

THE WORLDWIDE INCOME DISTRIBUTION: SOME SPECULATIVE CALCULATIONS*

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This paper uses a variety of assumptions to produce calculations of worldwide income distributions from recent international data compilations. The variable quality of the source materials in these compilations along with the arbitrariness in the assumptions required are emphasized. A number of working hypotheses for the worldwide income distribution are offered until data and methods improve. It is suggested the top 1 percent of world population may receive 10–15 percent of world income, the top 10 percent from 45–65 percent, and the bottom 20 percent from 1–4 percent. These figures seem more unequal than those for domestic distributions even for more inegalitarian countries.

I. INTRODUCTION

In spite of the current concern over differences in living standards between rich and poor countries, we have only a limited sense of the complete worldwide distribution of income. Some estimates of the size distribution of incomes *per capita* across countries have been made,¹ but the critical additional feature of inequality within countries has not been taken into account even though international compilations of income distribution statistics are now available. It can be claimed, with considerable justification, that there is no reliable statistical information for such a calculation, and guesswork is misleading in that it proves figures which will not be used with the extreme caution required. This pessimism may be warranted, but given the current international climate some form of guess at the worldwide income distribution does not, at least to the author, seem wholly out of place provided that sufficient warnings of data deficiencies are given en route.²

This paper therefore seeks to determine some possible implications of recent international data compilations for overall worldwide inequality in the income

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¹Both Musgrave [12] and Andic and Peacock [2] have presented estimates of size distributions of *per capita* incomes between countries, the latter estimates being reported by Atkinson in a chapter on world income distribution in his recent book [3].

²The dilemma posed by the use to be made of available economic statistics could hardly be put more clearly than in the present case. The basic data are potentially very unreliable, and the manipulations may further distort whatever "reliability" there is. Nevertheless, the importance of the issues addressed seems sufficient, to the author at least, to justify the enquiry, especially if the present calculations are a factor in better data eventually becoming available. The attempt is solely to get as close a statement as possible of what (to use a phrase of D. H. Robertson's) one might term the "alleged facts".

distribution. The data are sufficiently limited, and the difficulties in using it so obvious that even the word "speculation" may be a generous description of the calculations. The philosophy is that (i) if we assemble international data comparisons the marginal cost of crudely appraising their aggregate implications is relatively small and these implications are often part of the motivation of the compilation and are thus worth exploring and (ii) there are issues of sufficient interest that the compromises involved in aggregate estimates, while clearly troublesome, should not necessarily prevent the attempt. There are undoubtedly many people who will find the methods used so unsatisfactory as to reject all the calculations reported as virtually worthless. There can be little quarrel with such a view as the appraisal of the value of such calculations must remain entirely subjective; no meaningful statistical test of confidence seems to make any sense in circumstances such as those of the present paper. Rejection of the calculations may indeed be the appropriate course but the hope is that in the process both improved calculations will appear and the current perception of distributional issues will extend a little beyond national boundaries into the international arena where inequality seems to be of a wholly different character.

Recently constructed data sets containing cross-country distributional statistics provide the basic material for the paper. Similar compilations have been used by Paukert [12] in his analysis of income distribution and growth; and a similar philosophy of utilizing currently available distributional data, even with the difficulties of differences in coverage and ambiguities of definition, underlies the paper. A number of data compromises are made in an attempt to produce a size distribution of worldwide incomes which takes into account (albeit somewhat limited) information on distributions within as well as across countries.

The procedures used combine the latest and most complete set of private sector income distribution statistics³ by country compiled by Jain [5, 6] with GNP *per capita* figures reported in the 1974 World Bank Atlas [17] for the year 1972.⁴ A difficulty, which is not easy to correct for, is that many of the size distributions reported by Jain refer to household or family units rather than individuals. If inequality measured on a household basis is less than on an individual basis, as is sometimes argued, the use of household distributions in percentile terms in combination with GNP *per capita* and population estimates would tend to underestimate inequality in the total distribution. A further difficulty is the incomplete coverage of countries, and a procedure (clearly contentious) is used of adopting "typical" countries as representative of missing countries. A last point concerns the use of worldwide "dollar" incomes in the World Bank Atlas where currency conversions take place primarily at market exchange rates. Quantitative divergences of market exchange rates from "purchasing power parity" rates for

³Thus the redistributive impacts of the benefits of public sector real expenditures are not taken into account. By using the size distribution of personal incomes to allocate GNP, the implicit assumption is that such real expenditures are distributed proportionately to incomes. There are many further difficulties with these data, not the least of which is that for some of the countries included it is difficult to determine whether the income distribution statistics refer to incomes gross or net of personal taxes.

⁴This year is chosen as being a reasonably recent year closer to that of many of the distributional statistics than the more recent years 1973 and 1974 for which the 1975 and 1976 World Bank Atlases provide information.

less developed economies are known to be large in certain cases, and the probability is that limited welfare significance can be attached to calculations using these figures as providing a distribution of real incomes.⁵ For this reason a final section attempts to construct a crude purchasing power parity basis for the worldwide distributional calculation.

II. THE DATA USED IN THE STUDY

The basic data which underly this study come from two different sources each of which is a compilation of individual country statistics. Data on income distributions by country have been collected by Jain in a World Bank research study [5, 6]. From a wide range of official and academic sources, income distribution statistics have been collected and organized in terms of the shares of income going to various percentiles of the population of each country. In the unpublished version [5] of this study, information is presented for 78 countries for each semi-decile of the population, and in the published version [6] the sample has been extended to 81 countries, although information is only given for decile ranges. Some classifications are available for elements in the data sets; whether the sample is National, Agricultural/Rural, or Non-Agricultural/Urban, whether the reporting unit is the individual or the household, and the year of the survey. No classification is reported on the income concept; Jain comments on the absence of a uniform concept and the vagueness of definition in certain cases and suggests that users of the compilation should consult original sources. Interpolation over ranges is necessary for some of the information used in order to present figures on a comparable basis, and a procedure due to Kakwani and Podder [7] is used. A dominant feature of the compilation, clearly stated by Jain, is the absence of a uniform basis of measurement both for incomes and income recipients; for some countries the exact meaning of concepts used is unclear.⁶ For most countries included in the Jain compilation a choice between alternative income distribution estimates is necessary even with these ambiguities and the procedure followed is to choose samples as close to 1972 as possible, on a national basis if available, and for households. The last preference is accounted for by an attempt to achieve consistency since a uniform individual basis is not possible.

Data on GNP *per capita* come from the 1974 World Bank Atlas [17]. This source presents GNP estimates for the year 1972 in U.S. dollars divided by mid-year population estimates. Quite apart from the reliability of GNP estimates for less developed countries, the interpretation of conversions into U.S. dollars at official exchange rates is an obvious difficulty and this is returned to below. Further difficulties arise for centrally planned economies for which the basic accounting concept is Net Material Product rather than GNP and the difficulties of exchange rate conversions into U.S. dollars for these economies are also well known.

⁵See the work of Usher [14] on purchasing power parity calculations between Thailand and the U.K., and the Kravis, Kenessey, Heston, and Summers study [9] referred to below.

⁶To take an example, in the published version 25 different size distributions are reported for India alone with the share of the bottom 10 percent of income-receiving units varying from 0.8–4.0 percent of income and of the top 10 percent from 24.6–45.8 percent.

There are many reservations which can and should be stated in connection with these basic data. The following are important points to bear in mind for the calculations reported later.

(1) The sample of countries for which income distribution data are available is substantially deficient. Although the sample used covers around 80 countries, it does not include either China or the Soviet Union. Some evidence on the Soviet Union is available in Wiles [16]⁷ but to the author's knowledge no information on China at present exists. The available sample has been used to provide indications of distributional patterns within groups of nations and actual figures for each nation have only been combined where available. For "missing" countries, "typical" countries have been selected as being representative of the internal distributional position. Groupings of countries both on the basis of per capita incomes and on a geographical basis are used for this purpose and the procedures followed are explained below. The size and importance of the "missing" countries (especially China and the Soviet Union) are such that the treatment assumed is important and should not be lost sight of.

(2) National distributional statistics should be interpreted with care and, in cases, substantial scepticism may be in order.⁸ The volume of data and source materials involved in the Jain study make it impossible to check all figures for reasonableness if one is going to use them in the manner adopted here. There are several cases where more than one set of figures are available for a country and substantial differences are evident which cannot be accounted for by some obvious change of basis (such as the family versus the individual as the measure of income recipient) and some judgement on which figures to use has been necessary. As already mentioned one can identify broadly whether figures relate to national, urban, or rural samples, and whether the unit is a household, or an individual; one can also identify the year to which figures relate. One cannot confirm similarities in definition of income (e.g., gross or net of tax and transfers, including or excluding imputed income of various kinds).

These are all matters which can make a substantial difference to the perception of national inequality. There are also further difficulties of tax evasion for taxation based statistics and the low response of high income earners to sample surveys. At the broad sweep of the brush of the present paper, correction for these features for individual country statistics is impossible, and none is attempted here.

(3) Quite apart from the reliability of distributional statistics, GNP figures and even population figures are themselves subject to many well-known problems. For communist countries (including China) GNP figures are obtained for the World Bank Atlas by correcting published estimates of "material product" which by and large exclude service activity.⁹ For less developed economies it is often

⁷The information presented in Wiles [16] has not been combined into the basic data used for reasons given below.

⁸For Sierra Leone, for instance, the reported income share of the bottom 10 percent is 0.0 percent.

⁹The reader is referred to the notes in the World Bank Atlas [17] p. 21 where the adjustments are described. Besides an imputation for the exclusion of services, an allowance for capital consumption is made. There is a further problem of choice of exchange rate for conversion between currency units of centrally planned economies and U.S. dollars. Official exchange rates (of which there may be more than one) are not used for these economies in the World Bank estimates; instead the so-called "physical indicators" approach adopted by the UN Economic Commission for Europe is used.

suggested that a substantial underestimate for the imputed value of the extensive non-market activity of these economies is involved with GNP estimates. Even for advanced market economies there is extensive dependence of national accounting on the tax system and tax evasion in certain countries may substantially affect estimates of national income. Population statistics in some countries may also be unreliable.¹⁰

(4) There are severe and well-known difficulties of interpretation in using GNP figures in national currencies converted into U.S. dollars at "official" exchange rates. In the World Bank Atlas conversions are by and large at current exchange rates which it is known can be quite misleading as indicators of "real" income differences. The bias in such conversions in all probability acts increasingly against lower income countries. Knowledge of "purchasing power parity" rates of exchange is extremely limited and in this paper it has been felt best to provide indications of the differences such corrections might make rather than make "corrected" figures the centrepiece of the calculations. But the differences are substantial¹¹ and must be clearly stated as such.

III. INEQUALITY IN INCOME DISTRIBUTIONS WITHIN AND ACROSS COUNTRIES

From both the compilation of income distribution statistics for individual countries used here and earlier studies,¹² a broad picture emerges¹³ of Gini coefficients of domestic income distributions lying in the range¹⁴ of 0.25–0.60 depending on the country, data source, income and individual concepts used, and

¹⁰Morgenstern [11] p. 40 reports, for instance, that in the published 1950 Census in the U.S., 21 towns in Connecticut of more than 10,000 were entirely missing from the published table for Connecticut. He also reports that in the 1950 Census there were apparently many female widows and divorcees at age 14, and thousands of persons recorded as being in first or second year of elementary school at ages 13–15. As Morgenstern states, these reflect errors of "instruments" (man and machines) but in countries with less sophisticated statistical gathering machinery than the U.S., one would seem justified in doubting the reliability of census information in basic (unprocessed) form which may lead to substantial discrepancies in aggregate. In addition errors may well be quite deliberate. A well known example of likely error is the case quoted by Bauer [4] (and referred to by Atkinson [3]) of an official estimate of the 1963 Nigerian population of 56 million compared to an independent estimate of 37 million. A reason offered for this is that regional representation in the federal legislature at this time depended on population, and the political importance of official population statistics led to an inflation of estimates for individual regions and thus for the whole country.

¹¹See the references given in footnote 1, p. 2.

¹²Such as Adelman and Morris [1], Kuznets [10], the UN Economic Council for Europe [15], and Kravis [8]. Much of this material is summarized by Paukert [13].

¹³Such phraseology suggests, of course, that there is a consensus on the income distribution measure which should be used. This is far from being true. "Traditional" measures of comparisons of points on Lorenz curves, Gini coefficients, and mean to median ratios are used here, but it should be noted that this procedure leaves a considerable body of recent literature on one side.

¹⁴Paukert [13] has suggested that the data indicate increasing inequality over countries in low ranges of *per capita* incomes and a movement towards increased equality after a peak is reached in the range of \$201–\$300 *per capita* income. Paukert uses particular averaging procedures within groups of countries to reach this finding and this may not be substantiated if other averaging procedures and data compilations are used.

other matters.¹⁵ In percentile terms a share of the top 1 percent of income receiving units in the range 4–10 percent is perhaps not unreasonable with a share of the bottom 20 percent of perhaps 3–10 percent; i.e., the shares of the top 1 percent and bottom 20 percent on average across countries may not be dissimilar. Developing and less developed countries (and particularly Latin American countries) do appear to be somewhat more unequal than developed, although there are clearly exceptions to this.

This position within countries can be compared to the distribution of *per capita* dollar incomes across countries assuming all individuals within the country receive the same income. The Gini coefficient reported here for this case is in the range 0.6–0.7. Hence, forgetting for one moment additional inequality within countries, it would appear that the size distribution of *per capita* dollar¹⁶ incomes across countries is probably more unequal than that within most countries. Put another way, if the UN were to be given a choice between the two completely implausible options of (a) leaving relative inequality within countries unchanged and equalizing average incomes across all countries or (b) leaving relative incomes across countries unchanged and equalizing incomes within countries, as a worldwide redistributor they should probably pick the former.

Whether combining the separate domestic inequalities along with inter-country inequality into an overall worldwide distribution of incomes would tend to make things more or less unequal is an issue which, it would seem, cannot be settled on *a priori* grounds. One can, for instance, conceive of the case of two countries whose income distributions are completely equal. When combined into a “world”, an overall situation of inequality results due to the differences in *per capita* income. Equally, one can conceive of two countries, each with Gini coefficients of unity (“complete” inequality) which when combined lead to a situation where the Gini coefficient falls below the value of unity (“incomplete” inequality).

It is, of course, possible that one may be able to hypothesize what might be expected on the basis of some stylized view of the patterns of domestic inequality and the distributions of *per capita* incomes and populations. However, the number of elements involved is such that a numerical approach seems called for. An important feature in interpreting the calculations presented later is the position of

¹⁵An interesting statistic is the comparison between the most equal and most unequal (in terms of the Gini coefficients) of the series reported in Jain. For Peru for a 1961–63 national sample of individuals the reported Gini coefficient is 0.758 while for Pakistan for a rural population sample for 1970–71 the reported Gini coefficient is 0.146. Just what these imply can best be seen by comparing the Lorenz curves

		Percent of Population										
		0–10	10–20	20–30	30–40	40–50	50–60	60–70	70–80	80–90	90–100	Gini
Percent of Income	Peru Sample	1.0	1.2	1.5	2.2	2.9	3.8	5.1	6.9	10.1	65.3	0.758
	Pakistan Sample	7.0	7.6	8.0	8.5	9.0	9.5	10.2	10.9	12.3	17.0	0.146

It should be added that the highest Gini coefficient reported for Pakistan from among 27 samples is 0.443 while the lowest for Peru from among 4 samples is 0.594 so it seems safe to conclude that Pakistan (at least before partition) was more equal than Peru.

¹⁶With conversion into dollar values made at “official” exchange rates.

three large countries in population terms. One as a high *per capita* GNP country (the USA), and the others as low *per capita* GNP countries (India and China) results in a spreading of the tails of the overall distribution compared to a case of domestic inequality ignored. If countries with large populations were concentrated around mean world income with small countries in the tails a reduction in calculated world inequality might be expected from taking account of domestic inequality. Given this is not the case, some additional inequality is to be expected in the worldwide situation by taking into account domestic inequalities, although by how much is unclear.

IV. THE METHODS OF CALCULATION USED

The procedures which have been used to combine individual country income distributions into an overall income distribution fall in two parts. Firstly, for all countries (above a certain size) internal distributional statistics are obtained together with an estimate of *per capita* GNP and mid-year population. This involves choosing "typical" countries whose distributional position has been taken as representative of "missing" countries. Four alternative grouping procedures have been used for this purpose and are explained below.

Once obtained, the national distributions must be "added". This addition is not done in continuous form, but by use of a representation of each national distribution as a series of 20 uniform segments (i.e., every individual unit in each semi-decade of the population in any country is assumed to have the same income). Further disaggregation of the distributional position within any country would require either interpolation or curve fitting to a prescribed functional form (e.g., Pareto), and considerably changes the computational complexity of the calculation. Given both the number of countries involved (generating in total some 2,980 data points on the "world" Lorenz curve), and the crudeness of the basic data, ignoring these complications in the present calculations seems not an unreasonable simplification.¹⁷

No functional forms are assumed for the national or worldwide distributions, and the 20 data points (number of people, and their total income) for each country are taken to lie on the worldwide income distribution. This does not make any assumption of the relative position of individual country Lorenz curves. Each country Lorenz curve is simply approximated by 20 points each of which is assumed to lie on the world Lorenz curve. Thus as one moves along the world Lorenz curve one might, for instance, move sequentially from the poorest group in country X to the poorest group in country Y, to the next poorest in X, and so on.

The combined observations across countries are arranged in terms of income per person within each observation. The 2,980 data observations across the 149 countries are then ranked by income per person using a standard "sort" routine.¹⁸ Having been sorted in this way, cumulative distributions for combined worldwide incomes can be calculated in percentile terms. This then enables other charac-

¹⁷China and India are sufficiently large population groupings that one could argue for special treatment in these specific cases even though that is not done here.

¹⁸This is a routine which "efficiently" ranks a combination of data points. Execution times are small for the dimensionality involved.

teristics of the distribution to be calculated (the Gini coefficient, mean, median, etc.). This whole procedure is approximate insofar as it is assumed that each income recipient within each 5 percent group of the national population has the same income.

The procedure adopted for grouping countries to obtain typical income distribution patterns for "missing" countries is as follows. First, all countries reported in the World Bank Atlas with reported populations of less than 250,000 are eliminated from consideration. This removes a population of around 3.5 million; 0.08 percent of the world's population on the basis of the figures used here. The remaining countries are then grouped in two different ways: the first is on the basis of 1972 *per capita* dollar GNP as reported in the World Bank Atlas, and the second is on a geographical basis. The grouping by *per capita* GNP is similar to the procedure used by Paukert [12] in his study on income distribution and growth. The groups used are reported in Table 1. The geographical groupings used are given in Table 2. *Per capita* GNP (in 1972 U.S. dollars) is reported for each country in both Tables 1 and 2.

As already emphasized, the sample of countries for which income distribution figures are available in the compilation by Jain [5]¹⁹ does not cover all countries.²⁰ It is therefore assumed that within any grouping (an income or geographical grouping) all countries excluded from the compilation have the same national distributional pattern as that given by a "typical" country within the same group. No firm empirical justification exists for these assumptions, and they must be regarded as, at best, approximate. Differing procedures for the choice of "typical" countries are followed and the alternative grouping procedures therefore provide some sensitivity analysis on the calculations.

In the choice of "typical" countries to represent the income distribution in percentile terms for countries missing in the various groups, those countries within the group for which distributional figures are available on a national basis for household units are first considered. Two different bases are then followed by first choosing all of the largest (by population) of such countries in each group (the large country assumption) and then the smallest of such countries (the small country assumption). The reason for the use of these alternative bases is the suspicion sometimes stated that large countries may appear to be more unequal than small countries due to an aggregation over regional diversities.²¹ Where more than one set of figures is available for any country satisfying these condi-

¹⁹The percentage of personal income going to each 5 percent of the sample population is reported. In the published version [6] of this compilation, figures for decile ranges only are published and with a slight difference in country coverage. The extra detail of the semi-decile ranges is of considerable value here, and explains the use of the unpublished data [5].

²⁰An attempt was made to supplement this sample with additional national figures. Letters were sent to embassies of all nations not starred in Table 1 and 2 with a request for sources of distributional information. Where a response was received (in some 30 or so cases) an address of a national agency in the country of origin (central statistical office, national planning board, national bank etc.) was typically given. These suggestions were all followed up and although some helpful replies resulted (e.g., size distribution of earnings) nothing of which direct use could be made here materialized. It was following this attempt that a decision was taken to limit the use of national distributional statistics solely to those contained in the World Bank Compilation [5, 6]. This sample can be expanded upon a little (e.g., by use of Wiles' [16] figures on the USSR) but difficulties in keeping additional figures on the limited consistent basis which Jain has achieved dissuaded the present author from the attempt.

²¹See, for instance, Wiles [16] Lecture III.

TABLE 1
COUNTRIES^a GROUPED BY 1972 GNP/CAPITA IN \$U.S.^{b,c}

	\$100 and under	\$101-200	\$201-300	\$301-500	\$501-1000	\$1001-2000	\$2001 and up						
Burundi	70	Cameroon	200	Botswana*	240	Algeria	430	Gabon*	880	Libya	1830	Canada*	4440
Chad*	80	C.A.R.	160	Cape Verde	240	Angola	390	South Africa*	850	Reunion	1010	Puerto Rico*	2050
Ethiopia	80	Comoro Isl.	150	Congo	300	Ivory Coast*	340	Barbados	800	Argentina*	1290	U.S.A.*	5590
Guinea	90	Dahomey*	110	Egypt*	240	Rhodesia*	340	Brazil*	530	Martinique	1050	Israel*	2610
Lesotho	90	Gambia	140	Equat. Guinea	240	Tunisia*	380	Chile	800	Venezuela*	1240	Japan*	2320
Malawi*	100	Kenya*	170	Ghana	300	Zambia*	380	Costa Rica*	630	Singapore	1300	Kuwait	4090
Mali	80	Malagassy*	140	Guinea-Bisseau	230	Colombia*	400	Guadeloupe	910	Bulgaria*	1420	Austria	2410
Niger	90	Mauritania	180	Liberia	250	Cuba	450	Jamaica*	810	Cyprus*	1180	Belgium	3210
Rwanda	60	Nigeria	130	Mauritius	300	Dom. Rep.*	480	Mexico*	750	Greece*	1460	Czechoslovakia*	2180
Somalia	80	Sierra Leone*	190	Morocco	270	Ecuador*	360	Panama*	880	Hungary*	1520	Denmark*	3670
Upper Volta	70	Sudan*	120	Mozambique	300	El Salvador*	340	Peru*	520	Ireland	1580	Finland*	2810
Zaire	100	Tanzania*	120	Senegal*	260	Guatemala*	420	Surinam*	810	Italy	1960	France*	3620
Afghanistan	88	Togo	160	Swaziland	260	Guyana*	400	Trinidad and Tobago	970	Poland*	1500	F.R. Germany*	3390
Bangladesh*	70	Uganda*	150	Jordan	270	Honduras*	320	Uruguay*	760	Spain*	1210	G.D.R.*	2100
Bhutan	80	Bolivia	200	Papua-New Guinea	290	Nicaragua	470	Hong Kong*	980	USSR	1530	Luxembourg	3190
Burma*	90	Haiti	130	Philippines*	220	Paraguay	320	Lebanon*	700			Netherlands*	2840
Indonesia*	90	China	170	Thailand*	220	Fiji*	500	Oman	530			Norway*	3340
Nepal*	80	India*	110			Iran*	490	Saudi Arabia	550			Sweden*	4480
Yemen A.R.	90	Khmer	120			Iraq*	370	Albania	530			Switzerland	3940
Yemen P.D.R.	100	Laos	130			Korea, Dem.	320	Malta	950			U.K.*	2600
		Macao	160			Korea Rep.*	310	Portugal	780			Australia*	2980
		Pakistan*	130			Malaysia*	430	Rumania	810			New Zealand*	2560
		Portugese Timor	120			Mongolia	380	Yugoslavia*	810				
		Sri Lanka	110			Syrian A.R.	320						
		Vietnam D.R.	110			Taiwan*	490						
		Vietnam	170			Turkey*	370						

^aAs explained in the text, countries with population less than 250,000 are excluded.

^bAs reported in the World Bank Atlas; conversions from local currencies are made primarily at ruling exchange rates and not on the basis of "purchasing power parity" rates.

^cThe stars beside countries indicate those included in the income distribution data by country compiled by Jain [5, 6].

TABLE 2
COUNTRIES GROUPED ON GEOGRAPHICAL BASIS^a
GNP PER CAPITA IN 1972 U.S. DOLLARS REPORTED ALONGSIDE EACH COUNTRY^b

<i>Africa</i>					
Angola	390	Malaysia*	430	Chile*	800
Botswana*	240	Mongolia	380	Colombia*	400
Burundi	70	Philippines*	220	Ecuador*	360
Cameroon	200	Portuguese Timor	120	Guyana*	400
Cape Verde Isl.	240	Singapore	1300	Paraguay	320
C.A.R.	160	Taiwan*	490	Peru*	520
Chad*	80	Thailand*	220	Surinam*	810
Comoro Isl.	150	Vietnam D.R.	110	Uruguay*	760
Congo	300	Vietnam Rep.	170	Venezuela*	1240
Dahomey*	110				
Eq. Guinea	240	<i>Middle-East</i>		<i>Eastern Europe</i>	
Ethiopia	80	<i>Persian Gulf</i>		Albania	530
Gabon*	880	Algeria	430	Bulgaria*	1420
Gambia	140	Cyprus*	1180	Czechoslovakia*	2180
Ghana	300	Egypt*	240	German Dem. Rep.*	2100
Guinea	90	Iran*	490	Hungary*	1520
Guinea-Bissau	230	Iraq*	370	Poland*	1500
Ivory Coast*	340	Israel*	2610	Rumania	810
Kenya*	170	Jordan	270	Russia	1530
Lesotho	90	Kuwait	4090	Yugoslavia*	810
Liberia	250	Lebanon*	700		
Malagassy*	140	Libya*	1830	<i>Western Europe</i>	
Malawi*	100	Morocco	270	Austria	2410
Mali	80	Oman	530	Belgium	3210
Mauritania	180	Saudi Arabia	550	Denmark*	3670
Mauritius	300	Syria	320	Finland*	2810
Mozambique	300	Tunisia*	380	France*	3620
Niger	90	Turkey*	370	F.R. Germany*	3390
Nigeria	130	Yemen	90	Greece*	1460
Reunion	1010	Yemen PDR	100	Ireland	1580
Rwanda	60			Italy	1960
Senegal*	260	<i>North America</i>		Luxembourg	3910
Sierra Leone*	190	Canada*	4440	Malta	950
Somalia	80	United States*	5590	Netherlands*	2480
South Africa*	850			Norway*	3340
Rhodesia*	340	<i>Central America</i>		Portugal	780
Sudan*	120	Barbados*	800	Spain*	1210
Swaziland	260	Costa Rica*	630	Sweden*	4480
Togo	160	Cuba	450	Switzerland	3940
Uganda*	150	Dom. Republic*	480	United Kingdom	2600
Tanzania*	120	El Salvador*	340		
Upper Volta	70	Guadeloupe	910	<i>Indian</i>	
Zaire	100	Guatemala*	420	<i>Sub-continent</i>	
Zambia*	380	Haiti	130	Afghanistan	88
		Honduras*	320	Bangladesh*	70
		Jamaica*	810	Bhutan	80
<i>East Asia</i>		Martinique	1050	India*	110
Burma*	90	Mexico*	750	Nepal	80
China	170	Nicaragua	470	Pakistan*	130
Hong Kong*	980	Panama*	880	Sri Lanka	110
Indonesia*	90	Puerto Rico*	2050		
Japan*	2320	Trin. & Tobago	970	<i>Oceania</i>	
Khmer Rep.	120			Australia*	2980
Korea Dem.	320	<i>South America</i>		Fiji*	500
Korea Rep.*	310	Argentina*	1290	New Zealand*	2560
Laos	130	Bolivia	200	Papua-New Guinea	290
Macao	160	Brazil*	530		

^aSee text for more detailed explanation, but note there is some arbitrariness in the geographical assignment in some cases (e.g. Mauritius in "Africa"). Also, all countries with reported populations of less than 250,000 have been excluded.

^bAs reported in the 1974 World Bank Atlas; see also Table 1 and text. Stars beside country names have the same meaning as in Table 1.

tions, figures for the latest year available have been taken (closest to 1972) and if a tie still remains it has been broken somewhat arbitrarily by taking the set of figures which are most unequal in terms of the share of the top 5 percent of income units.

The typical countries which this procedure has thrown up are reported in Table 3. Some of them are obviously contentious²² (e.g., the use of South Africa as

TABLE 3
 "TYPICAL" COUNTRIES USED TO REPRESENT THE DISTRIBUTIONAL PATTERN OF
 "EXCLUDED" COUNTRIES WITHIN PARTICULAR GROUPINGS

<i>A. Grouping by Income Range</i>		
<i>Per capita GNP in 1972 U.S. dollars</i>	<i>Large Country Assumption</i>	<i>Small Country Assumption</i>
≤ 100	Bangladesh	Chad
101-200 ^a	India	Dahomey
201-300	Thailand	Botswana
301-500	Turkey	El Salvador
500-1000	Brazil	Costa Rica
1001-2000	Spain	Cyprus
2001+	USA	Puerto Rico
<i>B. Grouping on a Geographical Basis</i>		
	<i>Large Country Assumption</i>	<i>Small Country Assumption</i>
Africa	South Africa	Gabon
East Asia ^a	Japan	Malaysia
Middle East-Persian Gulf	Turkey	Lebanon
North America	USA	Canada
Central America	Mexico	Costa Rica
South America	Brazil	Surinam
Eastern Europe	Poland	Hungary
Western Europe	U.K.	Finland
Indian sub-continent	India	Sri Lanka
Oceania	Australia	New Zealand

^aThe treatment of China (given its population) is important in these calculations and it should be noted that China appears in this income grouping.

a "typical" African state) but it has been felt best to stick to a consistent procedure rather than tread the difficult path of special cases. The over-representation of certain continents in the income groups (3 African and 3 Central American states out of a total of 7 for the "small" country assumption) may also be a little unsatisfactory.

Having chosen typical countries to represent excluded countries in this way, the income distribution pattern within each country (given by the percentiles of income received by each 5 percent of the national population) is applied to the

²²Whether such assumptions really make sense is, of course, hard to judge and in any exact terms such assumptions are ridiculous. China, for instance, is clearly important and the four procedures have the distribution assumed as alternately like that of India, Dahomey, Japan, and Malaysia.

population and GNP figure for each country. This gives numbers of people and amounts of income for each semi-decile of each country's population. Each country separately generates 20 points (an income and population figure) on the worldwide income distribution. These data observations are then "added" as described above.

V. RESULTS OF CALCULATIONS

The results of the calculations described above are reported in Table 4, which labels the figures as "dollar" incomes to distinguish them from the "purchasing power parity" calculations which follow in Table 5. To give some comparability between calculations of inequality across countries with and without domestic inequality, a calculation has also been reported for a world income distribution assuming the distributional pattern within each country to be one of perfect equality.

From Table 4 the picture one obtains of the worldwide "dollar" income distribution is one of considerable extremes in inequality. While hardly surprising as a qualitative judgement, the orders of magnitude are disturbing if accepted as in any way reflecting the real situation. The top 1 percent of income recipients in the world come out in the calculation as having between them on the order of 15 percent of worldwide income, the top 5 percent around 40 percent and the top 10 percent around 60 percent. At the lower end of the distribution the bottom 50 percent of the population receives around 5 percent of income, the bottom 20 percent about 1 percent, and the bottom 10 percent about 0.3 percent. Comparing the figures reported under Calculation 5 to the orders of magnitude given above, inequality within countries adds an extra and substantial twist to the pattern of worldwide inequality which, as one would expect, is particularly pronounced at the tails of the distribution. These figures suggest that inequality within countries cuts the share of income going to both the bottom 20 percent and 10 percent of the world's population by around one-half and more than doubles the share of the top 1 percent. The concentration of incomes on a worldwide scale thus appears to be more substantial than for any national unit.²³

The figures in Table 4 can be compared to calculations produced on a rough "purchasing power parity" basis. As emphasized in the introduction to this paper, there is empirical evidence which suggests that the extent of the divergence of purchasing power parity rates of exchange between currencies from market (or "official") rates for developing and less developed countries is substantial. To the extent this is so the use of official exchange rates (as in the World Bank Atlas) discriminates against poorer countries in the calculations in Table 4. From the results of the recent joint UN-University of Pennsylvania study [9] on detailed purchasing power calculations for a small sample of countries some "stylized" corrections have been made to the underlying data and worldwide income distributions recalculated.

²³See footnote 2.

TABLE 4
 CALCULATIONS^a OF THE WORLDWIDE DISTRIBUTION OF INCOME UNDER ALTERNATIVE ASSUMPTIONS:
 SHARE^b OF WORLD INCOME ACCRUING TO PERCENTAGES OF WORLD POPULATION

Groups of Income Recipients	Calculation 1	Calculation 2	Calculation 3	Calculation 4	Calculation 5
	Countries grouped by 1972 <i>per capita</i> GNP and small country assumption used for choice of "typical" countries to represent excluded countries	As for 1 but with use of the large country assumption to represent "excluded" countries	Countries grouped on a geographical basis and small country assumption used for choice of "typical" countries to represent excluded countries	As for 3 but with use of the large country assumption to represent "excluded" countries	The distribution of income within countries assumed equal
top 1%	14%	15%	14%	14%	5%
top 5%	39%	39%	38%	40%	27%
top 10%	59%	58%	58%	58%	49%
top 20%	80%	78%	78%	78%	71%
top 30%	89%	89%	88%	89%	85%
top 50%	95.5%	95.5%	95.5%	95.5%	94%
bottom 20%	0.85%	0.9%	0.85%	0.9%	2%
bottom 10%	0.3%	0.4%	0.3%	0.3%	0.9%
Gini coefficient of concentration	0.740	0.736	0.731	0.733	0.667

^aSee text for explanation of assumptions and methods involved.

^bTo obtain strictly comparable percentile estimates, interpolation is necessary. As 2,980 points on the Lorenz curve were generated for each distribution, figures in Table 4 are rounded from the nearest observation to the percentile reported.

TABLE 5^a
 CALCULATIONS OF THE WORLDWIDE INCOME DISTRIBUTION UNDER A SET OF
 "PURCHASING POWER PARITY" CORRECTIONS^b TO GNP DATA:
 SHARE OF WORLD INCOME ACCRUING TO PERCENTAGES OF WORLD POPULATION

Groups of Income Recipients	Calculation 1	Calculation 2	Calculation 3
	Countries grouped by <i>per capita</i> income and small country assumption used for choice of "typical" countries to represent excluded countries	As for 1 but with use of the large country assumption to represent "excluded" countries	The distribution of incomes assumed equal within countries
Top 1%	12%	12%	4.5%
top 5%	35%	34%	23%
top 10%	50%	50%	41%
top 20%	70%	70%	60%
top 30%	80%	81%	74%
top 50%	91%	91%	86%
Bottom 20%	1.8%	1.9%	4%
bottom 10%	0.65%	0.7%	2%
Gini coefficient of concentration	0.653	0.649	0.543

^aSee notes to table 4.

^bSee text for explanation.

The corrections made follow the income grouping basis reported in section IV and for each assume a dollar exchange rate premium at official rates over a purchasing power parity rate.²⁴ The "premia"²⁵ (one for each grouping) are then used to scale up all of the *per capita* GNP figures for countries within the group; different "premia" being applied for each group. Once the GNP/capita figures have been corrected in this way, the same procedures as described in section IV are applied to produce a worldwide income distribution. The correction factors used and sources are given below²⁶ and the results are reported in Table 5. As with

²⁴That is, a conversion between currencies at market rates "undervalues" domestic currency measures of GNP relative to a "purchasing power parity" conversion.

²⁵The UN-University of Pennsylvania study [9] uses the terminology "exchange rate deviation index".

²⁶The basic source for these "premia" is the recently published UN-University of Pennsylvania study [9] on "A System of International Comparisons of Gross Product and Purchasing Power" for 10 countries (France, Germany, Italy, UK, USA, Colombia, Hungary, India, Japan, and Kenya). This is an extremely careful and detailed piece of work which provides a number of purchasing power parity calculations on different bases for years up to 1970. Selecting one set of figures is a little treacherous, although the differences are perhaps of secondary importance given the crudeness of the calculations reported here. The table on p. 8 of this study has been used which provides the following factors for 1970 for countries by income ranges; <\$100 no country; \$100-200; India 3.49, Kenya 1.91; \$200-300 No country; \$300-500; Colombia 2.32; \$500-1000 No country; \$1000-2000 Hungary 1.87; Italy 1.29; \$2000+ Japan 1.47; France 1.24, W. Germany 1.16, UK 1.35. These figures compare to Usher's [14] (approximate) factor of 4 for a £ exchange rate for Thailand for 1958 (Thailand being in the range \$200-300). The basis for this figure is, however, somewhat different from that for the U.N.-Pennsylvania study [9] and is not used here. The following "correction" factors have been assumed; range ≤ \$100 = 3.49 (India's figure); \$100-200 = 3.49 (India); \$200-300 = 3.0 (rough average over India and Colombia); \$300-500 = 2.32 (Colombia); \$500-1000 = 2.0 (rough average over neighbouring ranges); \$1000-2000 = 1.50 (rough average over Hungary and Italy); \$2000+ = 1.35 (UK as intermediate of the four countries reported).

Table 4, figures based on an assumed equality in all domestic distributions are also given. The sparsity of purchasing power parity estimates is such that a correction by income grouping rather than on an individual country basis is all that is possible. The geographical basis described above is therefore not used.

The effect of these adjustments is substantial. Compared to Table 4 the shares of the top 1, 5, and 10 percent fall from 15 to 12 percent, 40 to 35 percent, and 60 to 50 percent respectively by going to the crude purchasing power parity basis. The shares of bottom 10 and 20 percent rise from 0.3 to 0.7 percent and from 1 to 2 percent respectively. The Gini coefficients for calculations 1 and 2 of Table 5 are of a comparable order to calculation 5 (no domestic inequality) of Table 4. The indication from Table 5 is still that domestic inequality cuts the shares of income going to the bottom 10 and 20 percent of the world's population by around half and more than doubles the share of the top 1 percent.

To conclude from these calculations that there is considerable inequality in the worldwide distribution does not go much beyond one's *a priori* view before the calculations were performed. Equally drawing too much by way of precise numbers is clearly not warranted. A fair statement may be that as working hypotheses until such time as data and methods of calculation improve, it might be reasonable to assume that the share of the top 1 percent of income recipients in world income is in the range 10–15 percent, the top 10 percent in the range 45–65 percent and the bottom 20 percent perhaps 1–4 percent. Domestic inequalities (in addition to inequality across countries) may double the share of the top 1 percent and half the share of the bottom 10 percent. Inequality in the worldwide distribution appears more unequal than for individual countries.

VI. SUMMARY

Casual empiricism alone would suggest that there are wide differences between rich and poor in the world today. There is therefore some value in trying to place the current situation in a quantitative perspective although it should be made very clear that the data difficulties in such an attempt are enormous and all calculations are therefore highly speculative. The indications from calculations reported in this paper are that the top 1 percent of the world's population may receive 10–15 percent of world income, the top 10 percent, 45–65 percent, and the bottom 20 percent, 1–4 percent. Domestic inequality (in contrast to inequality across countries) appears to approximately double the share of the top 1 percent and to halve the share of the bottom 10 percent.

It is easy to react too simplistically to figures such as these by suggesting "worldwide" redistributive taxation involving rich nations surrendering fractions of domestic GNP to the lower income groups of poorer nations greatly in excess of current aid programmes. The trade-off between redistribution and efficiency in all distribution matters should not be ignored, and there is no evidence to suggest it is not more pronounced on an international than on a domestic level. Nevertheless, it seems hard to deny that the figures emphasize a case of social justice on the side of the poorer citizens of the third world countries. Calculations such as these would seem to be worthwhile pointing out to pro-redistributive groups within countries to divert attention from the domestic settings where distributional issues seem to be primarily discussed to the international arena.

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