DEVELOPMENT INDICES: A COMPARATIVE STUDY OF INDIA AND CHINA*

Anjani K. Kochak

Both India and China have grown impressively in recent years. This paper seeks to unravel the various dimensions in which development has taken place in the two countries. The first section discusses the various indicators that are generally used to measure economic progress in any economy. The second section explains the methodology used by UNDP to construct four important indices, namely the Human Development Index (HDI), the Gender Related Development Index (GDI), the Gender Empowerment Index (GEM) and the Human Poverty Index (HPI), and their respective limitations. The third section compares the progress made by India and China in terms of these indices and looks at some other important indicators of development for the two countries. The final section seeks to draw some conclusions and spell out the policy implications.

I

Indicators of economic growth

Kuznets defined economic growth as a sustained and substantial increase in per capita national income accompanied by certain institutional and structural changes. For a long time, the economic progress of a country was measured by growth in Gross National Product (GNP) per capita. It was assumed that growth would 'trickle down' to the poorer sections so as to increase the well being of the country. However, an

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increase in the average income could equally come about by an increase in income of a rich minority, even if the majority of the population remains poor. Thus equity in income distribution came to the forefront as an additional objective. Also, it was realized that an increase in GNP per capita could mean an increase in the availability of goods and services to the masses, while other aspects of life -- health, education, etc. -- were ignored. Thus M.D. Morris put forth the 'Physical Quality Of Life' index, using three indicators--infant mortality, life expectancy and literacy—thereby shifting the perception of development from economic growth to *socio-economic development*. From the 1980s there has been a further shift towards *human development*, meaning that people are viewed not as a means of development but as ends. Human development is seen as a process of enlarging people's choices, opportunities and capabilities. The GDP per capita is a one-dimensional average, which fails to capture the cultural, political, social and other choices that people make. Thus there was a need to evolve a more comprehensive, multi-dimensional index which can combine many variables in a single number, for cross-sectional and inter-temporal comparisons.

In 1991 the UNDP evolved one such index – the Human Development Index (HDI) -- that takes into account three basic dimensions of human development, namely, the right to live a long and healthy life, to acquire knowledge, and to have a decent standard of living. Other human rights are not incorporated in this because these are difficult to measure and are subjective in nature. To capture gender inequalities, the UNDP in 1995 introduced two indices – the Gender Development Index (GDI) and the Gender Empowerment Index (GEM). While the GDI discounts the HDI for gender inequalities and focuses on the capabilities of women, the GEM is concerned with the use of these capabilities to take advantage of opportunities. In 1997 the UNDP introduced the Human Poverty Index (HPI) to capture the extent of deprivation in human development. In addressing the problem of poverty, economic growth is necessary, but equally important is the nature of growth.

II

Methodology

Human Development Index

The three basic dimensions of human development captured by the HDI are:

1. **'A long and healthy life'**, measured by life expectancy at birth. Life expectancy is used as a proxy for other health indicators like infant mortality, under-five mortality maternal mortality, etc.
2. **'Knowledge',** measured in terms of adult literacy rate and gross primary, secondary and tertiary enrolment ratio. In 1990, only adult literacy rate was used to represent knowledge. Although literacy is a basic requirement for the capability to acquire and use information, there is more to knowledge than literacy alone. Thus, from 1991, mean years of schooling was also added to acknowledge the importance of high level of skill formation. From 1995, mean years of schooling has been replaced by a combined primary, secondary and tertiary gross enrolment ratio because of easier data availability. The weights attached to adult literacy and gross enrolment ratios are 2:1.
3. **'A decent standard of living',** measured by GDP per capita (PPP USD)[1]. Income in HDI is used as a proxy for a bundle of goods and services needed for best use of human capabilities. The basic approach in the treatment of income has been driven by the fact that achieving a respectable level of human development does not require unlimited income. A $300 increase in per capita income makes a significant improvement in the standard of living if current income is $600, but matters less if current income is $2000. Since GDP per capita in the HDI index emphasizes sufficiency, and not satiety, higher income needs to be discounted. Thus from 1997, log (GDP per capita) is used as the variable to reflect a decent standard of living.[2]

[1] At PPP USD rate, one dollar has the same purchasing power in the domestic economy as one dollar has in the US.

[2] From 1991-97 a different procedure for discounting income was used which heavily discounted income above the threshold level. The threshold level was the poverty level of industrialized countries till 1994, and the average global value of GDP per capita thereafter

Before the HDI is calculated an index is created for each dimension. To calculate these dimension indices, maximum and minimum values (goal posts) are chosen. Performance in each dimension is expressed as a value between 0 and 1 by applying the general formula.

Dimension index:

$$(Actual - Minimum) \Big/ (Maximun - Minimum)$$

HDI is then an average of the three dimensional indices.

The methodology of HDI has undergone changes from 1990 when it was first calculated by the UNDP. Goal posts for calculating HDI till 1994 were the actual maximum and minimum values, that is, the values for the best and the worst performers. This meant, fluctuating goal posts, which made comparisons over time meaningless. Thus, from 1994, fixed goal posts for extreme values were adopted. These are the most extreme values observed over the previous three decades or expected over the next three decades. (Table 1).

Table 1: GOAL POSTS

	Max.	Min.
Life expectancy (years)	85	25
Adult literacy (%)	100	0
Combined enrolment ratio (%)	100	0
GDP per capita (PPP USD)	40,000	100

However, this aggregate, though extremely useful, conceals vast discrepancies between men and women, rich and poor, urban and rural residents and different ethnic or religious groups.

Gender Related Development Index

The Gender Related Development Index (GDI) is calculated to reflect inequalities between men and women in the three dimensions used in calculating HDI. The three indices, namely, life expectancy index[3], education index and GDP index are calculated separately for men and women, and an equally distributed index is calculated for each dimension. Given a moderate aversion to inequality, the equally distributed indices are weighted harmonic means of the male and female indices. Thus they give a higher weight to the lower value, i.e. they decrease as the differences in achievement between men and women increases.

Equally Distributed Index = $\{[(\text{female population share})\ (\text{female index})^{-1}] + [(\text{male population share})\ (\text{male index})^{-1}]\}^{-1}$

The GDI is an average of the three equally distributed indices. The way the GDI is calculated, it will generally be lower than or equal to the HDI. This is because it gives a higher weight to the lower achiever. Interpretation of this index would become ambiguous if the female index is higher for one dimension and lower for another. This is true for a number of countries, like Philippines, Thailand, Korea, Mongolia, Botswana, etc. For India and China the female index is lower for all three dimensions and therefore the deviation of GDI from HDI would reflect gender bias against women. But if we were to look at a country like Korea where female index for education and income is lower than the corresponding index for males but the life expectancy index for females is higher than that for the males, the deviation of GDI from HDI does not have any clear meaning. The UNDP needs to reform this index so that it correctly reflects gender inequalities.

Gender Empowerment Index

The Gender Empowerment Index (GEM) focuses on women's opportunities and captures gender inequality in three areas:

1. Political participation and decision making power: measured by women's and men's percentage shares of parliamentary seats.
2. Economic participation and decision making power: measured by two indicators – (a) Women's and men's percentage share of positions as

[3] The goal posts for female life expectancy are 27.5 and 87.5 because of the biological differences in survival rates favouring women given comparable care.

legislators, senior officials and managers; and (b) Women's and men's percentage shares of professional and technical positions.

3. Power over economic resources: measured by women's and men's estimated earned income (PPP USD).

For the first two dimensions, an equally distributed equivalent percentage (EDEP) is calculated as a population weighted average. Given a moderate aversion to inequality, this formula is the same as that used to calculate EDI for the three dimensions of GDI, i.e. a weighted harmonic mean of the male and female percentages. These EDEPs are then indexed by dividing by 50, since in an ideal society with equal empowerment of both sexes, these should be 50%. The indices for the two components of economic participation and decision making power are then averaged. Given the scheme of inequality correction which is being followed, an index for each dimension should have been calculated first, and then an equally distributed index should have been calculated, as in the calculation of GDI. The end result would not be affected. For the third dimension, an income index is calculated for both males and females using unadjusted values of estimated earned income, unlike log income which was used in calculating HDI and GDI. This is because income here is used to represent economic power. An equally distributed income index is then calculated. The GEM is a simple average of the three EDEPs. The GEM suffers from the same problems in interpretation as the GDI.

Human Poverty Index

The Human Poverty Index is defined separately for industrial (HPI-2) and developing countries (HPI-1).The HPI-1 measures deprivation in the three basic dimensions of human development captured in HDI:

1. Vulnerability to death, measured by probability at birth of not surviving to age 40.
2. Exclusion from the world of knowledge, measured by adult illiteracy rate.
3. Lack of a decent standard of living, measured by two indicators: (a) Percentage of population without access to an improved water source. Reasonable access is defined as availability of at least 20 liters of water per person per day from a source within one kilometer of the user's dwelling; and (b) Percentage of children underweight for age. Originally, deprivation in

decent standard of living also included access to health services, but this factor was later dropped because of unavailability of data.

The HPI-1 is calculated by combining the above indicators.

Deprivation in a decent standard of living (P_3) is measured as a simple average of two indicators.

P_3 = ½ (% of population without access to an improved water source + % of children under weight for age)

P1 = Probability at birth of not surviving up to age 40 (times 100)

P2 = adult literacy rate

HPI-1 = $\{1/3 (P_1^3 + P_2^3 + P_3^3) \}^{1/3}$

The HPI-1 rank of the country will be higher the lower the value of HPI-1. Since income is excluded from this index, it becomes a *social index* and needs to be used in tandem with income poverty estimates in order to obtain an overall understanding of human deprivation.

HPI-2 measures deprivation in the same dimensions as HPI-1, but adds another variable -- *social exclusion*, which is measured by long term unemployment.

III

India and China compared

Human Development Indices

Human Development Report 2004 shows rankings of 177 countries according to the value of HDI for 2002. The index varies from 0 to 1. Fifty-five countries have a high HDI (range 1-0.8); Eighty-six countries have a medium HDI (range 0.799 – 0.5); and thirty-six countries have low HDI (range 0.5-0). Both India and China fall in the second group.

Table 2: COMPONENTS OF HDI

	Rank	Life Expectancy	Education Index	GDP Index	HDI

		Index			
China	94	0.76	0.83	0.64	0.745
India	127	0.64	0.59	0.55	0.595

China has an HDI rank of 94, while India has 127. The corresponding ranks in 2001 according to the *Human Development Report* (2003) were 104 and 127. China has progressed substantially between 2001 and 2002, while India has stagnated. As can be seen from the Table 2, all three-dimensional indices are higher for China, but the greatest difference is in the education index. Within this group it is adult literacy where India (61.3%) falls way behind China (90.9%) (Table 3).

Table 3: COMPONENTS OF EDUCATION INDEX

	Adult Literacy Rate (%)	Combined Primary. Secondary and Tertiary gross enrolment ratio
China	90.9	68
India	61.3	55

The HDI rank for China is five above its GDP rank, while the HDI rank for India is ten below its GDP rank. This is indicative of the different development strategies followed by the two countries. Because of its socialist background, the Communist Party of China gives greater priority to provision of basic social services (health and education) to its people compared to India. This goes to prove that a healthy and educated labour force is an asset to the economy and is instrumental in increasing the productivity and growth of the economy.

If we look at the HDI trends (Table 4) we find that the HDI index has consistently improved for both China and India. However the difference in HDI between the two has been widening over the years, especially since 1990. This indicates that India is lagging behind and not catching up in human development with China. Though India started its reform process a little over a decade after China, in terms of HDI its current position is similar to that of China in 1985—a 17 year lag.

Table 4: TRENDS IN HDI						
Year	1975	1980	1985	1990	1995	2002
China	0.523	0.557	0.593	0.627	0.683	0.745
India	0.411	0.437	0.476	0.514	0.548	0.595
Gap	0.112	0.120	0.117	0.113	0.135	0.150

If we make a region-wise comparison (Table 5), we find that China has done marginally well in HDI as compared to the other countries of East Asia and the Pacific region. This is because of its slightly better performance in the life expectancy index.

Table 5: HDI COMPARISON – CHINA AND EAST ASIA & PACIFIC				
	Life Expectancy Index	Education Index	GDP Index	HDI
China	0.76	0.83	0.64	0.745
East Asia and the Pacific	0.75	0.83	0.64	0.740

India has done better in HDI than the countries the of the South Asia region (Table 6). While the life expectancy index and GDP index is the same, India has scored marginally on education index.

Table 6: HDI COMPARISON – INDIA AND SOUTH ASIA				
	Life Expectancy Index	Education Index	GDP Index	HDI
India	0.64	0.59	0.55	0.595
South Asia	0.64	0.57	0.55	0.584

Thus we find that the HDI for both countries is marginally better than the average for their respective regions.

Human Poverty Index

The HPI-1 was introduced in 1997 to capture the extent of deprivation in human development. Economic growth is necessary to address the problem of economic poverty, but equally important is the nature of growth. For growth to benefit the masses of the people, growth opportunities must be equitably distributed through deliberate policy action, especially by building up the human capabilities of the entire population. Thus the underlying cause of economic poverty is the poverty of opportunity. The denial of basic human choices diminishes the opportunities that are available for the betterment of human life. It is this denial which keeps people poor.

In terms of HPI-1 ranking, China is 24 and India is 48 (Table 7). However, the breakup shows a startling result – the percentage of population without access to an improved water source is 25 per cent in China, as compared to 16 per cent in India. If we look at the rural urban breakdown of this variable, we find that 34 per cent of rural population in China is without access to an improved water resource as compared to 21 per cent in India. Providing safe water decreases the incidence of water-related diseases, and thus increases productivity. Also, increased access to safe drinking water will translate into increased time for productive activities, since water collection has a high opportunity cost for women and children, especially in mountainous regions. In China, pollution of river water, lakes and ground water by industrial waste, insecticides, pesticides and sewage is widespread. According to a survey by the State Environmental Protection Administration, fewer than 40 per cent of the sections of China's seven major rivers monitored in 2003 reach the standards for drinking water, while merely a quarter of the checked 28 key lakes and reservoirs were up to the mark. Groundwater supplies were checked in 44 cities and 95 per cent were found to be polluted with sewage. India's performance in all other indicators is worse. Especially marked is the adult illiteracy rate (38.7 per cent India, 9.1 per cent China), and children underweight for age (47 per cent India, 11 per cent China). In 2001, public spending on health was only 0.9 per cent of GDP in India, compared to 2.0 per cent for China. Clearly, India needs to increase public expenditure on health and education to decrease human poverty.

Table 7: HUMAN POVERTY INDEX						
	Rank	Value (%)	Prob. at birth of not surviving to age 40(%) 2000-2005	Adult illiteracy rate (%) 2002	Population without sustainable access to an improved water source (%) 2000	Children underweight for age (% under age 5) 1995-2002
China	24	13.2	7.1	9.1	25	11
India	48	31.4	15.3	38.7	16	47

Looking at the income poverty measures we find that the percentage of the population earning less than a $1 a day during 1990-2002 was 16.6 per cent in China and 34.7 per cent in India. In other words, India is much more impoverished when compared to China.

As mentioned, in 1995 the UNDP introduced in 1995 two indices, the Gender Related Development Index (GDI) and the Gender Empowerment Index (GEM) to capture gender disparities.

Table 8: GENDER RELATED DEVELOPMENT INDEX (GDI)										
	HDI	GDI	Life Expectancy at birth (years) 2002		Adult Literacy rate (%) 2002		Combined Primary, Secondary and Tertiary gross enrolment ratio (%) 2001-2002		Estimated earned income (PPP USD) 2002	
			Female	Male	Female	Male	Female	Male	Female	Male
China	0.745	0.741	73.2	68.8	86.5	95.1	64	69	3571	5435
India	0.595	0.572	64.4	63.1	46.4	69	48	62	1442	3820

One way of gauging gender inequalities in a country is to compare its GDI value and its HDI value. If we look at the percentage reduction in GDI value from HDI value for India and China, we find the percentage reduction to be much lower for

China (0. 5 per cent) compared to India (3.86 per cent). Thus gender disparities are lower in China compared to India. Mao believed in the equality of men and women ('women hold up half the sky'), a principle which was incorporated in the constitution. The Communist Party also passed laws abolishing concubinage, giving women the right to own property, choose their own husbands, sue for divorce, etc., which improved, the status of women and their participation in all aspects of life. The status of women in India has also improved, but at a slower rate. Retrograde practices like sati were banned, and the legal rights of women on inheritance of property, divorce, widow remarriage, etc., were secured. However, domestic violence and dowry deaths are still common in India.

Looking at the components of GDI (Table 8), we find that India lags behind China significantly in estimated earned income of females, which is less than half of their counterparts in China. This is partly due to the much lower female economic activity rate in India compared to China (India 42.4 per cent, China 72.5 per cent).

The GEM could not be calculated for India or China because of non-availability of data for all indicators. Data was available for percentage of seats in parliament held by women, which was 20.2 per cent for China and only 9.3 per cent for India. (The Bill on reservation of one-third parliamentary seats for women in India has still not been passed). The GDI and GEM indices do not cover many important aspects of gender inequality, like participation in community life and decision making, consumption of resources within the family, dignity and personal security.

Thus we find that for all three indices -- HDI, HPI-1, and GDI -- China fares better than India. It scores over India especially in terms of adult literacy and percentage of children underweight for age. China seems to have a higher percentage of population without access to an improved water source.

Other indicators of human development

The above indices do not, however cover all aspects of human development. Human development also requires a more equitable distribution of income, the replenishment of natural resources for future generations, and the encouragement of grassroots participation of people in events that shape their lives.

If we look at inequalities in income and consumption we find that China is worse off than India. According to the *Human Development Report, 2004*, the ratio of the share of income of the richest 10 per cent to the share of income of the poorest 10

per cent was 18.4 for China, while the ratio of share of consumption of the richest 10 per cent to the share of consumption of the poorest 10% is 7.0 for India. The Gini index[4] was 44.7 for China and 32.5 for India. It appears that China has retreated substantially from its path of equality under the socialist regime. Kuznets' inverted u-curve indicates that, historically, as a country develops income inequalities first increase and then decrease. China is still on the upswing.

If we look at interregional inequalities the picture seems just as bad. According to the Asian Development Bank, the GDP per capita in 2001 in the western region was two-thirds the national average and one third the average for the eastern region. Interregional inequalities in India are much less compared to China. According to the *Economic Survey* in 2002-03 the highest GDP per capita (at current prices) was of Chandigarh which was 8.8 times that of Bihar, the poorest state. In China, Shanghai's GDP per capita was 13 times that of its poorest province, Guizhou.

China's record on conservation of the environment is also disturbing. If we look at the share of China in total world carbon dioxide emissions in 2000, the figure is 11.5 per cent while the corresponding figure for India is 4.4 per cent. The carbon dioxide emissions per capita in 2000 were 2.2 metric tons for China, and 1.1 metric tons for India. Water pollution is also widespread in China. About a quarter of its population gets drinking water contaminated with arsenic, fluorine, etc., with adverse health effects. This highlights the 'futureless' nature of growth in China.

Another important indicator of human development is political freedom. The 1991 Human Development Report presented a human freedom index for 1985 by modifying Charles Humana's human freedom index for 88 countries. According to this, India is placed in the medium freedom ranking countries while China is placed in the low freedom ranking countries. Mahbub-ul-Haq (1995) has constructed a political freedom index for 1994. The value for this index for India was 71.5, indicating a fairly high degree of political freedom, while for China it was 38, indicating fairly low political freedom. James Gwartney and Robert Lawson (2004) have constructed an index to measure economic freedom for 123 countries for 2002. This summary index measures the degree of economic freedom in five areas: (i) size of government; (ii) legal structure and protection of property rights; (iii) access to sound money; (iv) international exchange; and (v) regulation. The ranking of India for this index is 68,

[4] Gini index measures inequalities over the entire distribution. A value of zero represents perfect equality and a value of 100 represents perfect inequality.

while China stands at 90. Indians thus enjoy a much greater level of political and economic freedom compared to their counterparts in China.

IV

Conclusions

The above analysis of human development in China and India suggests that, though China has achieved significant economic progress, it has not been without cost. The large and growing interpersonal inequalities, interregional inequalities and intergenerational inequalities are likely to lead to social tensions which will stall the process of economic development. To ensure sustainable development, greater emphasis has to be placed on conservation of the environment and the redistribution of the gains of growth to the poorer people and backward regions through appropriate governmental policies. The Western Region Development Programme and the anti-poverty programmes of China are steps in the right direction. China also needs to improve the availability of safe drinking water for its population. The health of about 2 million people has reportedly been affected by diseases related to drinking water with high arsenic content in parts of Inner Mongolia, Shanxi, Xinjiang, Ningxia and Jilin. A giant South North Water Diversion project was started in 2002 to satisfy the demand for safe drinking water in the northern region by diverting water from the Yangtze River. China has done reasonably well in education and health parameters. This has helped it to convert its human resources into an asset, since low wages combined with technical skills have conquered global markets.

Though India's growth has been much slower than China's, it has a better spread in terms of population and regions. Living in one of the largest democracies in the world, Indians enjoy much greater political and economic freedom than do the Chinese. However, India needs to invest much more in health and education, especially adult literacy, to take advantage of its large labour force and leapfrog into the 21st century to become a dominant economic power in South Asia.

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APPENDIX: Calculation of HDI

Now let us take the example of Albania to show how the HDI is calculated.

The life expectancy in Albania was 73.4 years in 2001. Applying the formula for the dimension index and the goal posts, we get:

Life Expectancy Index = (73.4 - 25) / (85 – 25) = 0.807

To measure the Education Index, we need to calculate the Adult Literacy Index and Gross Enrolment Index. The Adult Literacy Rate in Albania was 85.3 in 2001 and Gross Enrolment Ratio for 2000-2001 was 69%.

Adult Literacy Index = (85.3 – 0) / (100 – 0) = 0.853

Gross Enrolment Index = (69 – 0) / (100 – 0) = 0.690

Education Development Index is a weighted average of the above two. Thus:

Education Development Index = (2/3)(0.853) + (1/3)(0.69) = 0.798

To calculate the GDP Index, we need data for GDP per capita in PPP USD. Since GDP per capita PPP USD is 3680 for Albania,

GDP Index = (log (3680) – log (100)) / (log (40000) – log (100)) = 0.602

HDI can now be calculated as an average of the three dimension indices:

HDI = (0.807 + 0.798 + 0.602) / 3 = 0.735.

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Anjani K. Kochak has M.A. and M. Phil. degrees in Economics from the Delhi School of Economics, and has been teaching at Lady Shri Ram College (University of Delhi) since 1975. She has co-authored an article on 'Paper and Paper Board Industry: Productivity, Structure and Related Issues', published in *Productivity* (1990), and has prepared a set of video lectures for the University Grants Commission's satellite learning programme. She has also been a Resource Person for the National Training Workshop of the Institute of Chinese Studies (2004-2005).

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