Review of Income and Wealth
Series 35, Number 4, December 1989

DISTRIBUTIONS OF REAL INCOME: WITHIN COUNTRIES AND BY WORLD INCOME CLASSES

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Income and expenditure data from 14 countries (representing one-third of the world's population), mostly from the 1970s, are used to construct national income distributions *and*, after normalizing by purchasing power parities, to construct a "world" distribution of *real* income. The density of real-income equivalent groups (socio-economic classes) across countries is measured for the "affluent," the "well-off," and the "poor." In comparison with earlier studies, most national distributions of income seem to have been improving, the numbers of those in poverty (based on real income) are lower, and, most important (and disturbing for some) is that the "affluent" class (and those above "middle class" income levels) has (prematurely) swelled in a number of developing countries.

Key words: income distribution; middle-income classes; inequality; poverty; world real incomes; purchasing power parity.

Since the early 1970s, when income distribution became an operational objective of economic development (Chenery *et al.*, 1974), the state of knowledge on the subject has improved greatly. A number of analytical treatises have focused on the issue (Pen, 1971; Atkinson, 1970; Cline, 1975) and, more important, data on income distribution are routinely reported for about a score of developing countries (LDCs) and as many developed countries (DCs) (World Bank, 1987; Jain, 1975; Paukert, 1973). These data treat the within-country relative income distribution and report one or more of the common inequality measures. Moreover, for some countries measures of absolute poverty exist which report, e.g. the population that lives below a "poverty level," defined in terms of consumption (calories) or income (e.g. Dandekar and Rath, 1971; Bardhan, 1970, 1973; Fishlow, 1972). Aggregated over a number of countries, such measures of absolute poverty give a measure of relative world poverty, and an idea of how it is distributed between countries. Cross-country comparisons have been based on rank ordering of various countries by measures of relative income distribution.

In this paper we measure the within-country relative and absolute poverty; but also goes one step farther. "*Real*" is the operative qualifier both for within and between country comparisons. Having normalized various national income distributions for *real* (rather than nominal) income one can do two more things: (i) construct a world distribution of real income—and within that examine the between-country inequality; (ii) more importantly, define equivalent income

Note: I am grateful to L. Naiken who was instrumental in initiating this research, to S. N. H. Naqvi, Mahub-Ul Haq and an anonymous referee for useful comments and to M. M. Khan for research help. An early version of this paper was delivered at the Pakistan Society of Development Economists' Annual Meeting, Islamabad, August 1987. The completion of this project was supported by a research leave to the University of Tilburg, The Netherlands, for which I am thankful.

groups in the within-country distributions, pluck them out and transfer them to the world income distribution—in other words define global socio-economic classes and measure their density based on material levels of living that extend across national aggregates.

This is not an idle exercise; it has some obvious applications. The more interdependent the world system becomes, the more important the transnational implications that the within-country class structure acquires. The members of the elites in the developing world invidiously compare their levels of living to those of their counterparts in richer countries. Furthermore, a decision taken in the developed countries, say a stabilization program, may affect differently the welfare of various classes in the developing world—it may, e.g. hurt the poor more than the middle classes. As long as world institutions exist, the world distribution of real income indeed matters, despite the fact that there is no World Government.

Another use of the approach is as an analytical tool. Once we define comparable socio-economic classes across countries, the concept of class solidarity acquires an empirical counterpart. Could it be that it also has operational implications for economic development? Some thoughts on this issue are suggested in the concluding section.

The two "methodological parents" of this paper, which distinguish it from previous attempts to derive a world distribution of income, are the approach used to specify from national data the underlying income distribution and the conversion of local currencies into "international" dollars (PPP$). Neither methodological construct is new, but their combination and application is. In section I, we discuss the statistical method used and the logic of the purchasing-power-parity application.

Household Income and Expenditure Surveys (HIES) provide the raw data for constructing income distributions. However, they have hardly ever been used for constructing a world income distribution and for measuring relative international inequality for two main reasons: the HIES are expressed in local currencies, and therefore international comparability becomes meaningless; and the HIES refer to various subsamples of a national population which are taken at different times and therefore they constitute a nonhomogeneous cross-country data base.[1] In section II, we discuss the data used which impose some considerable limitations to this research.

In section III the national distributions are presented and the within-country relative inequality as it appears from the recent data and in comparison with earlier studies is discussed. In Section IV, the concentration is on the absolute distribution of income and highlights the size-distribution of three groups in the various countries, the "affluent," the "well-off" and the "poor," in reference to two "global" distributions for LDCs and DCs, and to the "world" distribution of income. In section V, the summary and conclusions as well as future extensions of this work are presented.

[1]As an example, Grosh and Nafziger (1986) construct a world distribution of real income, but instead of starting from HIES they assume that within a country income is equally distributed at the national per capita level. They construct the world distribution by converting the nominal per capita income to PPP values and ranking populations across countries on the basis of these values.

I. Approach and Rationale

The Statistical Method: National Distribution Density Functions

All attempts to construct distributions of income from grouped HIES data face the statistical problem of deriving the Lorenz curve from an unknown density function of an income distribution. The usual approach is to fit a well-known density function and derive the equation of the Lorenz curve from the fitted function. The trouble is that the usual density functions rarely give good fit to a wide range of observed income distributions. Kakwani and Podder (1976) addressed this problem by specifying a functional form of the Lorenz curve which has certain properties that can be effectively utilized to specify the underlying equation. Once the Lorenz equation is specified and estimated from actual data, standard inequality measures can be derived from the parameters of the equation, the standard errors of the inequality measures can be computed from the standard errors of the parameters of the equation, and the density function can also be derived from the equation (Kakwani, 1980, chapter 7).

The first step in specifying a new functional form for the Lorenz curve is to define the coordinates of that curve. Let these coordinates be

$$s=\frac{1}{\sqrt{2}}(P+Q) \quad \text{and} \quad r=\frac{1}{\sqrt{2}}(P-Q)$$

where P is cumulative function of population and Q is cumulative function of income. The equation of the Lorenz curve to be estimated is assumed to be log-linear. Thus, the Lorenz curve, in terms of s and r can be written as,

$$r=g(a)=a's^{\alpha}(\sqrt{2}-s)^{\beta}$$

or,

$$\log r=a+\alpha \log s+\beta \log(\sqrt{2}-s) \tag{1}$$

where $a=\log a'$ and $a'>0$, $1>\alpha>0$ and $1>\beta>0$.[2]

For grouped data, we have information on income ranges, and the estimation procedure can utilize this additional information. The authors showed that, if x_t is the upper limit of the income class t and m is the mean of income, given the Lorenz function (1), the following relation also holds.

$$\frac{(m-x_t)}{(m+x_t)}\cdot\frac{s_t(\sqrt{2}-s_t)}{r_t}=(\sqrt{2}-s_t)\alpha-s_t\beta. \tag{2}$$

Introducing the stochastic terms in (1) and (2) and combining them together, we get,

$$\begin{pmatrix}\log r_t\\ D\end{pmatrix}=\begin{pmatrix}1 & \log s_t & (\sqrt{2}-s_t)\\ 0 & (\sqrt{2}-s_t) & -s_t\end{pmatrix}\begin{pmatrix}a\\ \beta^{\alpha}\end{pmatrix}+\begin{pmatrix}w_1t\\ w_2t\end{pmatrix}$$

[2]The restriction $a'>0$ implies that $g(s)\geq 0$ for all values of s in the range 0 to $\sqrt{2}$, which means that the Lorenz curve lies below the line of equal distribution. The restriction α, $\beta>0$ means that $g(s)$ assumes values of zero when $s=0$ or $s=\sqrt{2}$. The restriction α, $\beta<1$ satisfies the condition that the second derivative is negative which rules out the possibility of inflection in the Lorenz curve. In interpreting the estimated coefficients, if $\alpha=\beta$ the distribution is symmetrical, while if $\alpha>\beta$ or $\alpha<\beta$ the distribution is skewed towards (0, 0) or (1, 1), respectively (Kakwani, 1980, p. 133).

where D is the dependent variable in equation (2). The system can be estimated by using GLS. In the event that the restrictions on α and/or β in (1) were violated, the coefficients were estimated by constrained *ML* method with a large penalty term in the likelihood function for $\alpha > 1$ or $\beta > 1$. In Table 1 the estimated coefficients of the Lorenz curves for the 14 countries of this study are given.

Given the estimate of the Lorenz curve, the density function can be estimated. Next, from the density function one can calculate the percent of income or population at any level of income. The relationship between income level (I_t) and s is given by

$$\frac{m - I_t}{m + I_t} = a'\alpha s^{\alpha} - 1(\sqrt{2} - s)^{\beta} - a'\beta s^{\alpha}(\sqrt{2} - s)^{\beta - 1}. \tag{3}$$

Since mean income m is known and I_t is assumed, the above equation can be solved for s using numerical methods. From the knowledge of s and the estimated coefficients, r can be obtained.

TABLE 1

ESTIMATED COEFFICIENTS OF LORENZ CURVES

Country	a	α	β	$\bar{R}^2$	F
LDCs					
Bangladesh	−1.636	0.868	0.781	0.99	2,014
	(−20.97)	(35.81)	(19.59)		
India	−1.080	0.870	0.787	0.99	1,588
	(−48.50)	(65.17)	(50.04)		
Sri Lanka	−0.714	0.940	0.309	1.00	963
	(−66.62)	(293.99)	(13.13)		
Pakistan	−1.102	0.906	0.808	0.98	1,066
	(−42.33)	(46.29)	(52.53)		
Indonesia	−1.124	0.901	0.823	0.99	1,152
	(−42.81)	(54.54)	(45.13)		
Philippines	−1.033	0.883	0.781	0.99	711
	(31.75)	(44.64)	(32.67)		
Brazil	−1.078	0.968	0.866	0.98	227
	(−17.99)	(24.06)	(20.44)		
Mexico	−0.741	0.970	0.991	1.00	1,230
	(−42.49)	(102.60)	(67.29)		
S. Korea	−1.085	0.879	0.746	0.98	437
	(−26.76)	(28.54)	(33.93)		
DCs					
Ireland	−1.747	0.753	0.629	0.99	458
	(−30.21)	(23.14)	(7.40)		
United Kingdom	−1.893	0.998	0.912	0.98	621
	(−28.63)	(31.65)	(14.27)		
France	−1.174	0.905	1.00	0.99	1,232
	(−27.11)	(31.26)	(24.73)		
Japan	−1.044	0.793	0.792	0.99	1,450
	(−51.27)	(57.47)	(57.78)		
United States	−0.96	0.86	0.999	0.99	8,298
	(41.51)	(55.27)	(53.18)		

Note:

All regressions were estimated with GLS. Numbers in parentheses are estimated t-ratios.

In interpreting the estimated coefficients, it is noted that the Lorenz curve is symmetric if $\alpha = \beta$, skewed toward (1, 1) if $\beta > \alpha$ and skewed toward (0, 0) if $\alpha > \beta$.

International Comparability: PPP Dollars

The problem of international comparability is not simply that of finding a common numeraire to apply to different countries. The exchange rate would have done for this purpose. It is well established by now that exchange rates which reflect the relative prices of internationally traded goods tend to understate the real income of LDCs by a factor which is systematically (and inversely) related to the country's GDP per capita. This factor has been measured as the "exchange rate deviation index" or "Kravis factor" (Kravis, Heston and Summers, 1978; 1982). Two are the reasons for a value of the "exchange rate deviation index" which is different from 1.0: the relationship between prices of tradables and nontradables in the process of development; and the share of tradables and nontradables in the budget as incomes grow.

With respect to the first factor, the general observation is that prices of nontradables (relative to tradables) tend to be cheap in LDCs and they tend to increase as incomes grow. The converse is true for the prices of tradables. This systematic relationship of prices of tradables and nontradables is based on Ricardo's principle. Ricardo observed that the productivity-differential gap between rich and poor countries is smaller in the nontradable sector (e.g. haircuts) than in the tradable sector (e.g. manufacturing). In the tradable sector the "law of one price" holds which tends to equalize prices of tradable goods among countries (allowing, perhaps, for a constant band representing transportation costs, tariffs and subsidies). Given equal prices of tradables in DCs and LDCs, wages will be high in countries that have high productivity in tradables, the DCs; they will be low in countries that have low productivity in tradables, the LDCs. More precisely, and as a result of the operation of the "law of one price," the ratio of wages in the tradable sector between DCs and LDCs tends to be proportional to the ratio of their respective average productivities.[3]

The "law of one price" does not operate in the nontradable sector. Yet relative wages there are still influenced by labor productivity in tradables, for DCs and LDCs alike. The low tradable wages in LDCs carry over to the nontradable sector, despite the fact that the LDC productivity there is not so low. (Note that this is a heretical statement that turns conventional wisdom on its head. It implies that the free trade link may be the cause of *low*, rather than high, wages in LDCs.) Correspondingly, the high wages in the tradable sector in DCs carry over to the nontradable sector also, despite the low (close to LDC) productivity these countries have in nontradables. Not only then is the ratio of

[3]More precisely, it is equal to the respective average productivities of labor normalized by a constant proportionality factor. Consider a Cobb-Douglas production function where Q is output, L is labor, W is the wage rate, P is the price of output, the superscripts denote, respectively, DCs or LDCs, and a and b are the respective labor coefficients for DCs and LDCs. The marginal productivity condition is written $PaY^D = W^D$ (and correspondingly for the LDC) where Y is defined as the average product of labor, Q/L. Since $P^D = P^L$, according to the law of one price, the ratio of average productivities is written $1(Y^D/Y^L) = (W^D/W^L)(b/a)$. The greater Y^D and/or the greater a is, the higher W^D relative to W^L. In other words, in the DC tradable sector the general level of wages is pulled up by the greater weight of capital- and technology-intensive, high productivity (and high a) industries. On the other hand, given low productivity in the LDC tradable sector, wages are also low in that sector.

DC to LDC wages in nontradables greater than one, but it also follows from Ricardo's Principle that the higher wages in the nontradable sector in the high-tradable productivity countries (DCs) cannot be fully offset by greater nontradable-productivity advantage. They must therefore lead to higher prices of non-tradables in DCs as compared to LDCs.[4]

Moreover, assuming a non-increasing differential in DCs and LDCs in nontradable productivities, the prices of nontradables and the associated wages in the nontradable sector will be increasing faster in the developed than in the developing countries.[5]

Given the systematic relationship between prices of tradables and nontradables at different levels of income, the share of tradables and nontradables in the budget (and GDP) as incomes grow is determined by the Gerschenkron effect. It states that demand tends to adjust to a country's factor proportions: nontradables being relatively cheap in LDCs tend to assume high weight in the budget and the converse for the DCs where tradables tend to be consumed in greater proportions.

The "Kravis factor" has been derived empirically by studying prices and purchasing power parity in a large number of countries. It purports to measure the bias that enters international comparisons as a result of the application of Ricardo's principle and of the Gerschenkron effect. Its application results in a conversion to PPP dollars that favors the lower incomes more than it does the higher incomes. Its value for the countries in the sample is given in Table 2.

II. Data and Limitations

Income distributions for LDCs are almost always based on HIES data, although for a number of DCs, besides HIES data, information from other sources, such as census samples or tax records, has recently become available.[6] In our case, given the interest in LDCs plus the ultimate objective of matching distributions of real income with observed consumption patterns from a cross-country sample, HIES became the exclusive source.[7]

A large number of HIES were scrutinized to make sure they represent as closely as possible a sample of the country's national population, as opposed to urban only, rural and so on.[8] The description of the surveys appears in Table 3.

[4]With notation of the previous footnote but small letters and primes to indicate nontradables, we write $(p^D/p^L)/(y^D/y^L) = (w^D/w^L)(b'/a')$. Since $w^D/w^L > 1$ and, because of the inability of DCs to fully offset the higher wages in their nontradable sector by greater nontradable-productivity advantage, $d(y^D/y^L)/dt \leq 0$ and $d(a'/b')/dt \leq 0$; it then follows that $p^D/p^L > 1$, i.e. the higher wages in DCs must lead to higher prices of nontradables, as compared to LDCs.

[5]With the notation of the previous footnotes, this implies: $d(w^D/w^L)/dt > 1$ and $d(p^D/p^L)/dt > 1$, both conditional on y^D/y^L.

[6]For example, the Luxembourg income study has so far provided non-HIES data sets for ten DCs for years ranging from 1979 to 1982. See Buhman *et al.* (1988).

[7]See section V.

[8]This is more limiting a consideration than it sounds, since "income distributions" commonly originate from a grab-bag of data. The HIES of about 50 countries were examined in order to yield the 14 which were deemed "representative" and "acceptable."

TABLE 2

COUNTRY POPULATION AND INCOME DATA, 1980

Country	Population (million)	Per Capita Income		K-factor
		U.S.$	PPP$	
LDCs				
Bangladesh	88.7	144	535.7	3.72
India	663.6	245	681.1	2.78
Sri Lankka	14.2	273	802.6	2.94
Pakistan	82.6	291	710.0	2.44
Indonesia	146.4	495	801.9	1.62
Philippines	48.1	732	1,464.0	2.00
Brazil	121.3	2,059	2,985.6	1.45
Mexico	69.4	2,685	4,269.2	1.59
S. Korea	38.1	1,634	2,859.5	1.75
Global LDC	1,272.4			
DCs				
Ireland	3.4	4,880	4,636.0	0.95
United Kingdom	55.9	7,212	5,769.6	0.80
France	53.9	12,163	9,487.1	0.78
Japan	116.8	9,890	8,565.4	0.86
United States	227.7	11,556	11,556.0	1.00
Global DC	457.7			
Total	1,730.1			

All data were expressed uniformly on a per capita basis and for a 12-month period.[9]

Of the 14 countries included in the "world" distribution of income, 9 are LDCs, with a total of 1.3 billion population and 5 DCs with population of 0.5 billion. This is obviously a "small world," and expansion of the sample with other populous countries is desirable. The 1980 population for each country and its per capita income, in dollars, PPP and U.S. is given in Table 2. The K-factor employed for converting the latter to the former is also given.

The limitations of the data used for constructing income distributions are well known (Ahluwalia, 1974, pp. 4-6). The most suitable concept of income for economic analysis is permanent income which is the annualized concept of an appropriate stock of wealth over a specified period (a lifetime). Permanent income does not exactly correspond with the flow concept of annual income, let alone with the snapshot of income captured over a shorter period in most surveys which is appropriately blown-up to one year. Moreover, surveys cover only money income, failing to adjust for the incidence of tax and transfer payments. The question of whether income or expenditure is the better proxy for permanent income arises often. It is likely that the former is closer to permanent income for the higher income groups, while expenditure is more satisfactory for the lower

[9]Our approach of expressing family income per person, although better than the traditional alternative of dealing with family disposable income without adjusting for size, still ignores economies of scale in the production and consumption of household goods and services. For an attempt to account for such effects by devising equivalence scales see Buhman *et al.* (1988).

incomes. Where there was a choice, it was made after considering the probable magnitude of the two biases. To the extent that these problems exist, they are shared with all other income distribution studies.

Assuming away problems relating to the accuracy of the HIES data, the accuracy of estimating the distribution of income in the population from such sample surveys has always been a nagging concern of investigators. While it is widely acknowledged that the Kakwani and Podder method is the most appropriate for estimating the underlying distribution, it has been used in the literature only for illustrative purposes. Our results probably reflect the improved technique. A more serious, and inevitable, problem arises with the conformability of the various estimated distributions of income in the process of transposing them to the base-year 1980. Since, as shown in Table 3, the various national surveys range

TABLE 3

DESCRIPTION OF HOUSEHOLD INCOME AND EXPENDITURE SURVEYS

Country	Year of Survey	Number of Classes	Income/ Expenditure	Unit	Time
LDCs					
Bangladesh	1973-74	13	I	Household	Month
India	1973-74	14	E	Individual	Month
Sri Lanka	1981-82	11	I	Household	Month
Pakistan	1979	34	I	Individual	Month
Indonesia	1981	11	E	Household	Month
Philippines	1985	9	I	Family	Year
Brazil	1974	9	E	Household	Year
Mexico	1977	13	I	Household	Week
S. Korea	1983	15	E	Household	Month
DCs					
Ireland	1980	13	I	Household	Year
United Kingdom	1983	16	I	Household	Year
France	1978-79	7	I	Consumption Unit	Year
Japan	1981	18	I	Household	Month
United States	1972-73	12	I	Household	Year

from the early 1970s (U.S.) to the mid-1980s (Philippines), we have to make the assumption that the respective Lorenz curves fitted to these data remain invariant to the base-year. The farther away a national survey is from the base-year, the more tenuous this assumption becomes. In practice it amounts to shifting the mean of the distribution to represent the changes in per capita incomes in the years intervening between each survey and 1980, without changing the other parameters of the Lorenz curve. The result is a proportional shift in all incomes upward (downward) and an increase (decrease) in the density of the higher (lower) income groups as long as per capita incomes have been increasing (decreasing). Although certainly a strong assumption, it is routinely employed in the literature. Whether development operates in such a "neutral" fashion or is instead "biased" in favor of certain income groups is an empirical question which has been commonly treated in an aprioristic fashion.

Finally, in going from money income to real income, the appropriate 1980 national PPP deflator (K-factor) has been used (Summers and Heston, 1984).[10] Socio-economic group-specific deflators would have been more appropriate given the wide variation of prices facing different consumers. Although PPP adjustment is not formally carried out at the within-country level, this problem is less serious in our study.[11] The K-factor for each country has been derived by using quality-adjusted prices. To the extent that lower-income classes consume lower-quality goods, the PPP adjustment may still underestimate their real basket. The effect of this bias may partly offset the bias involved in the distribution-invariance assumption discussed above.

In conclusion, some of the limitations of data and method in this study are shared with extant studies of income distribution. Some improvements in method have been introduced. No specific additional cost of extending the study to between-country distributions seems to arise.

III. National Distributions

Relative Within-Country Inequality

The conventional approach to income distribution focuses on relative within-country inequality. In Table 4, two standard inequality indexes are presented, shares of population quintiles in income and Gini coefficients. At this level of analysis our approach contributes only the improved estimation techniques and the recent data. The conversion to PPP$ is immaterial, since no income-group specific Kravis factors are available.

The within-country distributions emerging with the recent data of this study are comparable with parallel studies based on earlier data. Two measures of inequality are presented in Table 5, share distribution and Gini coefficient, estimated from the two standard sets of national data, Paukert (1973), representative of the period of the 1950s and Jain (1975), representing the period of the 1970s. The share distributions obtained by Ahluwalia (1976) and those estimated by Ahluwalia and Carter (1979) which are based on the Jain data are also given. The findings of this study (Table 4) are dramatically different from the conclusions in the literature reached thus far (Table 5). In no country was the share of the lowest 40 percent of the population less than 12 percent of the income. Four of the countries in our sample, Philippines, Brazil, Mexico, and France, had fallen in this category according to the Ahluwalia data and were characterized as cases of "high inequality" (Ahluwalia, 1974). Brazil and Mexico had graduated to "moderate inequality" (share of lowest two quintiles of the population between

[10]In the interim the results of Phase IV of the ICP became available, reported in Kravis and Heston (1988). Besides including 60 "benchmark countries," as opposed to the 34 of Phase III, they also adjust for errors which might have biased the PPP conversion of some incomes in the previous phases. In general, the correction affects mostly African countries and certain countries that have real incomes less than one-fifth those of the U.S. From the countries of our sample only Bangladesh and S. Korea show some difference in their PPP deflators in Phase III and Phase IV (from 23 to 32 and from 53 to 64, respectively); the other countries are unaffected.

[11]Such adjustment would involve using weights for each income group as reported in the HIES and prices as reported in the ICP. The price data exist only for the subset of countries in our sample which happen to be "benchmark countries" in the ICP.

TABLE 4

MEASURES OF RELATIVE WITHIN-COUNTRY INEQUALITY

Country	Gini Coefficient	Percentage Income by Population Groups			
		Lowest 40%	Third Quintile	Fourth Quintile	Fifth Quintile
Bangladesh	0.216	27	18	22	33
India	0.357	21	15	20	44
Sri Lanka	0.213	13	9	12	66
Pakistan	0.347	21	15	21	43
Indonesia	0.342	20	16	20	44
Philippines	0.368	19	14	17	51
Brazil	0.361	14	11	20	55
Mexico	0.458	13	13	24	50
S. Korea	0.346	23	16	23	38
Global LDCs	0.501	15	17	27	41
Ireland	0.224	29	17	21	33
U.K.	0.149	30	20	22	28
France	0.306	21	18	23	38
Japan	0.411	16	17	24	43
United States	0.389	16	16	24	44
Global DCs	0.428	17	16	22	45

12 percent and 17 percent) thus joining Japan; and the three countries had been joined in this group by Sri Lanka[12] and the United States, both previously classified in the low-inequality group. The remaining countries had a share of the two lowest deciles of 17 percent of income or above and had "low inequality."

The Gini coefficients of within-country inequality in Tables 4 and 5 describe the entire distribution and as a result they present a more complete, and often different, picture from that conveyed by quintile shares in income. The example of Sri Lanka, which had the highest inequality among LDCs with the quintile measure and had the lowest Gini (along with Bangladesh, which had also the lowest quintile inequality) illustrates the case.[13] The general observation is that Gini coefficients are lower with the more recent data, as compared to earlier

[12]The case of Sri Lanka is an interesting example of inevitable biases that may intervene in the collection of HIES data. The 1969 data showed extremely low inequality and made Sri Lanka a celebrated success case in distribution—with the trade-off in growth (Sen, 1981; 1987). This has been vehemently contested recently (Glewwe, 1986; Bhalla and Glewwe, 1986). One factor that must have affected both the 1969 and the 1981 data was the understatement of income through the failure of HIES studies to fully account for taxes and subsidies. However, the understatement might have not affected differentially the different economic groups in 1969 when subsidies and in-kind transfers were general. Since the economic liberalization and the structural adjustment policies were introduced in 1977, subsidies have become means-tested in an attempt to target them to the poor. If successful, this policy must have increased the understatement of incomes in the lower groups only, thus increasing measured inequality. Moreover, since 1979 the eligibility for rationed rice, one of the most important subsidies, was restricted to households whose income fell below Rs 300 per month (equivalent to PPP$ 130 per capita per year). This might have led to wide under-reporting of all incomes by households attempting to protect their rice ration. The very narrow distribution of income in Sri Lanka around a peak of about PPP$ 160 (statistics in Table 1) may well reflect such generalized under-reporting.

[13]The low Gini value of Sri Lanka and Bangladesh reflects to a certain extent the sensitivity of the index to inequality changes around the median income, as opposed to those at the low (Atkinson) and high (Theil) ranges of income (Atkinson, 1970; Sen, 1973).

TABLE 5

COMPARISON OF MEASURES OF RELATIVE WITHIN-COUNTRY INEQUALITY, GINI COEFFICIENTS AND SHARES OF LOWEST 40 PERCENT OF POPULATION

	Paukert (1973)			Jain (1975)			Ahluwalia (1976)		Ahluwalia and Carter (1979)	
Country[a]	Year	Share	Gini	Year	Share	Gini	Year	Share	Year[b]	Share
India	1956-57	20.0	0.33	1967-68	13.1	0.48	1963-64	16.0	1975	17.0
Sri Lanka	1963	13.7	0.44	1969-70	17.8	0.38	1969-70	17.0	1975	19.3
Pakistan	1963-64	17.5	0.37	1970-71	20.6	0.33	1963-64	17.5	1975	16.5
Philippines	1961	12.7	0.48	1971	11.9	0.49	1965	11.8	1975	11.6
Brazil	1960	12.5	0.54	1970	9.2	0.57	1970	10.0	1975	9.1
Mexico	1963	10.1	0.53	1969	10.2	0.58	1969	10.5	1975	8.2
S. Korea	1963	23.0	0.26	1971	23.7	0.27	1970	18.0	1975	16.9
U.K.	1964	15.3	0.38	1968	18.5	0.34	1968	18.8		
France	1962	9.5	0.50	1962	10.0	0.52	1962	9.5		
Japan	1962	15.3	0.39	1971	14.8	0.42	1968	15.9		
U.S.	1969	17.9	0.34	1972	14.1	0.42	1970	19.7		

Sources:

Ahluwalia, Montek S., Inequality, Poverty and Development, *Journal of Development Economics*, 3, December 1976, pp. 307-342.

Ahluwalia, Montek S. and Carter N.G., Growth and Poverty in Developing Countries, in Chenery, H. B., *Structural Change and Development Policy*, pp. 456-495, Oxford University Press, New York, 1979.

Jain, Shail, *Size Distribution of Income: A Compilation of Data*, The World Bank, Washington, D.C., 1975.

Paukert, Felix, Income Distribution at Different Levels of Development: A Survey of Evidence, *International Labor Review*, 108, August-September 1973, pp. 97-125.

[a]Bangladesh, Indonesia and Ireland are not included in the other studies.

[b]Estimates for 1975 are based on extrapolation from the year of the survey.

studies. The only countries in our sample that do not have clearly lower Ginis (inequality) are South Korea, Japan and the United States.

The general picture that emerges from the within-country distributions is an overall improvement, with a few notable exceptions of deteriorating income distribution. The marked deterioration in the distribution shown by the Gini coefficient in Korea (and perhaps the United States) comes as a surprise. If it holds under further scrutiny for DCs or upper-middle-income LDCs, the famous Kuznets U-curve of income distribution may have to be reexamined. On the other hand, the improvement for the majority of countries is not entirely unexpected and it is in keeping with the trend observed in the World Bank estimates which have been gradually increasing the income share of the lowest classes in LDCs in their periodic revisions (World Bank, 1987, and previous years). This improvement, where it occurred, may have been the result of the vigorous rates of growth most LDCs experienced in the decade starting in the late 1960s; and/or it might have followed the increased political awareness of the problem that came with the international politicization of poverty. However, how much of the improvement in distribution is real as opposed to a statistical artifact, is also a legitimate question, since increased awareness of distribution might have led to better data-collection techniques and fewer measurement errors.[14] When the improvement in distribution is judged by reference to Gini coefficients, the effect of the increased efficiency of estimation between the previous studies and the present one is testable.[15] The hypothesis that the decrease in the size of the Gini is generally due to the estimating procedure was rejected in almost all cases.[16]

IV. World Class Comparisons

Relative Two-World Inequality

The drawback of the Gini, along with any other measure of inequality, is that its value is not independent of the level of aggregation. The novel aspect of our approach is that by converting incomes to homogeneous PPP$ units we can construct different levels of aggregation and measure inequality within that new framework. In Figure 1, the same income axis is plotted, but different population coordinates represent the global distribution of income for the LDCs and that for the DCs. The modal values of the two distributions clearly suggest that we are examining two worlds with relatively small regions of continuity between them. This is an insight which is not clearly conveyed by ranking the countries in terms of per capita incomes, an exercise that assumes a continuum between the two worlds.[17]

Following that insight we estimate the Gini coefficients for the two global populations separately, LDCs and DCs. The resulting inequality index is higher

[14]The ten years difference between the Ahluwalia data (mostly from the 1960s) and the data of the present study may account for better data-collection techniques in the most recent surveys.

[15]The result of increasing efficiency in estimation through the method used is raising the mean for the lower quintiles and correspondingly lowering it for the higher, reflecting the underlying log-normal distribution.

[16]The reestimation of the Gini coefficients based on the Jain data with the two-equation approach of this study yielded slightly different results from those in Table 5 only for Sri Lanka (0.36) and Brazil (0.60). In other cases the results are largely the same.

[17]E.g. Grosh and Nafziger (1986).

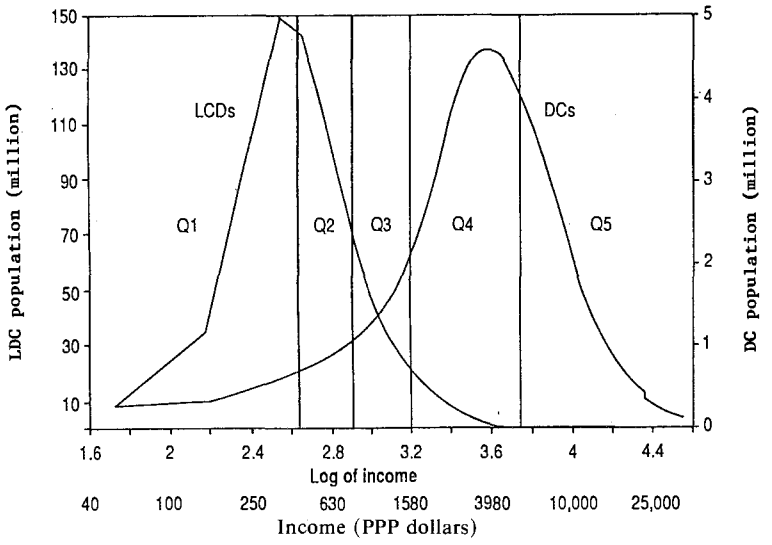

Figure 1. Global Income Distribution: DCs and LDCs

than all the within-country inequality indexes estimated for either country group. One may be inclined to dismiss this result as simply a fluke of aggregation. For those who assign political life in national aggregates the message may be different. If inequality, e.g. in the EEC increased after the enlargement with LDC partners, it may be that the perception of inequality has also increased, which could lead to strengthening countervailing political pressures. Is "fragmentation" (whether in markets or in politics) a form of pressure-release valve?

The Affluent Class and the Well-Off

By expressing local currencies in comparable PPP units any population group, at any level of aggregation, can be referenced with respect to an absolute level of income. A specific band of income that deserves further comment is that between PPP$ 1,600 to 5,300, or the fourth quintile of the world's population, where the tail of the LDC distribution penetrates into the upper income levels of the DC global distribution (Figure 1). This region represents the "affluent" in the world distribution of income, as opposed to the "rich." It is further highlighted in Table 6 and Figure 2.

A total of 350 million people of the world's population, 220 from LDCs, and 130 from DCs, belong in the affluent group (defined arbitrarily as 20 percent of the world population). The surprise in the data is the broad participation of some middle-income LDCs in this group: South Korea, Mexico, and Brazil have more than one-half of their populations in the affluent class, followed by the Philippines and Indonesia with one-fifth to one-third of their population represented. Such rates of participation in affluence are not much different from those of the DCs.[18]

[18]The statement is not meant to infer that the balance of the DC population is in the "poor" category. From Figure 1, it is more likely to be in the "rich." Ireland is a case in point, with 74 percent of its population in the affluent group—and small percentage in the rich, because of its lower per capita income as compared to other DCs.

TABLE 6

THE NATIONAL COMPOSITION OF THE "AFFLUENT" AND THE "WELL-OFF" IN THE WORLD DISTRIBUTION OF INCOME, 1980

Country	Affluent[a]			Well-Off[b]		
	Number (million)	Percent of Country Population	Percent of Total in the Group	Number (million)	Percent of Country Population	Percent of Total in the Group
LDCs						
Bangladesh	0.45	0.51	0.13	3.16	3.56	0.75
India	37.87	5.71	10.69	107.12	16.14	25.48
Sri Lanka	0.00	0.00	0.00	0.00	0.00	0.00
Pakistan	5.24	6.34	1.48	14.66	17.75	3.49
Indonesia	32.42	22.14	9.15	65.82	44.96	15.66
Philippines	14.52	30.19	4.10	26.46	55.00	16.30
Brazil	72.54	59.80	20.47	106.55	87.84	25.35
Mexico	34.93	50.33	9.86	61.58	88.73	14.65
S. Korea	24.74	64.93	6.98	34.98	91.81	8.32
Global LDCs	222.71	17.50	62.86	420.33	33.03	100.00
DCs						
Ireland	2.53	74.41	0.71			
U.K.	24.94	44.62	7.04			
France	13.26	24.60	3.74			
Japan	37.64	32.23	10.62			
U.S.	53.21	23.37	15.02			
Global DCs	131.58	28.75	37.14			
Total	354.29	20.48	100.00			

[a]Affluent was defined as the population in the fourth quintile of the world distribution, with incomes in the range of PPP$ 1,600 to $5,300.

[b]Well-off was defined as the population with incomes above PPP$ 1,000.

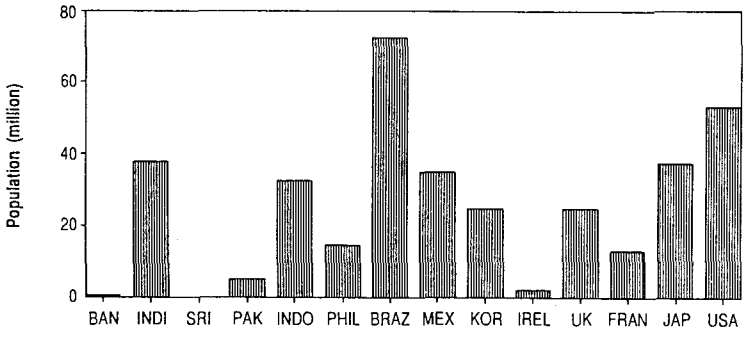

Figure 2. Composition of the Fourth Quintile ("World" Distribution)

This in fact is a startling conclusion. Despite the two-world distribution of income, in terms of means and variances, the elites in most LDCs enjoy comfortable DC middle-class standards of living.

As opposed to the affluent, the middle-class (well-off) can be defined, again arbitrarily, with an income threshold of PPP$ 1,000. Table 6 indicates that 33 percent of the total LDC population enjoy incomes above that threshold. Not surprisingly, the middle-income LDCs that participated heavily in the world

affluent category have even larger shares of those populations that have crossed a "well-off" threshold which represents about 2.5 times the poverty level, to be discussed presently.

The Measurement of Poverty

The measurement of absolute poverty across countries has always been an elusive goal. Having established homogeneous PPP incomes, we can proceed to measure the numbers of people who fall below a standard income that provides "non-poverty" subsistence; or above a standard income that provides "middle-class" (or well-off) subsistence. At this stage of analysis we set these standards arbitrarily by definition. As we will note later, however, there is nothing that precludes drawing the cut-off points by observation.

For purposes of comparison we reference the cut-off point of poverty to two parallel studies with earlier data. Ahluwalia (1974) defined poverty as the population falling below the income line of U.S.$ 75 (1971 values). This figure, adjusted to 1980 values and for purchasing power is equivalent to PPP$ 355, which becomes our threshold of poverty. Ahluwalia and Carter (1979) adopted the income level of the 45th percentile of the 1975 Indian income distribution as the poverty cut-off point on the assumption that it corresponds to consumption expenditure which enables a daily supply of 2,150 calories per person—presumably an adequate nutrition level. Expressed in purchasing-power equivalent, the Indian standard is approximately PPP$ 200 (1970 prices) and it is adopted for estimating the population in poverty in 1975.

In Table 7 the poor in LDCs are calculated at 236 million, or 18.5 percent of the total LDC population. In the previous study (Ahluwalia, 1974) the poor in the eight countries that overlap our sample (excluding Indonesia) represented 55 percent of these countries' population. This is a dramatic difference. What is constant, however, is India's paramount position in poverty. Based on 1969 data India accounted for 76 percent of the total world's poor, the same share shown in Table 7. However, while in Ahluwalia's study 67 percent of the Indian population was classified as poor, our data accounts for only 27 percent. By using unadjusted per capita incomes, the study gave too much emphasis to a poverty superstar while dimming the importance of broadly-spread poverty. This is confirmed by comparison with the later Ahluwalia and Carter (1979) study.

The question arises, how seriously can one take the headcount of the poor? Obviously the absolute number depends on the definition of the poverty line. The U.S. $75 (1970) cut-off point was chosen not out of conviction that it is the right number, but because it makes comparison with the World Bank estimates of the late 1960s possible.

The plausibility of the absolute count of the poor can be defended by considering the anatomy of a few extreme examples. Sri Lanka seems to have an unexpectedly high poverty level with 51 percent of its population in that group. Odd as it appears, this is not independent of the high relative income equality in the country. Had the distribution been more skewed, the headcount of the poor would probably have been smaller. Errors in measurement may also explain Sri Lanka's performance. The country relies heavily on health and welfare

TABLE 7

THE NATIONAL COMPOSITION OF THE POOR IN THE LDC GLOBAL DISTRIBUTION, 1980

Country	Below U.S. $75[a] (1969)		Below PPP$ 200[b] (1975)		Below PPP$ 355[c] (1980)		
	Number of Poor (million)	Percent of Country Population	Number of Poor (million)	Percent of Country Population	Number of Poor (million)	Percent of Country Population	Percent of Total
Bangladesh	—	—	51.60	64.00	19.43	21.91	8.25
India	359.30	66.90	275.50	46.00	181.35	27.33	76.97
Sri Lanka	7.80	65.30	2.00	14.00	7.56	53.24	3.21
Pakistan	64.70	57.90	31.40	43.00	19.40	23.49	8.23
Indonesia	—	—	76.70	59.00	5.58	3.81	2.37
Philippines	11.20	30.00	14.00	33.00	1.74	3.62	0.74
Brazil	18.20	20.00	16.00	15.00	0.36	0.30	0.15
Mexico	8.70	17.80	8.30	14.00	0.02	0.03	0.01
S. Korea	2.30	17.00	2.80	8.00	0.15	0.39	0.06
Global LDC	472.20	55.50	478.30	42.00	235.60	18.52	100.00

Sources:

Ahluwalia, Montek S., Income Inequality: Some Dimensions of the Problem, in Chenery, H. B. *et al.* (ed.), pp. 3–37, *Redistribution with Growth*, Oxford University Press, Oxford, 1974.

Ahluwalia, Montek S. and Carter, N. G., Growth and Poverty in Developing Countries, in Chenery, H. B., pp. 456–495, *Structural Change and Development Policy*, Oxford University Press, New York, 1979.

[a]The cut-off point for poverty was defined by Ahluwalia (1974) as U.S. $75 in 1971 prices.

[b]The cut-off point of PPP$ 200 (in 1970 prices) was adopted by Ahluwalia and Carter (1979) as representing an adequate nutrition level based on Indian data.

[c]The cut-off point of PPP $355 represents adjustment of the Ahluwalia (1974) benchmark of $75. It was arrived at by using the mean PPP conversion ratio for LDCs = (0.4) and expressing 1970 dollars in 1980 terms.

instruments for poverty alleviation. Such types of subsidies are usually not captured in HIES. Finally, it is likely that the number of the poor has increased since 1979 when the main instrument for poverty alleviation, the food ration guarantee, was eliminated. The 1983 data may well reflect that change.

Is it plausible that the number of poor in Bangladesh and in Pakistan is the same, 19.4 million? Bangladesh in this case may have been the beneficiary of a statistical artifact. The HIES data refer to 1973–74 (as opposed to 1979 for Pakistan). By the 1980 base-year the country had grown at an average of 5 percent per year. On the assumption that the distribution remained invariant to the change in the mean, the whole distribution shifted to the right with the survey-year number of the poor declining by 5 percent annually. It is therefore important to obtain reliable HIES data at close reference points, and it is also important to determine empirically the exact relationship between GNP growth and the change in the parameters of the distribution. Panel data on HIES are necessary for this purpose.

Leaving aside the exact count of the poor, the comparison with the previous studies in Table 7 leads to the inevitable conclusion that poverty in LDCs must have declined. The differences among the three studies reported in the table are substantial. In part they are due to the underlying national data and the distributions fitted. First, Ahluwalia relies on the Jain data of the 1960s, and presumably so does, at least partly, Ahluwalia and Carter (although the data used are not explicitly mentioned), while we rely on more recent data. Real changes have occurred in the interim which probably worked in the direction of decreasing absolute poverty levels. Second, as stated earlier, assuming invariance in the underlying income distribution and applying it to the per capita income at a later date results in shifting populations to the right (left) of that income level at the same rate that per capita incomes grew (declined) in the period. In our case, the estimates of Bangladesh, India and Brazil are likely to have been biased downward as based on distributions which are relatively more distant from the 1980 income point of reference. Depending on the data used, the previous studies also suffer from this problem to a varying degree. Third, and most importantly, the distribution of income is less equal if estimated on a household basis and more if computed on a per person basis.[19] Since the per person distribution is more appropriate, our study converted the household data first by applying the household size in each cell. The previous studies, however, seem to have been based on household distributions and therefore are likely to yield higher measures of inequality and greater numbers in poverty.

V. Conclusion and Extensions

In this paper we trod some common ground with the conventional literature on income distribution by first estimating measures of within-country relative inequality using HIES grouped data. The contribution at this level has been the use of improved statistical methods that utilize all the information available in grouped data to estimate the parameters of the underlying population distribution.

[19]See comparisons in Jain (1974).

Next, the distributions estimated were fitted on the 1980 per capita incomes of 14 countries after they were converted to PPP dollars. The resulting national PPP distributions were then aggregated to produce global income distributions for DCs and LDCs. These global distributions were used to carry out cross-country comparisons of inequality, as well as to measure the density of the distribution and the number of people at any arbitrary cut-off point of income.

Our estimates have substantially reduced the numbers of those in poverty, as compared to the estimates with data from the 1960s. Part of the improvement is due to the factors mentioned earlier—data, techniques or trickling-down. The biggest component, however, is probably due to the adjustment for purchasing power which favors the lower-income countries. Had purchasing power adjusted also for socio-economic-class-specific prices, the improvement would have been greater.

The estimates of the "affluent" population in the world distribution of income and of those who are above a cut-off point for the "well-off" cannot be readily compared to earlier estimates.[20] Still they must come as a surprise. The LDCs in our sample contributed 220 million population to the DCs 130 million population to constitute the "affluent" group in the world's income distribution (PPP$ 1,600 to 5,300). Moreover, 33 percent of the LDC population have crossed a "middle-class threshold" of PPP$ 1,000, to be considered among the "well-off." One may debate whether economic development homogenizes the population of Worlds One-to-Three. All the same, it certainly homogenizes the Third World elites—to the standard of living of their peers in the First World.

One might be tempted to conclude that the decrease in poverty should be the end of the story and whether income distribution in the process improves or deteriorates is immaterial. In effect the answer depends on the role that socio-economic classes play in the process of development. Is the fact, e.g. that Brazil, Mexico and Korea have over 50 percent of their population in the "affluent" group uniformly good or bad for economic development? The "tricklers-down" would tend to believe the former. The structuralists, on the other hand, would be inclined to argue that affluence goes along with increased power to expropriate the rents of economic development for the benefit of a certain class, which makes overall development more difficult. Is this, however, as likely to happen in Korea, as it is in Brazil? The answer evolves around the way in which socio-economic classes interact one with another, in other words, whether a society is articulated or disarticulated. The relation between socioeconomic classes and the degree of articulation of a development process can be formulated as a testable hypothesis.

The class structure of a country is arguably an important variable in determining the process of development. That it has not been rigorously defined is probably related to the fact that its role has been largely ignored. Instead, distinctions between countries (colonialism, imperialism, etc.) have attracted major attention as the causes of underdevelopment. It is conceivable that if the role of the upper socioeconomic classes is more closely examined, the answer to underdevelopment might be: "We have faced the enemy and it is us!"

[20]Keyfitz (1976) has estimated the size of the world's middle-income class by using as a criterion automobile ownership across countries.

If class structure is really important we cannot afford to measure it by arbitrary definition. If a class is a real construct, it should have some observable characteristics which make its role in economic development amenable to testing. The next stage of this research is to consider objective criteria that define the cut-off points (and the world socio-economic classes) with certain universal applicability. The regularities observed in consumption behavior, when mapped onto the distributions of income, may provide such objective reference points for measurement (Yotopoulos, 1985).

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