**z-value**
SDPPC1	-1.69	-0.32
TER1	0.031	1.13
$IMRL_1$	-0.030	1.47
INV1	0.33*	1.71
Constant	6.285	0.48
Number of observation	255	
R^2: within	0.045	
R^2: between	0.205	
R^2: overall	0.038	
Wald chi2(3)	6.37	
Prob > chi2	0.173	

Note:
* 10% level of significance

Table 3.9 Result of Hausman Test	
Chi 2 (3)	20.25
Prob>Chi 2	0.0004

CHAPTER –4

Economic Growth and Human Development: A Comparative Analysis of the Performance of Indian States

4.1: INTRODUCTION

In the previous chapter the two-way relationship between economic growth and human development has already been established in case of the fifteen major states of India. Now it can be said that human development will enhance economic growth, which in turn will increase human development, and the process continues. According to Ranis et al (2000) the cycle will move faster if the links in the two models[1] are stronger. The cycle can move in either positive direction or in negative direction depending on which an individual state may find itself in a virtuous cycle or in vicious cycle. If the links in both these models are strong then vigorous growth will lead to improved human development, and improved levels of human development in turn leads to vigorous growth, when this happens the country is said to be in virtuous cycle. If the opposite of this happens then, weak growth will lead to weak human development and weak human development will lead to weak growth and finally the country will land up in vicious cycle. On the other hand if the linkages are weak then either there will be strong human development and weak economic growth or strong economic growth and weak human development. This will lead to lopsided development. If there is strong human development and weak economic growth then

[1] Model A runs from economic growth to human development and Model B runs from human development to economic growth. Detailed discussion of this is done in Chapter 3.

it is called *human development lopsidedness* (HD – Lopsidedness). Similarly when there is strong economic growth and weak human development it is known as *economic growth lopsidedness* (EG- Lopsidedness). These lopsided cases do not continue for long period of time. *"Either the weak partner in the cycle eventually acts as a brake on the other partner, leading to a vicious cycle case, or if the linkages are strengthened, possibly by policy change a virtuous cycle case results".* [2]

Therefore to examine these various categories of performance we compare all the states during the period 1981-1997. To do this we need to know the percentage shortfall reduction of Human Development Index and SDP per capita growth for each state. Therefore we have to calculate both the variables first. Section 4.2 presents HDI for each state and also presents the profile of states with respect to HDI, its various components and SDP per capita. The calculation of SDP per capita growth rate is done in 4.3. 4.4 categorize the states according to their performance in economic growth and human development.

4.2: HUMAN DEVELOPMENT INDEX

Human development report was published for the first time in 1990 by UNDP. In this report Human Development Index of different countries of the world were calculated. Human Development Index or HDI was developed to measure the basic concept of human development, which, is said to occur when there is an enhancement in individuals' choice set. This choice set includes *"desire to live life, to acquire knowledge, to have a comfortable standard of living, to be gainfully employed, to*

[2] Ranis etal (2000) p.209

breathe clean air, to be free, to live in a community"[3] All these things when achieved make an individual's life happier. Therefore the best thing is to construct an index, which will measure all these indicators. But all the indicators are not measurable. So, it was agreed to consider only – long life, achievement of knowledge and a comfortable standard of living for constructing HDI. This was done mainly to keep it simple and manageable. This index is narrower than the concept of human development. Inspite of this drawback, it is widely used because of its political appeal. Moreover it has *"a stronger impact on mind and draw public attention more powerfully than a long list of indicators combined with a qualitative discussion."*[4]

Now let us see how the indicators used in constructing HDI are measured.

(1) Long Life – This can be captured by life expectation at birth which is measured in years. Life expectancy was taken because "long life is valuable in itself"[5]. Various indirect benefits like adequate nutrition and good health are closely associated with higher life expectancy. This makes life expectancy an important indicator of human development especially when comprehensive and reliable data on people's health and nutrition intake is not available.

(2) Achievement of knowledge: - Adult Literacy rate, which is measured in percentage, is taken as a proxy for achievement in knowledge. Apart from adult literacy rate, combined primary, secondary and tertiary enrollment ratios are also taken. The educational attainment is then obtained by a linear combination of adult literacy rate and combined primary, secondary and tertiary enrollment ratios. Two third weights are assigned to adult literacy rate and one-third weight to combined

[3] Haq (1996) Pg 47
[4] Paul Streetan's 'Foreward' to Haq, (1996) p.ix.
[5] HDR (1990)

gross enrollment ratios. So far as India is concerned, reliable state level data on tertiary enrollment ratio is not available. That is why in this study only combined primary and secondary enrollment ratios are considered.

(3) Standard of Living: - to maintain a decent standard of living people should have command over resources. It is very difficult to measure standard of living, as it requires data on access to land, credit, income and other resources. Out of all these variables, data on income are readily available others are difficult to obtain. Therefore Human Development Report published by UNDP, has considered income as an indicator of standard of living. The most easily available income indicator - per capita income has been considered for this purpose. But per capita income in nominal prices are not very useful for international comparisons as they are distorted by the presence of nontradable goods and services, exchange rate anomalies, tariffs and taxes. Therefore purchasing power adjusted real GDP per capita (PPP $) is used as a measure of standard of living. These problems associated with per capita income (as a measure of standard of living) will not arise when we are constructing HDI of fifteen major states of India. Inspite of this if we still want to convert per capita net state domestic product into real GDP per capita (PPP$) then the ratio of per capita net state domestic product measured at constant prices to national per capita income is multiplied with India's real per capita GDP (in PPP $). But data on India's real per capita GDP (in PPP $) is not available for the year 1981. So, it is not possible to convert per capita net state domestic product of 1981 into real GDP per capita.[6] Therefore we are using per capita net state domestic product at constant prices to measure the standard of living.

[6] We are constructing HDI of 1981and 1997.

In order to construct the HDI, the first step is to specify a minimum value and a desirable (maximum) or adequate value for life expectancy, literacy, gross enrollment ratio and per capita net state domestic product. In scaling the diverse indicators, the main consideration has been to make attainments on each of them comparable and at the same time ensuring that the selection of end points i.e., the maximum and the minimum values on the scales for each indicator are such that they support intertemporal comparisons for a reasonable period of time. While selecting the norms, the attainments of the best performing state on the concerned indicators and the comparable international norms are also kept in mind. The maximum and minimum values for each of the indicator are given in Table 4.1

Table 4.1 Maximum And Minimum Values Of The Indicators:

Variables	Maximum	Minimum
Life Expectancy	80years	50years
Adult Literacy	100%	0%
Combined Gross Enrollment Ratio	100%	0%
Per Capita net state domestic product at (80-81) prices	Rs 6294	Rs 1019

The extreme values (maximum and minimum) of life expectancy are based on National Human Development Report published by Planning Commission of India (2001); The maximum and minimum values for adult literacy rate and combined gross enrolment ratio are the same as that used by the Human Development Report published by UNDP (1999). The per capita net state domestic product at constant prices (1980-81) of Goa, in 1997 has been taken as the maximum value of income. It was the maximum income among all states during the period 1981-1997. The

minimum value is the per capita net state domestic product at constant prices (1980-81) of Bihar in 1981-82. This is the minimum income during the entire period.

These maximum and minimum values allow us to compare the HDI of fifteen major states of India in 1981 with 1997 because they remain unchanged during this period.

For any component of the HDI individual indices can be computed using the following formula: -

$$\textbf{Index} = \frac{\textbf{Actual value} - \textbf{Minimum value}}{\textbf{Maximum value} - \textbf{Minimum value}}$$

Let us explain the calculation of individual indices with the help of an example.

Suppose. Life expectancy at birth in a particular country is 75 years. Therefore the index of life expectancy of that country will be:

Life expectancy index = (75 – 50) / (85 – 50) = 25/35 = 0.714

In the same way we can calculate the index of adult literacy and combined primary and secondary enrolment ratio.

The educational attainment index is then obtained by using the following formula:

2/3 (adult literacy index) +1/3 (combined primary and secondary enrolment ratio)

The construction of income index is little more complex. Initially it was believed that achieving a respectable level of human development does not require unlimited income. To reflect this, income has always been discounted in calculating the HDI. Any income above the threshold income which is nothing but the world

average is discounted using the following formulation based on Atkinson's formula for the utility of income: -

$$
\begin{aligned}
W(Y) &= y^* && \text{for } 0<y<y^* \\
&= y^*+2\,[(y-y^*)^{1/2}] && \text{for } y^*<y<2y^* \\
&= y^*+2\,(y^*)^{1/2}+3\,[(y-2y^*)^{1/3}] && \text{for } 2y<y<3y^* \\
&= \ldots\ldots\ldots\ldots && \\
&= \ldots\ldots\ldots\ldots && \\
&= y^*+2(y^{*1/2})+3(y^{*1/3})\ldots\ldots\ldots\ldots+n\,[y^*(n-1)y^*]^{1/x} && \\
& && \text{for } (n-1)y^*<y<ny^*
\end{aligned}
$$

Where y is the actual income and y* is the threshold income.

The main drawback of this formula is that it discounts the income above the threshold level very heavily, penalizing the countries in which income exceeds the threshold level. Therefore to overcome this problem HDR 1999, published by UNDP has developed a new methodology. This new methodology is based on the work of Anand and Sen (1999). In this case the income index is constructed by the following formula:

$$W(Y) = \frac{\text{Log } y - \text{Log } y_{min}}{\text{Log } y_{max} - \text{Log } y_{min}}$$

The advantages using this formula are given below:[7]

First, this new formula discounts income less severely than the previous formula.

Second, it discounts all income, not just the income above a certain level.

[7] HDR 1999, UNDP.

Third, with the help of a diagram it has been shown that, when the curves representing the discounted income (using old and new formulas) are plotted the asymptote starts quite late with the new formula, so middle-income countries are not penalized unduly. Moreover as income rises further in these countries, they will continue to receive recognition for their increasing income as a potential means for further human development.

4.2.1 Data base

For the construction of HDI the data on the components of Human Development Index have been taken from the following sources:

1. National Human Development Report, Planning Commission, Government of India, 2002.
2. Census of India 1981.
3. Selected Educational Statistics, GOI, New Delhi, Ministry of HRD, (various volumes).
4. Education in India, GOI, New Delhi, Ministry of HRD, (various volumes).
5. Office of Central Statistical Organisation in Sardar Patel Bhavan, at Parliament Street, New Delhi.
6. Assam's population figure for 1981 is a an official projection obtained from the office of Central Statistical Organisation in Sardar Patel Bhavan, at Parliament Street, New Delhi.
7. NSSO 52nd Round Vol. 439.

4.2.2 Construction of HDI of fifteen major states of India

In our analysis the three indices for the year 1981 and 1997 are given in Table 4.2.

Table 4.2: the indices of HDI

STATES	Life expectancy index of 1981	Life expectancy index of 1997	Education index of 1981	Education index of 1997	Income index of 1981	Income index of 1997
Andhra Pradesh	0.28	0.39	0.45	0.53	0.29	0.53
Assam	0.06	0.19	0.50*	0.71	0.22	0.32
Bihar	0.10	0.31	0.39	0.48	0.00	0.07
Gujarat	0.25	0.37	0.61	0.70	0.49	0.82
Haryana	0.34	0.45	0.51	0.63	0.53	0.81
Karnataka	0.36	0.42	0.55	0.65	0.30	0.61
Kerala	0.61	0.76	0.88	0.92	0.25	0.54
Madhya Pradesh	0.05	0.16	0.42	0.57	0.21	0.41
Maharashtra	0.36	0.49	0.66	0.74	0.54	0.92
Orissa	0.1	0.22	0.48	0.61	0.18	0.33
Punjab	0.44	0.57	0.60	0.67	0.63	0.88
Rajasthan	0.12	0.30	0.37	0.50	0.17	0.51
Tamil Nadu	0.23	0.44	0.68	0.75	0.31	0.67
Uttar Pradesh	0	0.23	0.41	0.50	0.17	0.35
West Bengal	0.25	0.40	0.58	0.63	0.33	0.66

*The national growth rate in adult literacy between 1971 and 1981 has been used to project Assam's adult literacy rate.

HDI is a simple average of the above three index.

So, HDI = 1/3(Life Expectancy Index + Education Index + Income Index)

The HDI of fifteen states of India for 1981 and 1997 are given in Table 4.3

Table 4.3 HDI

STATES	HDI 1981	Ranks in 1981	HDI 1997	Ranks in 1997
Andhra Pradesh	0.338	9	0.484	9
Assam	0.261	10	0.358	14
Bihar	0.164	15	0.286	15
Gujarat	0.439	5	0.628	5
Haryana	0.460	4	0.630	4
Karnataka	0.398	7	0.559	8
Kerala	0.582	1	0.742	1
Madhya Pradesh	0.228	12	0.382	12
Maharashtra	0.520	3	0.717	2
Orissa	0.252	11	0.385	11
Punjab	0.555	2	0.687	3
Rajasthan	0.220	13	0.437	10
Tamil Nadu	0.406	6	0.620	6
Uttar Pradesh	0.194	14	0.360	13
West Bengal	0.386	8	0.564	7

When the ranks of the states in 1981 are compared with that of 1997, it is found that there is no major change in the rankings. Kerala remains at the top position in both the years and Bihar at the bottom. Punjab, which was second in 1981, exchanged its position with Maharashtra and slipped down to the third rank in 1997. There was improvement in the relative performances of Rajasthan (rank 10 in 1997 and 13 in1981) and Uttar Pradesh (rank 13 in 1997 and 14 in 1981) in 1997 when compared to 1981. West Bengal climbed to the seventh position in 1997 from its earlier rank of eighth in1981. Assam's position deteriorated in her relative performance in human development in1997 since she declined to fourteenth position from an earlier rank of tenth.

Following Human Development Report the states can be categorized into the following three categories: -

a) Low category: - States that have HDI below 0.5.

b) Middle category: - States that have HDI more than 0.5 but less than 0.8.

c) High category: - States that have HDI above 0.8.

In 1981 twelve out of fifteen states were in the low category, as their HDI was below 0.5. These states were Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Karnataka, Madhya Pradesh, Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal. Only Kerala, Maharashtra and Punjab belonged to the middle category. The maximum value of HDI was 0.582 (Kerala) and the minimum value was 0.164 (Bihar).

The situation improved in 1997. In this year the value of HDI increased for all states indicating an improvement in human development. Apart from Kerala, Maharashtra and Punjab five more states shifted from low category to medium category. These states were Gujarat, Haryana, Karnataka, Tamil Nadu and West Bengal. Altogether eight states belonged to the medium category in 1997. Apart from the general improvement in human development the inequalities among the states in terms of human development was also reduced. Reduction in coefficient of variation, which was 0.38 in 1981 and 0.28 in 1997 reflect this.

So far we have only talked about HDI. This does not mean that HDI replaces GNP in measuring the development of a country. Infact, it is a useful supplement to GNP in understanding and analyzing the society.

Let us compare the HDI and SDP per capita rankings of the states for the years 1981 and 1997 to examine the relationship between the two. For this purpose, after ranking the states on the basis of SDP per capita and HDI we perform pair wise

rank correlation to see whether the quality of human lives in each country correlates with its per capita income or not. We perform this exercise for both 1981 and 1997.

Table 4.4 Ranks The States On The Basis Of Hdi And Sdp Per Capita, 1981.

STATES	SDP Per Capita 1981	SDP Per Capita Rank	HDI 1981	HDI Rank
ANDHRA PRADESH	1569	8	0.338	9
ASSAM	1402	10	0.261	10
BIHAR	947	15	0.164	15
GUJARAT	2084	4	0.439	5
HARYANA	2399	3	0.460	4
KARNATAKA	1583	7	0.398	7
KERALA	1469	9	0.582	1
MADHYA PRADESH	1360	11	0.228	12
MAHARASHTRA	2441	2	0.520	3
ORISSA	1290	12	0.252	11
PUNJAB	2875	1	0.555	2
RAJASTHAN	1285	13	0.220	13
TAMIL NADU	1640	6	0.406	6
UTTAR PRADESH	1276	14	0.194	14
WEST BENGAL	1689	5	0.386	8

From the above table we can find rank correlation between HDI and Per capita SDP at constant price for the year 1981. The result of the rank correlation shows that there is very high correlation between the two variables.

Let us carry out the same exercise for the year 1997.

Table 4.5: Ranks The States On The Basis Of HDI And SDP Per Capita, (1997)

STATES	SDP Per Capita	SDP Per Capita Rank	HDI	HDI Rank
ANDHRA PRADESH	2413	9	0.470	9
ASSAM	1673	14	0.397	10
BIHAR	1073	15	0.276	15
GUJARAT	3976	4	0.571	6
HARYANA	3997	3	0.605	4
KARNATAKA	2761	7	0.533	7
KERALA	2444	8	0.713	1
MADHYA PRADESH	1961	11	0.361	13
MAHARASHTRA	4791	1	0.691	2
ORISSA	1688	13	0.368	12
PUNJAB	4416	2	0.690	3
RAJASTHAN	2306	10	0.388	11
TAMIL NADU	3057	5	0.585	5
UTTAR PRADESH	1757	12	0.346	14
WEST BENGAL	3002	6	0.523	8

Pair wise rank correlation for SDP per capita rank and HDI rank are again checked for1997. This time also the result indicates that there exists high correlation between the rank of HDI and that of SDP per capita.

Thus it can be said that SDP per capita and human development are correlated.

These tables give important signals. If the HDI ranks are less favourable than the SDP per capita rank then it implies that the benefits of national income are not being distributed to the people. The policy makers in that case should examine "*whether the problem lies in maldistribution of income or assets, or in wrong development priorities or in lack of public policy attention to social services*"[8] It will be wrong to assume that higher rank in HDI is always desirable than SDP per capita.

[8] Haq (1996) p54.

If economic growth is lower than human development then in the long run human development cannot be sustained, because economic growth provides the required resources needed for sustaining human development. East European countries and former Soviet Union support this point.

4.3: Growth Rates Of SDP Per Capita At Constant Price

The following table presents the estimated growth rates of SDP per capita at constant prices in the fifteen major states of India. The growth rate for each state is estimated based on log linear trend.[9]

Table 4.6 Annual Rates of Growth of Per Capita SDP

STATES	1981-97
ANDHRA PRADESH	3.47
ASSAM	1
BIHAR	1.9
GUJARAT	4.1
HARYANA	3.3
KARNATAKA	3.7
KERALA	3.55
MADHYA PRADESH	2.46
MAHARASHTRA	4.8
ORISSA	1.43
PUNJAB	3.10
RAJASTHAN	3.7
TAMIL NADU	4.4
UTTAR PRADESH	1.9
WEST BENGAL	3.6

From the table it can be said that Assam has the lowest growth rate while Maharashtra has the highest growth rate. Infact the growth rate of Maharashtra is

[9] Assuming that the underlying relationship is $Y = A(1+r)t$ we estimate the regression equation $\ln Y = a+bt$ where $b=\log(1+r)$. the growth rate r is then calculated using the regression estimate as r=antilogb – 1.

almost five times the growth rate of Assam. Bihar, MP, Orissa and UP are poor performing states while, Gujarat, Maharashtra and Tamil Nadu showed good performance. Andhra Pradesh, Haryana, Karnataka, Kerala, Punjab, Rajasthan and West Bengal showed moderate performance.

4.4: - Virtuous and Vicious Cycles and Lopsided Development

Let us now classify the states into four categories on the basis of their performance. The four categories are virtuous, vicious, human development lopsided (HD Lopsided) and economic growth lopsided (EG- lopsided).

This classification is based on the average performance of the states. The classification is shown in the Figure 1. In the horizontal direction per capita net state domestic product growth rate for the period 1981-97 is taken. The vertical axis measures the percentage of Human Development Index shortfall reduction during the period 1981-97. The HDI shortfall reductions are measured from 0.8 which is the boundary between medium category and high category. The vertical and horizontal thick lines (which are the cut off lines) represent the average performance of the state for the period, weighted by their population in 1997. The cut off line for economic growth is 3% and for HDI shortfall reduction is 38.73%.

The two cut off lines divide the figure into four quadrants.

The first quadrant, where economic growth and HDI shortfall reduction is below the average, is the vicious quadrant. It is the south-west quadrant.

The second quadrant is economic growth lopsided where economic growth rate is above average but HDI shortfall reduction is below average. It is the south-east quadrant.

The third quadrant is the virtuous quadrant, where HDI shortfall reduction as well as SDP per capita growth, both are above the cut off line. It is the north-east quadrant.

The fourth the quadrant is human development lopsided, where economic growth rate is below the out off line and human development index shortfall reduction is above the cut off line. It is the north-west quadrant.

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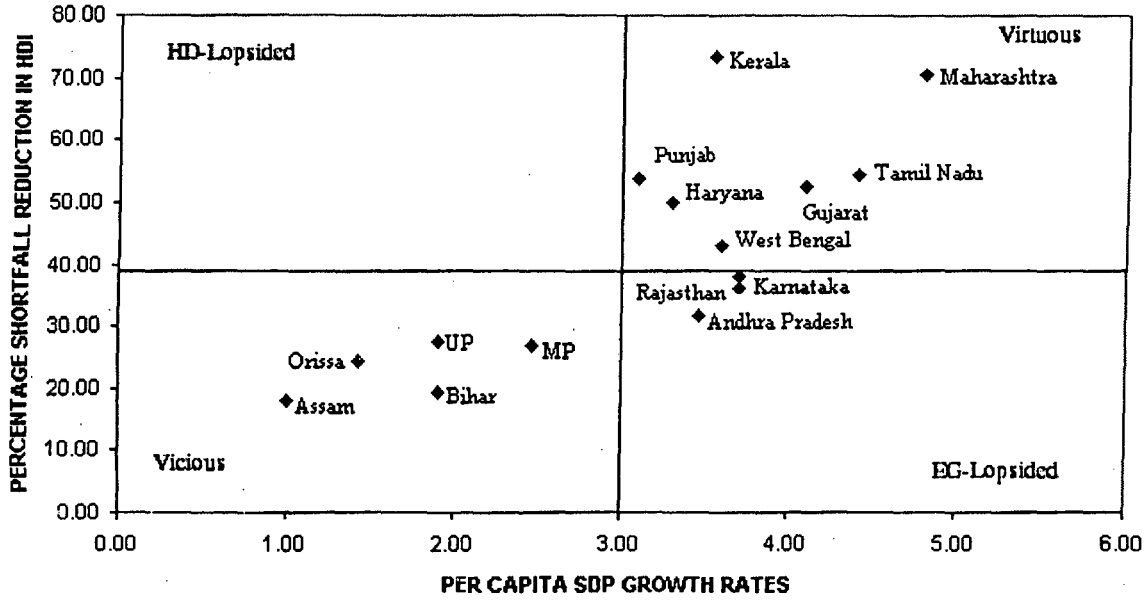

FIGURE-1

Out of 15 states five states are in vicious quadrant. These states are Assam, Orissa, Bihar, Uttar Pradesh and Madhya Pradesh. Three states such as Andhra Pradesh, Rajasthan and Karnataka are in EG-lopsided. Maharashtra, Kerala, Tamil Nadu, Punjab, Haryana, Gujarat and West Bengal are in virtuous circle.

The case of Kerala is a unique. From Ahluwalia's (2000) study it is seen that Kerala, which had a meager growth rate of 2.19% in 1980-81 to 1990-91, improved her performance to a growth rate of 4.52% in 1991-92 to 1997-98. This high growth performance can be attributed to human development achievements of Kerala[10]. Therefore it can be said that Kerala managed to move out from the vicious cycle to virtuous cycle through HD-Lopsided quadrant. From Figure 1 it is observed that there is no state in HD lopsided quadrant. Performance-wise Maharashtra has surpassed all states in economic growth sector; Kerala's performance in human development sector is the best. It is closely followed by Maharashtra. Assam is the worst performing state in both the sectors.

From the above diagram it can be said that Indian states emphasize more on economic growth than on human development. The states, which are in the vicious cycle, also show a tendency to emphasize more on economic growth than on human development. This attitude is dangerous, as without adequate human development, economic growth cannot sustain for long period of time[11]. The study by Ranis et al (2000) has shown that while HD-lopsidedness led to the movement towards a virtuous cycle, EG-lopsidedness reverted the countries to the vicious cycle. Experience of several countries of the world has shown that chances of movement from EG-lopsidedness to virtuous cycle are very bleak. Therefore the states, which belong to the vicious quadrant as well as to the economic growth lopsided quadrant, should spend more on human development enhancing inputs. This will improve the human development of the states, and hence will enable the states to move from

[10] Kerala ranks first in terms of HDI achievement in 1981 as well as in 1997.
[11] Ranis op.cit

vicious quadrant to human development lopsided quadrant. After that if the governments of these states create situations that are conducive to new investment then economic growth will take place and gradually the states will move to the virtuous cycle. If this is not done then there is a high probability that the economic growth lopsided states will revert back to vicious cycle and those, which are already in the vicious cycle, will remain in the vicious trap. In case of India, seven states are in the virtuous cycle. World experience has shown that a country moves from vicious cycle to virtuous cycle via HD-lopsidedness. But our data set is inadequate to make such conclusion in the context of Indian states. From Ahluwalia's (2000) study we can make such conclusion only about Kerala.

When one moves from vicious to human development lopsided pattern the links in Model A should be strengthened. Links in Model B should be strengthened when one moves from HD-lopsided to economic growth lopsided. The governments' of the states, which belonged to EG-lopsided quadrant, should take appropriate policies to improve their human development. Those states, which are in the virtuous cycle, should also review their policies from time to time in order to stay in the same cycle.

Conclusion

From the foregoing discussion we can say that the Indian states have improved their performance in human development sector. So far as economic growth is concerned there is mixed performance. From the four quadrant diagram it can be concluded that majority of the states emphasized on economic growth. Kerala is one exceptional state, which emphasized more on human development. As a result Kerala

has managed to raise her economic growth rate.and has been able to enter into the virtuous quadrant. Therefore from the experience of Kerala it can be said that if the states emphasize on the improvement of their human development then in the long run they will be able to enter into the virtuous quadrant. Cross-country study by Ranis et al (2000) has also suggested this.

Chapter 5

Conclusion

Human development is a relatively new concept than economic growth. It can be defined as a mechanism, which builds human capabilities and provides a framework for use of the same. If the balance between investment in people, creation of capabilities and absorption of these capabilities in employment in productive channels, is disturbed then it can result in a tremendous upheaval. Thus human development is "... a process of widening people's choices as well as raising the level of well-being achieved".[1]

Initially it was believed that economic growth could lead to economic development. But the fallacy of this premise was proved when in reality economic growth failed to sustain the goals of development in a multidimensional framework. To overcome this shortcoming a new term called *economic development* came to the fore. This new term can be broken into two components - economic growth and human development, which are interrelated.

Various theoretical and empirical literature have supported a two-way relationship between economic growth and human development. We have estimated this relationship in the context of Indian states. To examine the relationship basically two models - one linking economic growth to human development (Model A) and another human development to economic growth (Model B) are developed.

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[1] United Nations Development Programme, *Human Development Report 1997* (New Delhi: OUP 1997) p.15

To examine this relationship, fifteen major states of India have been chosen. It is observed:

- Growth rate of per capita income and government's spending on priority sectors have significant and positive effect on human development.
- Domestic investment, and human development (as captured by per capita income, total enrollment ratio, and infant mortality rate) have a significant and positive effect on economic growth

All these results point to the fact that economic growth led to a rise in human development, which in turn led to an increase in economic growth. This symbiotic relationship is affected to a considerable extent by the strength of the bondages that link economic growth and human development. The stronger the linkages in the models, stronger will be the reinforcement. If the linkages are strong then one can have either vicious cycle or virtuous cycle depending on the direction of the movement of the cycle. If any of the linkages is weak then cases of lopsidedness occur. This has been portrayed by categorizing the states on the basis of their performance in human development and economic growth sectors. For doing this we have constructed the Human Development Index for the year 1981 and 1997and growth of per capita SDP during the same period, of the short listed states. From the Human Development Index the following observations can be made:

- The magnitude of Human Development Index has gone up in 1997 for all fifteen states of India. This implies that the level of human development has improved in all the states.

- Human development is more equitable in 1997 than in 1981.This is reflected by a lower coefficient of variation of Human Development Index in 1997 (0.28) than in 1981 (0.38).
- The rankings of different states according to Human Development Index are almost same with minor variations in both the years. The ranking of different states that we have obtained is almost similar with the findings of Shiv Kumar (1991), Shah etal (1993), and Planning Commission (2001) with slight variations. If we consider the rankings of individual states then there are minor variations compared to that of other studies. But when the states are classified into different categories (low, middle and high) the results are almost the same. This variation is mainly due to differences in the variables that are taken in different studies for measuring the indicators of Human Development Index.[2]
- On the basis of the magnitude of Human Development Index, the states are ranked into low category, middle category, and high category. In 1981 only three states were in middle category and none of the states were in high category, whereas in 1997 eight out of fifteen states were in middle category. This is a significant improvement, but still none of the states could reach high category.

When economic growth rates were calculated it was observed that most of the states have a moderate performance with the exceptions of Bihar, Assam and Orissa

[2] For instance while measuring long life we have taken life expectancy (UNDP has considered life expectancy as a measure of long life), but HDR published by Planning Commission of India has considered infant mortality rate along with life expectancy as a measure for long life.

with dismally poor performance and Maharashtra and Tamil Nadu with high growth rates.

When the states are classified according to their performances in economic growth and human development it is observed that Bihar, Orissa, Assam, Uttar Pradesh and Madhya Pradesh are in vicious cycle; Andhra Pradesh, Rajasthan, and Karnataka showed economic growth lopsided pattern; and Punjab, Kerala, Gujarat, Maharashtra, Tamil Nadu Haryana and West Bengal are in virtuous cycle. This classification of states into vicious, virtuous and lopsidedness is essential for adopting appropriate policies.

All the countries of the world aim to reach the virtuous cycle. This is because when any country is in a virtuous cycle human development and economic growth reinforce each other and the citizens of the country live a blissful life. Indian states are no exception. Studies of several countries' experience have shown that to reach the virtuous cycle human development should precede economic growth. If the opposite happens then the country's prosperity is short lived and it reverts back to the vicious cycle. In case of India, more emphasis is placed on economic growth rather than human development with the exception of Kerala. This is not a very healthy sign and needs immediate rectification.

Thus the final conclusion is that there exists a symbiotic relationship between human development and economic growth in case of Indian states. Performance of most of the states in human development is not satisfactory. Therefore the governments of respective states should adopt policies that will enhance human development of the states. By doing these, states can achieved self-sustained growth.

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