

AMITA MAJUMDER, KRISHNA MAZUMDAR AND SNIGDHA CHAKRABARTI

PATTERNS OF INTER- AND INTRA-REGIONAL INEQUALITY:
A SOCIO-ECONOMIC APPROACH

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ABSTRACT. The regional development pattern of five regions, viz., North, South, Tropical America, Tropical Asia and Tropical Africa [see Theil (1989)] is studied using two indices based on a group of representative socio-economic indicators. The analysis is based on measures of 'inequality' and 'mobility'. Comparison of results using these indices and the Per Capita Gross Domestic Product (PCGDP) reveals that while the situation with respect to PCGDP has worsened over the years, that with respect to the socio-economic indicators has become better.

1. INTRODUCTION

Development is 'of the people, by the people, for the people'. The socio-economic upliftment of the people is the main objective of any country at any point of time. This obviously requires an increase in the level of Per Capita Gross Domestic Product (PCGDP) of the country. But a higher level of PCGDP does not necessarily mean a higher level of development in terms of socio-economic aspects of life. In fact, PCGDP is not the sum total of human life, it is only a means to create an environment for people to enjoy long, healthy and creative life. Thus, to have an idea of the level of development of a country/region it is more important to look at the socio-economic aspect rather than concentrating only on PCGDP.

The objective of this paper is to study the intertemporal inter- and intra-regional development pattern in the socio-economic aspects of life and to compare the development pattern thus revealed with that depicted by PCGDP. The analysis is based on the behaviour of inter-

and intra-regional inequalities in PCGDP and two indices based on different socio-economic indicators.

Earlier studies in this field include those of Ram (1979, 1980, 1982, 1984, 1987, 1992) and Ward (1982). Ram, in his series of studies used the Principal Component method to combine different social and economic indicators to represent different types of development indices and measured the inequality of these composite indices over all countries. In this respect this analysis is global and no reference is made to inter-regional variations. Ward considered inter-country inequalities in income as well as social indicators for the regions – developed East and West, underdeveloped South and OPEC along with the world as a whole. The main findings of this study are as follows: the inequality as measured by Gini coefficient depicted a stagnant picture for the world as a whole in respect of PCGDP, GDP and the social indicators. The regional inequalities of basic needs fulfillment declined over the years in the developed East and West, with the West tending towards a more equal distribution than the East. However, no intra-regional comparison has been made in his study.

In this paper we study inter- as well as intra-regional development pattern using a classification of countries offered by Theil (1989).¹ We compare our results based on the socio-economic indicators with those of Theil, whose study relates to PCGDP only. However, as the data set available to us does not exactly correspond to that of Theil, we repeat Theil's exercise with PCGDP using our data for comparability.²

The plan of the paper is as follows: Section 2 describes the choice of variables, data and methodology, Section 3 presents the results and finally Section 4 makes some concluding remarks.

2. CHOICE OF VARIABLES, DATA AND METHODOLOGY

Choice of variables. In general, the most frequently used composite index of development is the Physical Quality of Life Index (PQLI) with the three variables infant survival rate, adult literacy rate and life expectancy (Morris, 1979). However, it is generally believed that quality of life/welfare should be measured on the basis of a large number of

attributes as is relevant and feasible (see Slottje, 1991; Hirschberg *et al.*, 1991; Sen, 1985, 1987; Maasoumi, 1986; Atkinson and Bourguignon, 1982; Kolm, 1977). Therefore, we attempt to widen the scope of the 'physical quality of life' measure by incorporating variables from various groups of socio-economic characteristics of people. The variables we choose are as follows.

<i>Broad group</i>	<i>Variables</i>	<i>Variable name used here</i>
1. Population	Urban population (% of total)	URBPOP
2. Demographic characteristics	Life expectancy (years)	LIF
3. Health and nutrition	Caloric supply per capita (% of requirement)	CAL
	Infant survival rate	INFS
	Physician per thousand population	PHYS
4. Education	Adult literacy rate	ADLIT
	Teacher pupil ratio (primary)	PUPTEAC
5. Consumption	Energy consumption per capita (kilogram of coal equivalent)	FUEL
	Passenger car per thousand population	CAR

All the variables chosen are related to the outcomes of a development process. These variables are considered to be representative of the list of variables within the broad groups.

Data. The data for the years 1960, 1970, 1980 and 1990 on all the nine variables mentioned above have been obtained from different issues of World Tables and World Development Report. Figures not available for

these 4 years have been imputed in some cases by figures from around these years, and in some cases by estimated figures computed using trends. The data for actual calorie supply for 1990 are available, but percentage of requirement of calorie per capita for 1990 are not available. We approximate these figures using the ratio between percentage of requirement and actual supply for the year 1980. In this study all the variables have been standardized to the scale 0–100.³ For studying the development pattern using PCGDP, the data of Summers and Heston (1984, 1988) have been used.

Methodology. In this study we use the following two composite socio-economic indices based on the Principal Component method – (i) with INFS, ADLIT and LIF (Ram, 1982) and (ii) with all the nine variables – URBPOP, LIF, CAL, INFS, PHYS ADLIT, PUPTEAC, FUEL, and CAR. The resulting weighted indices are called PCPQLI and PC9IND respectively. Each composite index is a weighted sum of the individual variables, where the weights are the normalized elements of the characteristic vector of the covariance-matrix (of the variables) corresponding to the largest characteristic root.

To study the extent to which the distributions of PCPQLI and PC9IND change over time, we use the inequality index of Atkinson (1970), Kolm (1969) and Sen (1973) [AKS] and the mobility index of Shorrocks (1978).⁴ The indices are described briefly below.

The two inequality indices that have mostly been used in the context of cross country studies are the Gini index and Theil's entropy index (Theil, 1979; 1989). The former can be decomposed into between and within group components only under the condition that the range of incomes in one region does not overlap with that of the other region. This is somewhat disturbing unless the regions are defined in terms of the levels of PCGDP. The latter can be decomposed additively into between and within region components; but the interregional inequality here is defined as the inequality that arises if each country in a region has its per capita income equal to the region's mean income. Thus, here too, if the regions are not ordered with respect to PCGDP, the interregional inequality might become zero if the mean incomes of the regions happen to be equal. In a regional analysis, where regions need not always be

defined in terms of PCGDP and where decomposability is an important aspect with respect to PCGDP, we, therefore, use the AKS measure that overcomes this problem. The AKS index replaces the mean income by the Equally Distributed Equivalent (EDE) income, which is that level of income, which, if enjoyed by every individual, would make the total welfare exactly equal to the total welfare generated by the actual income profile and thus overcomes the above drawback. Moreover, it may be noted that all relative inequality indices, on suitable normalization, can be written in the AKS form (Chakravarty, 1990). The measure is defined as follows:

Let the income distribution in period k be $y^k = (y_1^k, y_2^k, \dots, y_n^k)$, n being the population size. The AKS index for period k is given by

$$(1) \quad I_{AKS}^k = 1 - \text{EDE}(y^k)/\text{Mean}(y^k)$$

where $\text{EDE}(y^k) = \Pi_{i=1}^n (y_i^k)^{1/n}$ is based on the welfare function due to Atkinson (1970). This index is decomposable into between (I_B^k) and within (I_W^k) region inequalities as

$$(2) \quad (1 - I_{AKS}^k) = (1 - I_B^k)(1 - I_W^k)$$

where $(1 - I_W^k)$ is the weighted average of the regional inequality indices in the following manner

$$(3) \quad 1 - I_W^k = \sum_{r=1}^R (n_r/n) [\text{mean}(y_r^k)/\text{mean}(y^k)] (1 - I_{AKS(r)}^k)$$

and $I_{AKS(r)}^k$ is the AKS index for region r in period k , y_r^k is the income vector for region r in period k , n_r is the number of members in region r and R is the total number of regions.

Indices of inequality are summary statistics of the dispersion of the values of a variable at a particular point of time. However, as time progresses, relative values of the variables are observed to change. An index of mobility measures such changes, while this feature of the time path of the variables is not captured by an index of inequality. To measure the extent to which the distributions of PCGDP, PCPQLI and

PC9IND are equalized over time and to see how the relative positions of the countries have changed, we use a measure of mobility proposed by Shorrocks (1978), which is given by

$$(4) \quad M_S(Y) = 1 - I_{AKS}(y^a) / \sum_{k=1}^T w_k I_{AKS}^k$$

where T is total time period, y^a represents the aggregate (long run) distribution with $y_i^a = \sum_{k=1}^T y_i^k$, $Y = (y^1, y^2, \dots, y^T)$ is the income structure, $w_k = \text{mean}(y^k) / \text{mean}(y^a)$ is the proportion of aggregate income received in period k . M_S measures the mobility of the income structure Y , i.e., $(1 - M_S)$ measures the stability of the distribution.

Shorrocks demonstrates that M_S lies in the interval $[0,1]$, attaining its minimum value when relative incomes remain constant over time and attaining its maximum value when the long run incomes are completely equalized. This index, in conjunction with the inequality index can be interpreted as follows: A high inequality value in the starting period with a value of the mobility index near 1 implies that the society is moving towards an equalized long run distribution. A low inequality value in the starting period with a mobility index near 0 implies that the society remains stable with a low inequality index.

3. RESULTS

Table I presents the means of PCGDP, PCPQLI and PC9IND by region and for all countries combined for the four years. As is evident from the table, the 'International' mean values with respect to all three variables have improved over the years. The regional patterns are somewhat diverse. Only 'North' and 'Tropical Asia' show an improvement with respect to all three variables. The other regions show an improvement with respect to PCPQLI and PC9IND (except in case of 'South' where mean of PC9IND is almost stable over the years) in contrast with a declining trend revealed by PCGDP.

For the three variables the overall, inter- and intra-regional inequalities are presented in Table II. Except for 'North', all the inequalities

TABLE I

Mean Values of PCGDP, PCPQLI and PC9IND – International and Across Regions

Year	International*	Region				
		North	South	Tropical America	Tropical Asia	Tropical Africa
(1)	(2)	(3)	(4)	(5)	(6)	(7)
PCGDP						
1960	25.99	51.41	52.40	21.70	15.56	10.86
1970	28.67	60.91	51.80	22.70	18.31	10.07
1980	29.90	66.09	48.60	22.00	21.50	9.31
1990	28.39	65.23	43.20	20.50	24.56	5.45
PCPQLI						
1960	72.13	92.37	93.12	75.63	68.44	52.77
1970	76.53	95.34	94.33	80.62	74.08	57.74
1980	79.85	96.20	95.20	84.34	78.18	62.63
1990	83.43	97.47	96.33	86.80	82.65	68.66
PC9IND						
1960	46.94	65.28	67.01	46.16	43.06	32.24
1970	48.55	69.02	67.09	47.54	44.52	32.76
1980	50.09	71.56	67.68	48.78	45.77	34.06
1990	51.50	72.33	66.37	50.54	47.32	36.10

* The term 'international' has a similar meaning as in Theil (1989).

show an increasing trend with respect to PCGDP. The behavioural pattern of the inequality indices corresponds fairly well with Theil's (1989, Table III) conclusions except in case of 'Tropical America', where the inequalities show a slightly declining trend in Theil's result as opposed to an increasing trend according to our results. As has been found by Theil, the regional inequality in our case also is between 70 and 80 percent of the 'International' inequality in each year. With respect to the socio-economic variables, viz., PCPQLI and PC9IND, the inequalities

TABLE II

Values of Inequality Indices of PCGDP, PCPQLI and PC9IND - International, Inter-regional and Intra-regional

Year	Inter-national	Regional	Overall within region	Region				
				North	South	Tropical America	Tropical Asia	Tropical Africa
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
PCGDP								
1960	0.265	0.182	0.102	0.114	0.046	0.088	0.124	0.096
1970	0.302	0.227	0.097	0.084	0.060	0.112	0.173	0.091
1980	0.335	0.269	0.099	0.064	0.057	0.091	0.254	0.121
1990	0.437	0.350	0.134	0.084	0.091	0.152	0.309	0.157
PCPQLI								
1960	0.034	0.024	0.010	0.007	0.002	0.011	0.017	0.009
1970	0.027	0.018	0.009	0.003	0.001	0.008	0.014	0.011
1980	0.021	0.012	0.009	0.002	0.0004	0.006	0.012	0.010
1990	0.015	0.009	0.006	0.001	0.0002	0.005	0.009	0.010
PC9IND								
1960	0.052	0.036	0.017	0.015	0.008	0.012	0.028	0.009
1970	0.055	0.040	0.016	0.014	0.008	0.011	0.028	0.010
1980	0.054	0.035	0.020	0.011	0.008	0.010	0.028	0.013
1990	0.047	0.034	0.013	0.008	0.007	0.010	0.022	0.013

are either slightly declining or stable. The magnitude of these indices are, however, very low. The regional inequalities are between 60 and 70 per cent of the international inequalities. The pattern of 'inter-regional' inequalities reveals the fact that the gap between 'North' and 'other region' in social development has narrowed in the last three decades, but the income gap has widened.

Table III presents the mobility indices for the periods 1960-80 and 1970-90 for the three variables. The low mobility values indicate that

TABLE III

Values of Mobility Indices of PCGDP, PCPQLI and PC9IND – International and Regional

Year	International	Region				
		North	South	Tropical America	Tropical Asia	Tropical Africa
(1)	(2)	(3)	(4)	(5)	(6)	(7)
PCGDP						
1960-80	0.028	0.046	0.018	0.073	0.078	0.082
1970-90	0.036	0.026	0.045	0.091	0.046	0.111
PCPQLI						
1960-80	0.029	0.187	0.093	0.042	0.037	0.076
1970-90	0.034	0.067	0.112	0.045	0.043	0.078
PC9IND						
1960-80	0.009	0.034	0.010	0.027	0.019	0.057
1970-90	0.010	0.048	0.022	0.028	0.021	0.050

the relative position of the countries in the world as a whole as well as within the regions have remained stable over the years.

The findings of the three tables can be combined and summarised as follows:

(a) Over the years the world as a whole has shown (i) an improvement in the average level of income, but there has been 'divergence' indicating polarisation, and (ii) convergence and an improvement in the average level in terms of the socio-economic indices (see Peacock *et al.* 1988 for the literature on 'convergence' and 'divergence' in international development).

(b) 'North' has experienced 'convergence' and improvement in average level in terms of both PCGDP and the socio-economic indices. This is because the process of development had started much earlier than 1960

in the countries in this region, and by 1960 these countries were already economically and socially developed.

'Tropical America', which comprises mainly Latin American and Caribbean countries, has shown 'divergence' and a decline in the average level of PCGDP over the years, while with respect to the socio-economic indices, it has shown 'convergence' for PCPQLI, stability for PC9IND and an improvement in the average level for both. This is consistent with the fact that although the countries in this region have shown economic deterioration, impressive average human development levels have been achieved since 1960 (*vide* Human Development Report, 1991, p. 34).

In 'Tropical Asia', although there has been an improvement in the average level of PCGDP, there has been divergence. This is due to the unequal development in this region, where countries like Singapore, Hongkong, Philippines and Malayasia have made considerable progress compared to the other countries in economic terms. The socio-economic indices depict an improving picture as in 'Tropical America' because some indicators like 'life expectancy' and 'infant survival rate' have improved significantly in this region (*vide* Human Development Report, 1991, p. 33).

'Tropical Africa' shows a pattern similar to that shown by 'Tropical America' with respect to all variables. In view of the fact that in the countries in this region economic growth has been slow and that Africa has made important human development gains in recent decades since 1960 (*vide* Human Development Report, 1991, p. 35), our results show the expected behaviour.

'South' shows a deterioration in terms of average level as well as disparity with respect to all three variables. The results for this region, however, must be treated with care because the sample size is rather small.

4. CONCLUDING REMARKS

This paper examines the intertemporal regional development pattern using PCGDP and two socio-economic indices PCPQLI and PC9IND,

an index proposed herein. This analysis makes use of a 'mobility' index, which supplements the 'inequality' measure in revealing the relative position of the countries in a region. Our analysis reaffirms the fact that the pattern of development depicted by PCGDP and by the quality of life indices could be rather different, thus implying that the link between economic growth and social development is not automatic. In an analysis spread over three decades (1960, 1970, 1980 and 1990) we have found that only for 'North' the situation has improved with respect to PCGDP as well as the socio-economic indices. For the other regions there has been a deterioration in respect of PCGDP, while according to the socio-economic indices there has been an improvement in general (exception to this is the region 'South'). This result corroborates the facts that (i) the developing countries have made significant progress towards social development in the last three decades, and (ii) average progress in social development conceals large economic disparities within developing countries (Human Development Report, 1990: p. 2). In addition, this study indicates that irrespective of convergence/divergence within regions the relative position of countries within the regions have remained the same.

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APPENDIX

List of countries by region

North (22 countries)

AUSTRIA, BELGIUM, CANADA, CYPRUS, DENMARK, FINLAND, FRANCE, FEDERAL REPUBLIC OF GERMANY, GREECE, ICELAND, IRELAND, ITALY, JAPAN, KOREA-REPUBLIC OF, THE NETHERLANDS, NORWAY, PORTUGAL, SPAIN, SWEDEN, TURKEY, UNITED KINGDOM, THE UNITED STATES OF AMERICA.

South (5 countries)

ARGENTINA, AUSTRALIA, CHILE, NEW ZEALAND, URUGUAY.

Tropical America (20 countries)

BARBADOS, BOLIVIA, BRAZIL, COLOMBIA, COSTA RICA, DOMINICAN REPUBLIC, ECUADOR, EL SALVADOR, GUATEMALA, GUYANA, HAITI, HONDURUS, MEXICO, NICARAGUA, PANAMA, PARAGUAY, PERU, SURINAME, TRINIDAD and TOBAGO, VENEZUELA.

Tropical Asia (16 countries)

BANGLADESH, BURMA, HONGKONG, INDIA, IRAN, IRAQ, ISRAEL, JORDAN, MALAYSIA, PAKISTAN, PAPUA NEW GUINEA, PHILIPPINES, SINGAPORE, SRI LANKA, SYRIAN ARAB REPUBLIC, THAILAND.

Tropical Africa (29 countries)

ALGERIA, BENIN, BURUNDI, CENTRAL AFRICAN REPUBLIC, CAMEROON, CONGO, EGYPT, ETHIOPIA, GAMBIA, GHANA, GUINEA, KENYA, LIBERIA, MADAGASCAR, MALAWI, MAURITIUS, MOROCCO, MOZAMBIQUE, NIGER, NIGERIA, RWANDA, SIERRA LEONE, SUDAN, TANZANIA, TOGO, UPPER VOLTA, ZAIRE, ZAMBIA, ZIMBABWE.

Total number of countries = 92

NOTES

¹ Recently Theil (1989) has analysed the income development in a regional context with the five regions dividing the temperate zone into 'North' and 'South' and the Tropical zone into 'Tropical America', 'Tropical Asia' and 'Tropical Africa'.

² See appendix for a listing of countries by region used in this study.

³ For standardization, first the variables have been made unidirectional such that a higher value indicates a higher position in the level of development, then the following transformation has been used:

$$\text{Scaled variable} = [\text{variable}/\text{max (variable)}] \times 100$$

It may be pointed out here that the data on Energy consumption per capita for 1990 are in terms of kilograms of oil equivalent. However, because of the scaling, the change in units does not affect our analysis.

⁴ Indices of inequality and mobility are generally used in the context of *income* or other *size variables*. Strictly speaking, use of these indices is not appropriate for PCPQLI and PC9IND. However, here the inequality measure is used merely to indicate (i) the global/regional concentration of varying levels of the indices and (ii) the extent of evenness in the distribution in fulfillment of social well-being. The mobility measure is used to indicate the change in relative positions in respect of these indices.

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