16 The World Distribution of Well-being Dissected

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This paper will attempt to illuminate the condition of well-being of the 5.5 billion people on earth. More *what* questions will be addressed here than *why* questions, but, until we know more than we do, there is plenty of room for a division of labor in dispelling darkness. The arithmetic that follows, in the form of tables and graphs, means and Gini coefficients, frequency distributions and Lorenz curves, etc., is the easy part. Determining which numbers are the relevant ones for the arithmetic is the hard part. Illumination is our modest objective.'

The primary data available for what follows, of greater or less quality, are time series of *real* gross domestic product (GDP) and its major components for nearly all the countries of the world .2 These come from an update of the Penn World Table (PWT), last described in Summers and Heston (1991),

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1. The world income distribution has been the subject of too many investigations to provide all the relevant citations here. Suffice it to say, the earliest study consulted here that attempted systematically to estimate the parameters of the world distribution in the spirit of the present work was Andic and Peacock (1961), where country GDPs were made comparable using exchange rates. Another study using an economic indicators approach was Beckerman and Bacon (1970). Earlier efforts by the present authors were Summers, Kravis, and Heston (1981, 1984).

2. The objections of some distinguished, knowledgeable economists to the use of national accounts data to measure welfare should at least be noted before the objections are ignored (see, e.g., Okun 1971). The well-known disparities between the utility-generating effects of a country's activities and the imperfect valuation of them using market data and relatively few imputations are indeed problems. With one exception, in the work described below we do not follow another trend among some economists to "correct" the deficiencies in the national accounts (see, e.g., Nordhaus and Tobin 1972; and Eisner 1988).

which in turn is based on the work of the International Comparison Program (ICP).' Unlike the values of the GDPs and components of the system of national accounts (SNA), all the country numbers are expressed in a common currency unit, based on a set of average world prices of a particular year, so they are directly comparable across countries and time. Since time series of country populations are also available, describing world well-being would appear to be a very simple matter, at least at a very primitive level. The introductory economics way of handling these numbers for any particular year would be to divide each country's GDP by its population to get the country's GDP per capita (GDPpc). (Never mind yet exactly what the meaning of this number is.) Then the mean and, say, the standard deviation of the collection of GDPpc s would be calculated and somehow interpreted. (For example, is the mean increasing fast enough? Is the standard deviation too big-or too small-and how is it changing over time?) Of course, when the persons engaged in this exercise get to intermediate economics, they will learn more sophisticated ways of getting at inequality than the standard deviation, and they will be reminded that they have not taken account of differences in income of people *within* countries. And, it may be hoped, there will be a clarification of what exactly GDPpc is a measure of. This paper will go through these introductory and intermediate economics exercises on data covering almost a half century, clarifying what is being measured and what might be better measured. In an effort to improve on the usual GDP approach, some additional country variables involving age composition, particular subaggregates of national output, and quintile expenditures will be introduced.

Section 16.1 sharpens the concept *well-being.* First, the distinctions between *material* well-being and other kinds are considered. For concreteness, some thoughts are advanced
being and longevity. (Please note: this does not augur an imminent entry into the still small cottage industry of researchers developing social welfare indexes that embrace material and sociological-cumpolitical-cum-demographic-cum-etc. well-being.) An effort is made then to illuminate-there is that word again-the overused concept *per capita* and suggest an alternative. Finally, two versions of the concept *current material wellbeing* are discussed that are designed to get at comparisons of present standards of living.

Sections 16.2-16.4 contain the empirical findings derived from the PWT international data set for the concepts in section 16. 1. The concluding section, section 16.5, summarizes the empirical findings.

3. References to the voluminous ICP work can be found in Summers and Heston (1991). The data underlying the present work come from the Penn World Table (Mark 5.6), a large space-time system of national accounts that has been under development since 1980, when the Mark I version appeared in Summers, Kravis, and Heston (1980). (Mark 5.6 is an update of the Mark 5 version described in Summers and Heston (1991].)

16.1 The Concept of *Well-being*

16.1.1 What Should Enter an Empirical Social Welfare Function?

How many arguments should one consider in thinking about a social welfare function (SWF) for a country? Although there are at least a couple of dozen candidates in the data volumes of the World Bank and other international organizations, most economists are glad to restrict their attention to their own bread and butter, namely, *material* well-being. They may use various social indicators to help explain differences in countries' material well-being, or they may investigate how the social indicators are affected by material well-being. It is only the venturesome who attempt, so far with extremely limited success, to incorporate nonmaterial and material dimensions of well-being in a single empirical indicator,

If there is agreement that a particular social indicator does measure something that contributes to countries' well-being, why should it not be included in the social welfare function? It should be if one can figure out how it should be fitted in. The problem is that rarely (if ever) can one find an acceptable [11] scientific" basis for combining the social indicator with the material well-being measure that economists are ready to embrace. Economists have no trouble coping with a multiple-argument social welfare function when they have a basis for weighting the utilities generated by each of the entries. Shoelaces and Chevrolets are easy to combine if a price of each is available that reflects the relative utilities flowing from a unit of each. But where does one find the appropriate "prices" for such social indicators as, say, political freedom or literacy or an extra year of life? In section 16.4, a pricing notion for the value of an extra year of life will be explored with a view to taking a baby step toward a broader social welfare function than one involving only material goods and services.

16.1.2 Material Well-being: Numerators Looking for Denominators

Denominators

The directly preceding discussion raises the question- without answering it!-of including more than just material well-being in assessing the overall welfare of countries. Here, and immediately below, however, the focus is on the simpler problem of judging material well-being alone. The conventional measure is **GDP,.' Obviously, GDP** by itself cannot be the measure. India's GDP is far greater than Ireland's, but no one would for a moment think that

4. Strictly speaking, gross national product (GNP) is more appropriate than GDP In some individual cases, Luxembourg particularly, the distinction may be important, but estimated distributions are not likely to be sensitive to the difference. Only GDP is considered in this paper.

was conclusive. GDP measures the quantity of goods and services available to meet a country's needs but is silent on the magnitude of those needs. Dividing GDP by the number of mouths to be fed adjusts for need; this is a way of rationalizing the use of the per capita concept. But what if some mouths are bigger than others (perhaps stomach size would be a more apt metaphor) and the proportion of little mouths is greater in some countries and less in others? (Remember these stylized facts: in developed countries, 20 percent of the population is under fifteen years of age, while, in developing countries-China apart at 25 percent-the percentage is more like 40.) Should one worry about taking account of these demographic differences across countries [5] The view here is, "Let's try." The reader will be able to judge from the presentation in section 16.2 whether the present attempt is helpful and, more specifically, whether it makes a difference.

Numerators

GDP is a very useful multipurpose measure of the quantity of goods and services available to a country, but it is not an all-purpose measure. Its breadth is attractive to development economists concerned with the level and change of a country's "stage of development, " However, some questions call for a measure of a country's *standard of living*, which in the end is what motivates productive activity. To put it in a suggestive way, consider an alternative concept, SL, that is concerned with *current* material well-being. This *now* emphasis still allows the use of the real national accounts database, but one must be selective in extracting elements from the ICP national accounts tableau. One should leave out the goods relating to the future and omit any part of GDP that does not directly contribute to material well-being. The first part is easy: simply leave out investment (including net foreign investment) and include only total consumption, private and public. The second part is more problematic: exclude any regrettable necessities that are measurable and that most people will agree on.'

The presentation in section 16.3 will focus primarily on SL. (Unfortunately, in the latest PWT, SL is available only for the years 1970-89.) Following this, a supplemental standard-of- living measure will be presented for a distinctly limited number of countries and years. This alternative, SLq melds some income distribution information with (private) consumption to show the per capita consumption of the middle quintile of the population for each available data point. Very loosely speaking, this may be thought of as an estimate of an expanded version of a country's median private spending.

5. Beware of stepping off onto slippery slopes! Are the material needs of people in a cold climate not greater than the needs of those in a temperate climate? How about taking account of rugged vs. gentle terrains? And so on.

6. Another very slippery slope!

16.2 The GDP Facts

16.2.1 Levels

GDP and GDP per Capita

Graphs of both world income, the sum of the GDPs of all the countries of the world, and world income per capita are presented for the years 1960-90 in figures 16.1 and 16.2. (A log scale is used on the vertical axes to facilitate growth rate comparisons at different times.) Also, the world is subdivided into groups of countries at three income stages: forty-five low-income countries; sixty-five middle-income countries, further subdivided into fifty-one non-oil countries and fourteen oil; and twenty-four industrialized countries.' Graphs depicting the income experiences of the four groups of countries also appear in figures 16.1 and 16.2.

The assignments are based on the World Bank's current classification system rather than an equivalent first-period 1960 classification system. This was to make the findings consistent with other research findings of the Bank. Of course, this grouping by late-period status presents problems for convergence analysis because the fastest-growing countries among the low- and middleincome countries in 1960 will have graduated to higher status by 1990, with the effect of understating the growth rate of the group of low-income countries and overstating the growth rate of the group of high-income countries. (If an Asian Tiger in the bottom category in 1960 reached the top category by 1990, its high rate of growth would have been credited to the top category under the Bank's system, even though it should have been credited to the bottom category.) Note, however, that using the late-period assignments means that, if we conclude on the basis of our empirical observation that low-income countries have improved their condition between 1960 and 1990, we can be really sure of it because we have not counted the growth of the star performers of the group.

The simplest questions answered by the graphs are, Is the world going uphill or downhill with respect to increasing its output and increasing its output faster than its needs have increased? The positive slopes of the world time series in both figure 16.1 and figure 16.2 indicate that the answers are uphill and uphill. Do the rich get richer and the poor get poorer? No, the positive slopes of both the GDP and the GDPpc graphs of the industrialized and low indicate that the rich and the poor are both getting richer. Do the rich get richer faster than the poor get richer? The naked eye is not good at comparing the slopes of the industrialized and low graphs over a long period, but the latter slope appears smaller in the early years and greater in the later years. Table 16.3 below, to be discussed shortly, contains the growth rates that will make the comparisons

7. For the specific country assignments, see the appendix. The World *Bank Atlas (1995)* lists an additional *75* countries and territories, all very small, beyond the 134 covered here that account for all but 3 percent of the world's 1990 population. The Penn World Table (Mark 5.6) contains data on 151 countries, but the time series for *17 of* them were too short to be useful in this paper.

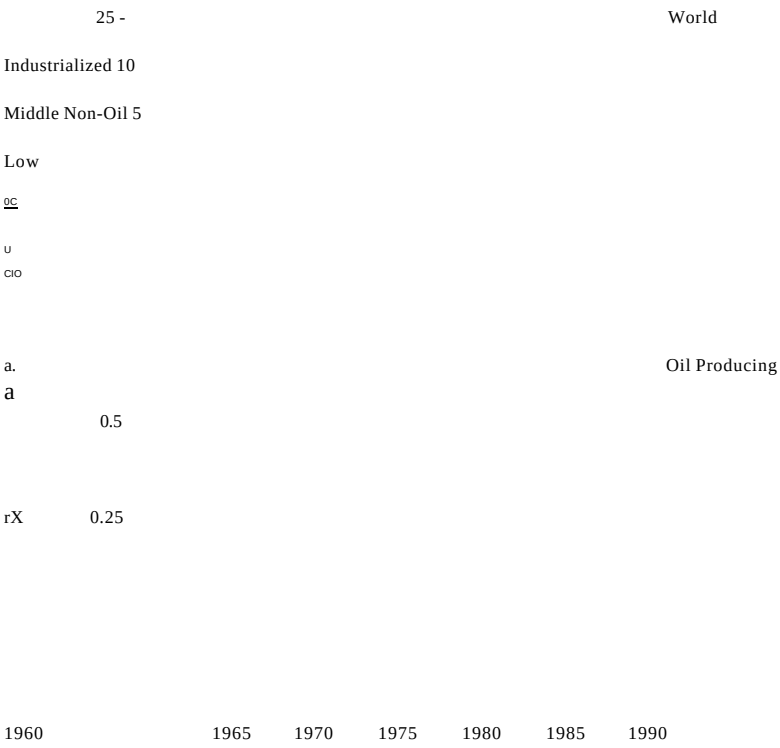


Fig. 16.1 Real GDP: world and by income group, 1960-90

clear. (Another dynamic question, apparently frivolous but not at all without content, is, Do the rich get richer and the poor get children? Rather than compare income-group slopes between fig. 16.1 and fig. 16.2, this question will also be reserved for the discussion of table 16.3.) First, however, How much richer are the rich than the poor? The entries in table 16.1 show this striking stylized fact in 1990: the poor (the lows) had just over half the population of the world but received only a sixth of the world's output, while the rich (the industrialized) had about a sixth of the population and got about half the output. Leading up to 1990, the rich share of world output went down between 1960 and 1990; the poor share stayed virtually the same; and the middles got what the rich lost. (More of that comes out in examining the growth rates of table 16.3.)

Table 16.2 is provided to show whether the message of table 16.1 is really dominated by the facts' about the most populous country in the world, China. It turns out that excluding China from the calculations in table 16.1 does not

8. Facts is not an apt word for describing the real national accounts of China. The hard facts that go behind the soft estimates so far available, which it is hoped will become available soon, will probably not change the differences between table 16.1 and table 16.2 much.

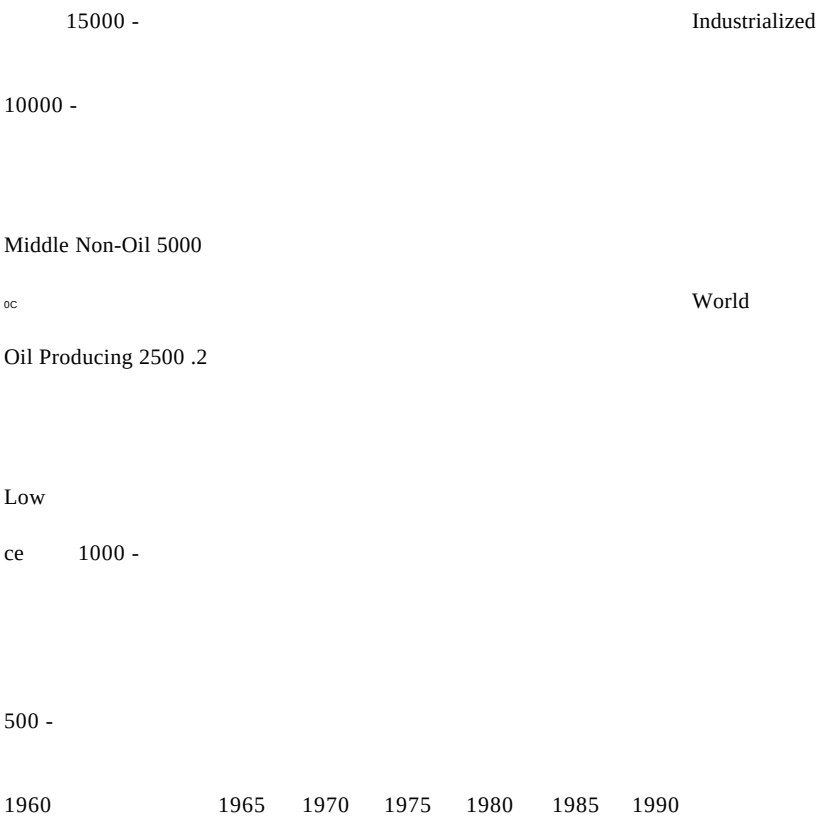


Fig. 16.2 Real GDP per capita: world and by income group, 1960-90

alter the pattern of change much. The low population is much smaller, of course, and the populations of the other groups are now a larger proportion of the world total. This affects the magnitude of change of the aggregate outputs of the groups, but it does not change the basic conclusion. The shares of the rich and middle are greater, and the poor's share is lower, but the changes in the shares between 1960 and 1990 are roughly the same as when China is included.

GDP and GDP per Equivalent Adult

Table 16.1 has been used so far to comment on countries' capacities to meet their *per capita* needs. Are the poor really as bad off relative to the rich if need is defined in a way that better takes account of countries' demographics? To say the least, it is hard to find proper equivalent-adult scales across 134 countries that value the relative consumption needs of persons in different demographic categories, but the equivalent adult (EA) entries of table 16.1 are meant to help put the big mouth/little mouth consideration in perspective. 9 How dif

9. In the light of the well-known significant increasing returns from consumption of families of different sizes, demographic considerations are better taken into account by working with house

Table 16.1 Real Shares of World Output: GDP 1960, 1970, 1980, 1990

Low	Middle	Oil	Non-oil	Total	Industrial
No. of countries	45	14	51	65	24
1960					
% of population	51.5	3.8	24.2	28.0	20.5
% of equivalent adults	50.5	3.7	24.3	27.9	21.6
% of GDP	15.1	3.3	21.5	24.8	60.2
1970					
% of population	52.9	4.2	24.1	28.3	18.7
% of equivalent adults	51.7	4.0	24.3	28.3	20.0
% of GDP	13.3	3.9	23.6	27.5	59.2
1980					
% of population	54.8	4.4	23.8	28.2	16.9
% of equivalent adults	53.6	4.1	24.1	28.2	18.2
% of GDP	13.8	4.5	27.5	32.0	54.2
1990					
% of population	56.3	5.1	23.5	28.6	15.2
% of equivalent adults	55.7	4.7	23.4	28.1	16.2
% of GDP	16.6	3.4	27.2	30.6	52.8

ferent are the needs of the income groups when they are defined in terms of equivalent adults, albeit very crudely scaled? The **proportion number of equivalent adults located in each income group is given for the not-implausible** case of **the EA value for children under fifteen 0.5 and that for everyone else at 1.0. Table 16.** I's **slightly surprising story is that judgments about the difference in well-being between the** are **only slightly affected by equivalent adult considerations.** [10]

16.2.2 Growth

Table 16.3 lays out the growth patterns of GDP, GDP,,, and GDP per equivalent adult over the three decades 1960-90.11 (Table 16.4, analog

hold size data for different countries as well as age composition. Data limitations across 124 countries make it impossible to follow the much more satisfactory equivalent adult procedures Smeeding, and Metz (1996). Our early minor effort in this direction foundered because sufficiently detailed data on household size was available for only a small number of developed countrie

10. Furthermore, the equivalent adult story remains essentially the same when EA is set at either 0.4 or 0.6. Unless one wants to make the case that EA is smaller than 0.4 or that it is smalle rich, the only defensible conclusion remains that per capita and per equivalent adult considerations tell essentially the same story.

11. The reader is reminded of a point made earlier. The country assignments are based on 1990 GDP per capita. This means that fast-growing Japan, Hong Kong, and Singapore are included i although in 1960 they would not have been. If the classification had been based on 1960 incomes, the average industrialized growth rate would have been lower.

Table 16.2 **Real Shares of World Output:** GDP, **Excluding China, 1960, 1970, 1980,1990**

Low	Middle	oil	Non-oil	Total	Industrial
No. of countries	44	14	51	65	24
1960					
% of population	37.3	5.0	31.3	36.3	26.5
% of equivalent adults	36.2	4.7	31.3	36.0	27.8
% of GDP	9.9	3.5	22.8	26.3	63.8
1970					
% of population	39.0	5.4	31.3	36.7	24.3
% of equivalent adults	37.7	5.1	31.4	36.5	25.9
% of GDP	8.5	4.1	24.9	29.0	62.5
1980					
% of population	41.4	5.7	30.9	36.6	22.0
% of equivalent adults	39.9	5.3	31.2	36.5	23.6
% of GDP	8.4	4.8	29.2	34.0	57.5
1990					
% of population	43.7	6.5	30.2	36.7	19.5
% of equivalent adults	42.4	6.1	30.4	36.5	21.1
% of GDP	10.5	3.6	29.2	32.8	56.7

16.2 in its exclusion of China, is provided without comment, just for completeness.) Now the focus is on the growth differences among the three income groups. Note that world growth in GDP slowed down over the decades, from 5.2 to 4.0 to 3.1 percent. Both the industrialized and the middle growth rates went down (from 5.1 to 3.1 to 2.8 percent in the first case and from 6.4 to 5.6 to 2.6 percent in the other). However, the growth rate of low went the other way, from 3.9 to 4.4 to 5.0 percent. Over the thirty years, not only was the poor's output increasing, but it was increasing at a faster rate than the rich's-- versus 3.6 percent! (The middle growth rate went down more sharply than the rich, but its average was still higher.) So much for output, but what about need? Over the thirty years, the low's GDP went up faster than the industrialized's-but its population growth was much greater. Its GDP,, growth fell short of that of the industrialized group, 2.1 against 2.6 percent.

The overall conclusions about the condition of countries around the world over the last thirty-odd years, in question-and-answer form, are as follows: (i) Has the output of the rich gone up while the output of the poor gone down? Not at all. (ii) Have the rich gotten rich faster than the poor? Not in terms of output, but, if need is adequately measured by population size, then yes. (iii) Have the rich gotten richer and the poor gotten children? Yes, but the output of the poor has gone up more than enough to still make them better off. (iv) Is the estimated gap between the rich and the poor greater if one takes

Table 16.3 **Average Annual Rates of Growth** (%): **GDP, GDP per Capita, GDP per Equivalent Adult, 1960-70, 1970-80, 1980-90, 1960-90**

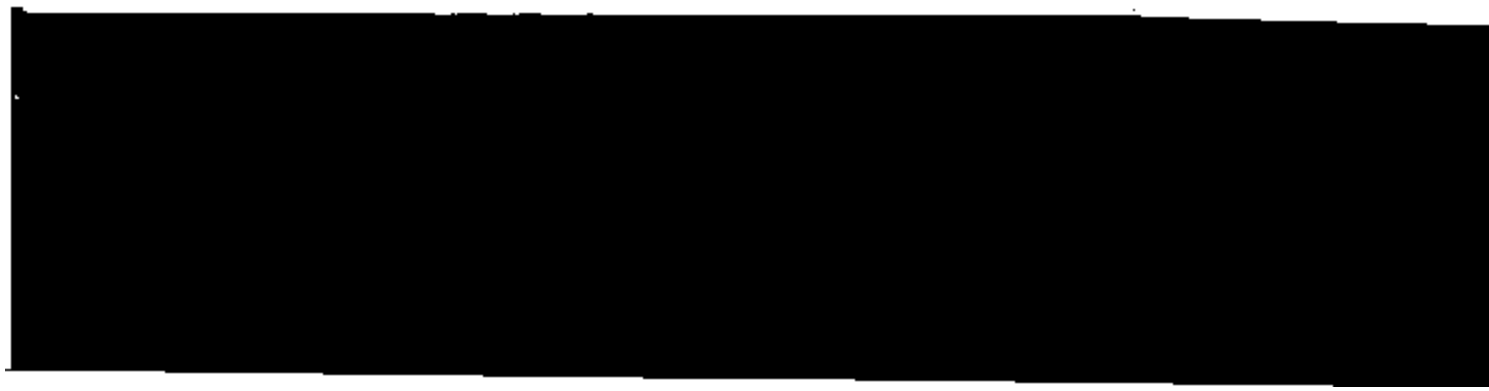
		Middle				
Low		Oil	Non-oil	Total	Industrial	World
1960-70						
GDP	3.9	7.2	6.2	6.4	5.1	5.2
GDP per capita	1.6	4.2	4.2	4.2	3.9	3.2
GDP per equivalent adult	1.7	4.3	4.2	4.2	3.8	3.2
1970-80						
GDP	4.4	5.6	5.6	5.6	3.1	4.0
GDP per capita	2.2	3.2	3.8	3.7	2.3	2.1
GDP per equivalent adult	2.0	3.1	3.7	3.6	2.0	2.0
7980-90						
GDP	5.0	1	2.9	2.6	2.8	3.1
GDP per capita	2.9	-3.0	1.3	.7	2.2	1.3
GDP per equivalent adult	2.6	-3.0	1.3	.7	2.0	1.1
1960-90						
GDP	4.4	4.2	4.9	4.8	3.6	4.1
GDP per capita	2.2	1.4	3.1	2.9	2.8	2.2
GDP per equivalent adult	2.1	1.4	3.0	2.8	2.6	2.1

Table 16.4 **Average Annual Rates of Growth, Excluding China** (%): **GDP, GDP per Capita, GDP per Equivalent Adult, 1960-70, 1970-80,**

1980-90,1960-90

Middle

Low		Oil	Non-oil	Total	Industrial	World
1960-70						
GDP	3.7	7.2	6.2	6.4	5.1	5.3
GDP per capita	1.3	4.2	4.2	4.2	3.9	3.3
GDP per equivalent adult	1.4	4.3	4.2	4.2	3.8	3.3
1970-80						
GDP	3.8	5.6	5.6	5.6	3.1	3.9
GDP per capita	1.3	3.2	3.8	3.7	2.3	2.1
GDP per equivalent adult	1.3	3.1	3.7	3.6	2.0	2.0
1980-90						
GDP	5.2	1	2.9	2.6	2.8	3.0
GDP per capita	2.8	-3.0	1.3	.7	2.2	1 - I
GDP per equivalent adult	2.6	-3.0	1.3	.7	2.0	1.0
1960-90						
GDP	4.3	4.2	4.9	4.8	3.6	4.1
GDP per capita	1.8	1.4	3.1	2.9	2.8	2.2
GDP per equivalent adult	1.7	1.4	3.0	2.8	2.6	2.1



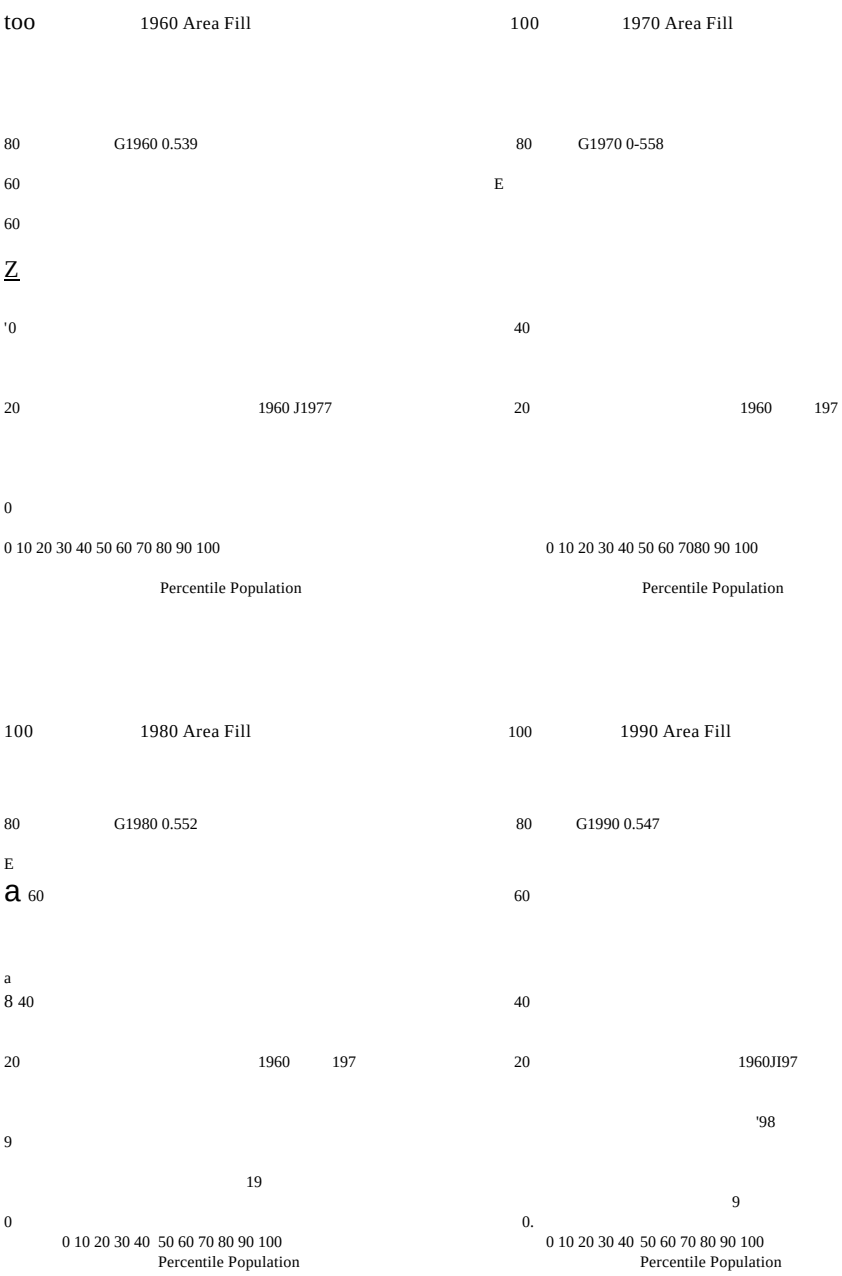


Fig. 16.3 Intercountry inequality: GDP per capita, Lorenz curves, and Gini coefficients, 1960, 1970, 1980, and 1990

account of the differences in age composition of the two groups? Allowing for the smaller consumption needs of children does not have much effect on the size of the gap.

16.2.3 Inequality

Tables 16.1-16.4 show how groups of countries at different points of the income spectrum fared over the last thirty years. In a last examination of the world distribution of material well-being as measured in GDP terms, figure 16.3 displays world Lorenz curves for each of the decennial years under study. The great similarity of the curvesl2 is consistent with table 16.5's report of very

12. The Lorenz curves are so similar that a single diagram depicting all four of them is difficult to digest. The device of displaying the diagram four times, each with the area under just one of the curves shaded in, helps clarify which curve is lowest where.

Table 16.5 Intercountry Income Inequality: GDP **(Gini coefficients: 1960, 1970, 1980,1990)**

		Middle				
Low		Oil	Non-oil	Total	Industrial	World
1960	.117	.452	.207	.252	.222	.539
1970	.108	.467	.218	.268	.141	.558
1980	.097	.442	.216	.261	.113	.552
1990	.117	.385	.258	.295	.090	.547

small differences between the Gini coefficients for the four years (0.539, 0.558, 0.552, and 0.547). This suggests that the four world income distributions are equivalent as far as inequality is concerned. However, the Lorenz curves cross. Close study of the curves shows what could have been gleaned from table 16. 1. The great similarity of the Ginis means that the average difference between all pairs of observations-country pairs in the present case-did not change much. The fact that the low grew more slowly than the industrialized (see table 16.3) would make one think that the average difference went up. How, then, could the Gini have remained practically the same? Observe in table 16.3 that the middle grew faster than the industrialized. This narrowed the difference between those groups enough to leave the overall difference more or less the same. The Gini did not change, so one should expect that the low was not left behind by the other two groups in 1990. Indeed, it ended up with a slightly reduced share of total world output, relative to its greater share of the world's population. A detailed examination of the Lorenz curves shows that the bottom quintile of the world got 4.74 percent of world output in 1960 but slightly less, 4.58 percent, in 1990. This is a 3.4 percent difference, hardly negligible for the most hungry part of the world's population. A comparison of the Ginis for the two years does not highlight this.

Incidentally, table 16.5 provides information about changes in inequality *within* as well as across the low, middle, and industrialized groups. [13] The only observed changes worth remarking on probably are a result of the way countries were assigned to income groups: they were assigned on the basis of their last-period rather than first-period incomes.

16.2.4 Some Miscellaneous Facts about the World Distribution of Income

Inequality in the World Distribution of Utility

The existence of diminishing marginal utility of income is widely recognized by economists, and its implications underlie many parts of political debate. The conceptual and operational problems associated with any kind of

13. Note that the absolute degree of inequality in each group is of no significance because that is dictated by the (somewhat arbitrary) choice of cutoff points defining the groups.

measurements associated with the notion of utility are so formidable that it is very difficult to make any kind of policy decisions that depend on "scientific" judgments flowing from interpersonal comparisons of utility. (The progressivity of most income tax schedules is testimony to the widespread belief in the declining marginal utility, but the degree of progressivity legislated never flows from any *scientific* evaluations of the rate of decline, particularly relative to its effect on incentives.) Nonetheless, one does see studies that either implicitly or explicitly value utilities of incomes rather than income. [14] Interpersonal comparisons apart, *diminishing* marginal utility implies that people are less than twice as well off if their incomes are twice as great. If even just for speculative purposes one is willing to consider the possibility that people have equivalent [11] utilometers" all over the world," then the obvious implications for how the inequality of world utility compares with inequality of world income should be considered. (This line of discussion may be skipped by readers who cannot abide such out-of-fashion, unscientific notions as these. However, the temptation is overwhelming to ask such skeptics if they think that Bill Gates enjoys a utility level compared with his subordinates anything like proportional to their relative incomes!)

Diminishing marginal utility of income requires that the relation between the utility of income (U) and income (y) have a negative second derivative. Many different functional forms can be used for the relation-Atkinson has a whole one-parameter family of them-but a common one because it is so simple is of the form U = log y. If the Gini for the world distribution of income in the years between 1960 and 1990 is just over 0.50, what would the Gini for the world distribution of utility be if utility is taken to be the log of income? (Of course, this functional form is entirely arbitrary-at one end of Atkinson's family-so the answer to the question has no operational significance.) How much less than 0.50? The computed values for 1960, 1970, 1980, and 1990 were 0.073, 0.076, 0.074, and 0.069, respectively. Apart from the absolute size of these Ginis they increased and decreased across the decades essentially like the GDP ones."

14. This is done, e.g., in the UN Development Program's construction of its Human Development Index (see UNDP 1994).

15. A point heretofore ignored is whether tastes are the same all over the world. If not, a variety of objections can be raised to the ways in which the ICP makes country real incomes comparable. Certainly, nothing in this section makes sense in the absence of similar tastes. It is reassuring, therefore, to find that, to the limited extent that the ICP data throw light on the issue, they have been found to be consistent at least roughly with the similar-tastes hypothesis (see, e.g., chap. 9 of Kravis, Heston, and Summers [1982] and a number of studies by Henri Theil

16. The authors were surprised at how easy it is to reduce apparently the great disparities in income so ubiquitously displayed around the world! However, there is a problem with basecountry invariance when dealing with utility functions. PWT estimates of country GDPs are denominated in international dollars, but all GDP relations, across countries and time, would be the same if the algorithm underlying PWT was set to generate estimates denominated in some other country's international currency unit. A similar base-country invariance does not carry over for utility expressed as a function of income.

Intercountry Inequality and Intracountry Inequality

Intercountry Inequality Compared with Intracountry Inequality. All discussion so far has treated each country as though its citizens received the same average (per capita or per equivalent adult) income, thus ignoring all intracountry inequality This leads naturally to an interesting question: Is the inequality of average income across countries greater or less than the inequality of income within countries? [17] For example, is the worldwide inequality greater or less than that of the United States and the United Kingdom, India and Indonesia, Bolivia and Brazil, etc.?" Light, if not positive resolution, on the general *inter* versus *intra* question is shed by the following simple, informal exercise. We arrayed the Gini coefficients of the ninety-four countries included in the admirable data set of Deininger and Squire (1996). (Where more than one Gini is provided for a country-for different years-the largest of them was used.) Then the world Ginis (0.539, 0.558, 0.552, and 0.547) were compared with the array to see where world inequality ranks in the country list. Only eighteen of the ninety-four country maximum Ginis exceeded the world's 0.539.19 The implication of this is better understood if the spread in the country Ginis is displayed (see table 16.6).

No obvious viable stochastic model presents itself in table 16.6. The Deininger and Squire data set also contains detailed quintile data for the countries. Examination of the quintile patterns reveals no single functional form to which one can resort in carrying out a decomposition .20 Fortunately, the fact that the World Ginis-for both GDP and consumption-are so deep in the tail of the country distribution makes plausible without a formal statistical test the judgment that the intercountry inequality exceeds the intracountry inequality.21

Total Inequality: Intercountry Plus Intracountry. Nothing new can be said here about world total inequality, but, for completeness, a brief review is presented

17. An analytic economist would ask the question more elegantly, in decomposition terms. Unfortunately, an empirical investigation in such terms requires detailed country data that are not available.

18. For the curious, the country Ginis referred to above are United States, 0.38; United Kingdom, 0.32; India, 0.37; Indonesia, 0.39; Bolivia, 0.42; and Brazil, 0.62.

19. Here, the intracountry Ginis have been compared with the intercountry Gini for GDP Logically, perhaps, they should be compared with the intercountry Gini for consumption. Since the latter differed only very slightly from the GDP Ginis (0.529, 0.549, 0.551, and 0.558 for 1960, 1970, 1980, and 1990, respectively), this shifting of concepts only reinforces the conclusion.

20. The availability of quintile data in the Deminger and Squire data set makes possible the use of a more transparent inequality index (H) for making the same kind of inter- vs. intracountry comparisons. Consider 11, the ratio of the total income received by persons in the top quintile to the total income received by persons in the bottom quintile. (The larger a country's 11, the greater its inequality.) As in the case of the world Ginis the world 11 falls in the upper tail of the frequency distribution of country II's

2 1. Incidentally, it may be remarked that, as expected, the countries represented in the frequency distribution with high Ginis all have low incomes. The eighteen countries with Ginis greater than 0.539 all had low incomes: eight of them had GDP, less than a tenth of that of the United States in 1990, and all were below a third.

Table 16.6 The Spread in the Country Ginis

Gini		Frequency	Gini	Frequency
.25 < G	.30	5	.50 < G< .55	13
.30 < G	.35	12	.55 < G< .60	10
.35 < G< .40	20	.60 < G < .65	3	
.40 < G	.45	17	Total	94
.45 < G	.50	14		

of the work done on this subject in a previous investigation (Summers, Kravis, and Heston 1984). Complete world distributions were synthesized under various conditions to see how the overall Gini (G.) based on the incomes received by all the individuals in each of the countries of the world exceeded the Gini (Gmean) calculated on the assumption that all individuals received the mean incomes of their own countries. An artificial world was defined that consisted of each of the countries included in the Penn World Table of that time (Mark 3), and all the country income distributions were assumed to be lognormal. For each year considered, each country was assigned as its mean income (u_j) the GDP per capita estimate in PWT 3 for that year. The procedure for each trial then was as follows: (i) a Gini coefficient (Gj) was assigned to each country; (ii) each country's income distribution was synthesized on the basis of its (u_j) and assigned Gj; (iii) on the basis of the synthesized country income distributions, the incomes of all the individuals in all the countries were combined into a single world distribution, for which G. was computed; (iv) finally, G. was compared with Gmean. By repeating trials involving different assumptions about the {Gini: country income} relation, it was possible to flesh out in rough terms how much greater Gw would be than Gmean for plausible Gj's.

Various $\{G_j: u\}$ relations were considered: (i) Gj = 0.3 and 0.5; (ii) Gj equals

a rising function of u; (iii) Gj equals a falling function of u; and (iv) Gj equals a Kuznetzian up-and-down function of u. The resulting G.'s based on Gmean 's of about 0.5 were between 0.57 and 0.66. [22]

Where Are the Rich Countries and Where Are the Poor Ones?

To make this question interesting, one must have a basis for judging what kinds of *where* are interesting. The possibilities are endless, starting with a usual breakdown, continents, to breakdowns from big/small or mountainous/ flat to cold/hot or dry/wet. (This sort of list can go on and on. How about old countries/young, or short peopled/tall peopled?) If economic or political categories are the focus, the question becomes the mainspring of the endogenous growth community.

Here, a very brief reference will be made to the geographic classification of countries by Theil and Seale (1994). They distinguish between countries in

22. The point of the original exercise was to start with the actual u_j's of particular years and estimate just how much the G.'s had changed.

the northern temperate zone, in the southern temperate zone, and in various groupings within the world's tropical zone. Contrary to expectation, distance from the equator without adjustment is not a very effective explanatory variable for affluence in simple regressions. However, when the tropical countries are appropriately grouped, the influences for which one thinks distance stands seem to play a critical role. (It would be interesting to know if a mechanical numerical taxonomy algorithm would have led to the same Theil-Seale clusters.)

16.3 The Standard-of-Living Facts

16.3.1 Current Material Well-being: SL

The goods and services that contribute directly to the *current* material wellbeing of the members of a society are those identified in the national accounts as total consumption, which consists of consumption (C: private consumption) and government (G: public consumption). GDP allows for C and G23 but also takes into account the production of goods meant to help in the production of goods in the future. Investment (1), without doubt a praiseworthy activity, has its payoffs-in fact, material well-being payoffs-but they are realized in the future rather than in the present." For many purposes, their potential contribution to material well-being should be noted, but not in valuing *current* material well-being. Therefore, the numerator of the standard-of-living variable, SL, excludes I (and also net foreign investment) from GDP.25

A not very subtle criticism of GDP is that some of the goods valued in GDP do not really generate intrinsic utility. The mildly protesting term *regrettable necessities* is usually used in this situation. The regrettable necessity that plays an important role in SL is *military expenditures.* We accept as a given that, if a society uses a portion of its resources to produce military goods and services, it is because, at the appropriate margin, such goods and services have a greater value to the society than alternative uses of the resources that went into their production. No judgment is made here, explicit or implicit, about the true value to the society of military goods and services. Subtracting military expenditures

23. Participants in the Hicks-Kuznets debate of the late 1930s would want note taken of the Kuznets view that in fact what government buys with its government expenditures are really intermediate goods and services. By accepting the notion of public consumption, we are simply taking the side of the winner of that debate.

24. Gross domestic product is not really the right measure of material well-being, even apart from current well-being considerations. The well-known difficulties associated with estimating depreciation make the more appropriate measure, net domestic product, unpopular. In a future version of the Penn World Table, estimates (of uncertain quality!) will be provided, based on new depreciation rates, for something perhaps called *maintainable* domestic product.

25. Some readers may find it helpful to be reminded of an important difference between the treatment of government expenditures on final goods and services in the system of national accounts and in the national accounts of the United States. In the latter, all public investment is retained in the government category, but in the former it is transferred from government to investment.

from **GDP is not** motivated by pacifist notions of any kind. The point of the exclusion is very simple: whatever the yeas or nays about military expenditures, the military goods and services that they buy are not part of the goods and services that SL is meant to quantify. Cannons, bombers, and submarines do not make a direct contribution to *current material well-being." To* summarize, our definition of SL is

SL = {C + [G - military expenditures]) /population."

The first, most obvious question to ask is whether shifting from GDP per capita to the SL concept makes a difference in one's judgment about countries' relative conditions .211 Figure 16.4 and table 16.7, directly analogous with the GDP materials already discussed, provide the answer to the question: Yes, a little. In general, the gap between the living standards of very poor developing countries and developed ones is a little smaller when measured by SL than by GDP,,. A broad generalization is that the bottom 50 percent of the world has about 10 percent more of the world's SL output than GDP output. To avoid repeating the prolonged GDP discussion but with SL centerstage, the SL discussion will concentrate on the relation between SL/GDPpc (denoted STLIV for short) and GDPpc If STLIV is negatively associated with GDPpc then the world distribution of the goods and services constituting SL will be less unequal than the world distribution of all goods and services; and the opposite will be the case if the association is positive. Without doubt, it is basically negative. In regressions run on a variety of {SL GDPpc} data sets (different years and different collections of countries), the first derivatives were always negative and significantly so. One sample scatter diagram is provided in figure 16.5 to illustrate this. No sophisticated econometric analysis is required to see that the points are higher for very poor countries than for rich ones but that the points for middle countries tend to be lower than those of the rich. In fact, regressions containing quadratic terms on the right confirm that there is a little (significant) curvature in the best fit to the scatter.

26. Nothing in the social sciences is ever entirely free of ambiguity:

1. Suppose that a very poor, homeless, starving person is recruited into the army. The food and quarters supplied by the army surely should be regarded as a contribution to the person's current material well-being and therefore subtracted from the military expenditure total. Unfortunately, the data needed for such an adjustment are not available.

2. Perhaps, for some people in a country, military expenditures buy peace of mind. Is this part of *current material well-being?* A visit to a psychiatrist's couch in quest of peace of mind surely merits inclusion in SL. We think that, for better and not for worse, the more general peace of mind purchased by military expenditures should not be included in St.

The saving grace in all this is that military expenditures are generally only a very small proportion of GDP, and the awkward parts of military expenditures are in most cases not a significant proportion of total military expenditure, This places these considerations in that most familiar of scientific economic categories, a problem acknowledged and then ignored!

27. The consumption and government components of SL have been taken from the Penn World Table (Mark 5.6). The military expenditure component is from Heston and Aten (1993), which supplies references to the original sources of the underlying data.

28. The difference-cubed principle provides the basis for the ultimate, minimum judgment about whether the SL innovation is of any value: A difference that makes no difference is no difference.

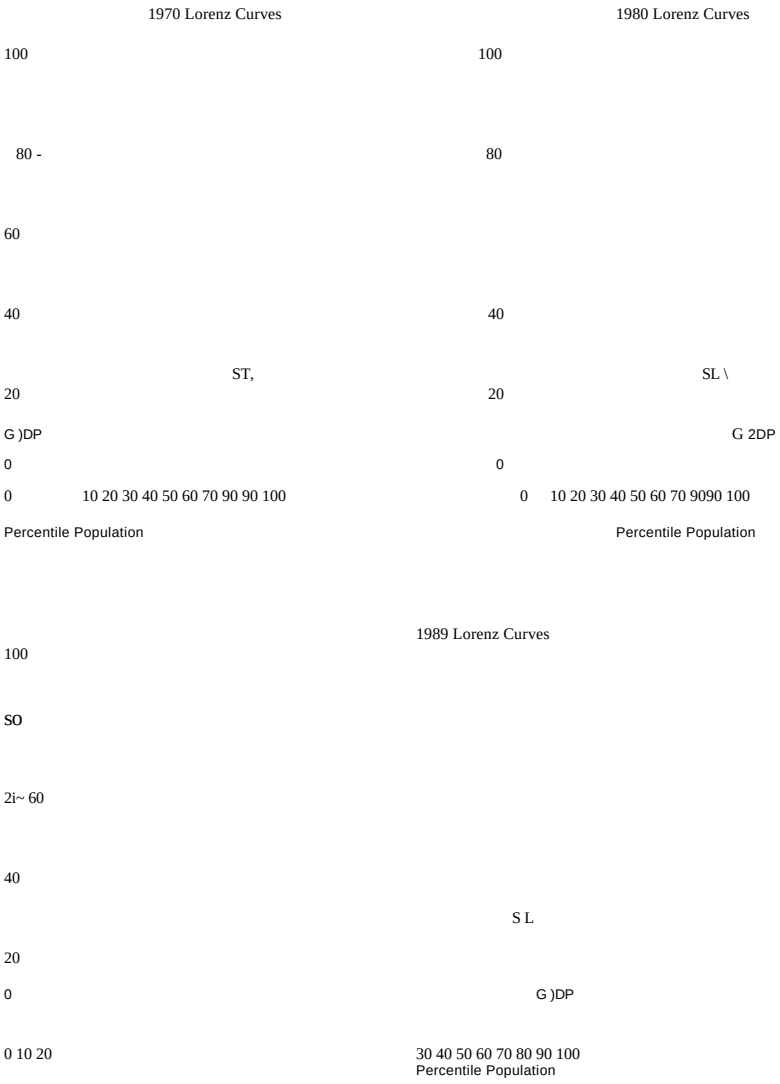


Fig. 16A Intercountry income inequality: GDP and current material wellbeing, 1970, 1980, and 1989

What is going on here? It is convenient to look in detail at the most recent year available, 1989. In that year, STLIV for the United States was 74.9. Then the SL of any country with an STLIV greater than 74.9 would be closer to the U.S. SLus than its GDPpc would be to the U.S. GDP,,. Using GDP,, as the criterion, classify countries into two groups, *richer* (the twenty richest) and poorer (the rest). About four-fifths of these latter developing countries had STLIVs that exceeded 74.9; only a fifth had STLIVs below 74.9. (Could an unusually low U.S. STLIV account for this four-to-one split? No. The simple unweighted average of the STLIVs of all twenty richest countries is even lower than 74.9!) The explanation for this pattern lies in the way the investment and military expenditure shares of GDP vary with GDPpc The investment share significantly exceeds the military expenditure share, and, on average, richer

Table 16.7 Real Shares of World Current Material Well-being: **Standard of Living (SL), 1970,1980,1989**

Low		Middle Oil	Non-oil	Total	Industrial
No. of countries	45	14	51	65	24
1970					
% of population	52.9	4.2	24.1	28.3	18.7
% of SL	15.1	2.9	22.5	25.4	59.5
1980					
% of population	54.8	4.4	23.8	28.2	16.9
% of SL	15.4	4.0	26.0	30.0	54.7
1989					
% of population	56.1	5.0	23.5	28.6	15.3
% of SL	18.1	3.3	25.9	29.2	52.7

	1970	1980	1989
World Gini coefficients for standard of living	.5483	.5385	.5293

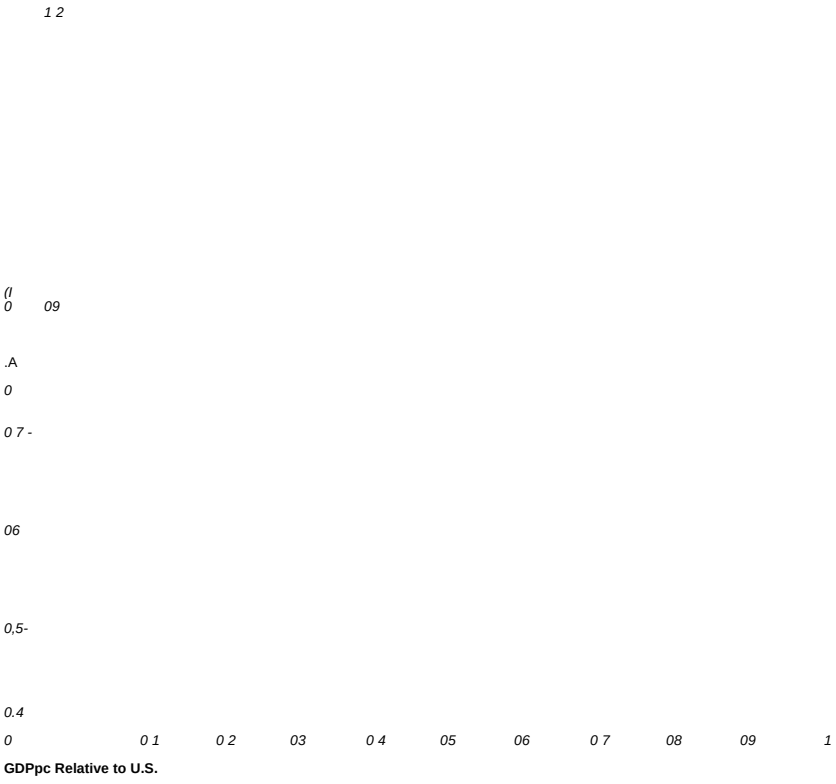


Fig. 16.5 A scatter diagram of the relation between SL/GDPpc and GDPpc relative to the United States, 1980

countries devote a larger proportion of their output to investment than poorer ones. The gap-narrowing tendency is present in all the years covered by tables 16.1 and 16.7.

The logic here is entirely straightforward. Unfortunately, the facts are somewhat less so. Everything said about the rich and the poor has been correct. The middles are not simply halfway between the two, however. This is not enough to make the speculative judgments wrong, but it keeps them from showing up strongly. Figure 16.4 shows how the SL Lorenz curves compare with the GDP Lorenz curves. They look more alike than might be expected because the middle does not toe the same mark as the low. Still, the increment of about 10 percent in the low's share of the world's current material well-being output (compared with the low's share of world GDP) is not at all trivial.

16.3.2 Current Material Well-being: SLq

Consider another variable designed to measure current material well-being, SLq This is an estimate of the average spending on consumption (private only) of the people of a country in the middle spending quintile of the country. (An intuitive way of thinking of this measure is that it is an "expanded median" of the consumption spending distribution. It is meant to reflect the same standard of living idea, but it concentrates on the spending by people in the middle of the spending distribution.)

The data requirement for estimating SL Q is availability of quintile data. These are available for ninety-six countries but in each case only for a quite limited number of years. Trying to construct an intercountry world distribution of SLq would be hopeless under the circumstances, but perhaps one could get an idea of the inequality of that distribution by examining the relation between SL_Q and SL. Regressions of the form SLq = aSL + 0 generated inconclusive results. The estimates of a for 1970 and 1989 data sets were slightly greater than one; the estimate for 1980 was very slightly greater than one. There is no reason for thinking that the world distribution of SLq would exhibit either more or less inequality than that of SL.

16.4 Material Well-being and Longevity

We return to the question of how one might combine a social indicator like longevity (L) with GDP,, to get a social welfare index that satisfactorily takes account of both dimensions of well-being. This topic is raised here, even though no numbers will appear in this section, because, if a good social welfare index can be computed for each country in the world, it would be illuminating to examine the world distribution of the combined welfare that the index represents .[29]

29. In effect, one is looking here for an indifference map that shows the relative preferences for units of material goods and services and years of longevity. In a careful study of the structural

Any simple version of averaging L and GDP_{pc} clearly cannot be satisfactory. The problem is not that the unit of L, years, and the currency unit of GDP_{pc} are incommensurate. A variety of scaling devices can be found to get around that. In constructing its Human Development Index, the UN Development Program (UNDP) in effect computes a country's GDP_{pc} position relative to the richest and poorest countries in the world in percentage terms, does the same for L, and then computes half the sum of the two. (Actually, the UNDP works with more than one social indicator.) This would probably be all right if, instead of an unweighted average, a properly weighted one was used that takes into account the importance— value, that is — of extra international dollars of GDP_{pc} relative to extra years of life. But the UNDP's approach stops far short of that. The trick is to find the right relative values. As indicated above, economists do not find this a formidable problem when the two well-being elements are goods traded in anything resembling free markets. The relative prices provide a basis for the weighting. (Again, why should a Chevrolet be given more weight than a pair of shoelaces in the averaging process? It is not that Chevrolets are big and shoelaces are small but that marginal utility ratios can be assumed to equal price ratios.)

What can be done about valuing more years of life relative to more GDP_{pc}? The economist's natural way to go about this is to look for a market where in effect one can get a dollar reading on the market valuation of an extra year of life. There are no malls or mail-order houses that sell extra years of life although some advertisements seem to offer such a product! However, there is a great deal of activity in which agents make economic decisions (not necessarily spending decisions) that reflect their valuation of an extra year of life. One common thread is to observe what workers do when faced with a choice between a more risky job with greater pay and a less risky one with lesser pay. Perhaps the very substantial "value-of-a-life" literature now published in both mainline and specialized journals can be mined to get, in effect, the needed prices for rich countries. With more difficulty, the same might be done for developing countries.

The various pitfalls here are formidable. (i) Clearly, one must not rely on values arising from just courtroom damage judgments because these are likely to reflect lost earnings; one must stick to the value of living, not capacity to earn while living. (ii) One must avoid the double-counting implicit in greater longevity being bought with the goods and services of the medical or public components of GDP: count the value of extra years but not the cost of the components; count the cost of the components but not the value of the extra years bought with them (essentially what is done now when longevity is ig-

relation between health and goods and services, Pritchett and Summers (1997) use (among other variables) life expectancy as a health indicator. They provide a country cross-sectional scatter diagram that shows just how correlated longevity and GDP per capita are. Their title, "Wealthier is Healthier," indicates the character of the relation. If the relation was monotonic with no scatter around the fitted curve, there would be no need for sec. 16.4 of this paper.

nored); but do not count both. (iii) One should at least try to take account of the shape of the mortality table and not simply its mean value. The extra value to the Japanese of having a longevity of seventy-nine, three years more than that of Americans, would depend on whether the extra three years carry with them the certain quality of life enjoyed by people aged seventy-six, seventyseven, and seventy-eight or the quality associated with other years but with different probabilities. [10]

The approach suggested here has already been exploited by Williamson (1984). The notion in the present discussion is primarily a cross-sectional one, but the Williamson valuation of the increase in longevity in Britain in the eighteenth and nineteenth centuries is a strict time-series counterpart. He supplements the standard estimates of annual growth of real output with an estimate of the corresponding growth rate of the value, expressed in output-growth terms, of increased longevity over the period. His approach is equivalent to what is being suggested here. However, it is to be expected that all the differences between cross-sectional and time-series analyses come into play to make the working out of the details quite different. (For example, Britain was poor in a different epoch from the subsequent ones when it was rich; the feedback from poor to rich in medical knowledge and technology was a reality but not the reverse. In the cross-sectional case, however, the poor countries live in the same epochs as the rich with much more interaction likely to be the rule.)

If one had the necessary data for developing longevity prices in developing countries, one could begin to develop estimates of the world distribution of a welfare that includes longevity as well as material well-being. In the absence of such estimates, one can only speculate on whether the distribution would be more or less unequal than the distribution of material well-being. Would the Lorenz curve of the broader measure of welfare lie above or below the Lorenz curve of GDP alone? The fact that longevity is positively correlated with GDPpc and significantly so, does not resolve the question. The degree of tilt of L/GDPpc with respect to GDPpc plays a critical role.

16.5 Conclusion

The concept *well-being* for people all over the globe has a number of dimensions, some of which have been examined empirically in this paper. *Material* well-being flowing from the availability of goods and services, expressed in either current or long-run terms, has been spelled out in some detail in the form of the world distribution of income and the distributions for different tiers of countries. *Nonmaterial* well-being, for example, longevity, defined for kinds of welfare conditions that do not necessarily flow simply from the availability of goods and services, has been discussed from an empirical point of view, but with only highly speculative conclusions. The problem of quantifying *need* has

30. Account should be taken of the fact that values of different years of life are not all the same.

been examined as well to get a basis for determining how far a quantity of goods and services goes in enhancing the material well-being of any particular population. Most of the empirical conclusions have a time dimension because they cover the forty-year period 1960-90.

Appendix
Country Assignments to Income Groups

Low Income (45)

Benin	Liberia	Zambia
Burkina Faso	Madagascar	Zimbabwe
Burundi	Malawi	Haiti
Cape Verde Islands	Mali	Honduras
Central African Republic	Mauritania	Nicaragua
Chad	Mozambique	Guyana
Comoros	Niger	Bangladesh
Egypt	Rwanda	China
Ethiopia	Sierra Leone	India
Gambia	Somalia	Indonesia
Ghana	Sudan	Myanmar
Guinea	Tanzania	Nepal
Guinea-Bissau	Togo	Pakistan
Kenya	Uganda	Sri Lanka
Lesotho	Zaire	Yemen

Oil Exporting (14)

Algeria	Trinidad and Tobago	Kuwait
Angola	Ecuador	Oman
Congo	Venezuela	Saudi Arabia
Gabon	Iran	United Arab Emirates
Nigeria	Iraq	

Middle Income (51)

Botswana	Seychelles	Guatemala
Cameroon	South Africa	Jamaica
Ivory Coast	Swaziland	Mexico
Mauritius	Tunisia	Panama
Morocco	Barbados	Puerto Rico
Namibia	Costa Rica	Argentina
Reunion	Dominican Republic	Bolivia
Senegal	El Salvador	Brazil

Chile	Philippines	Malta
Colombia	Syria	Poland
Paraguay	Taiwan	Portugal
Peru	Thailand	Romania
Suriname	Bulgaria	Turkey
Uruguay	Cyprus	Soviet Union
Jordan	Czechoslovakia	Yugoslavia
Korea, Republic of	Germany, East	Fiji
Malaysia	Hungary	Papua New Guinea

Industrialized (24)

Canada	Denmark	Netherlands
United States	Finland	Norway
Hong Kong	France	Spain
Israel	Germany, West	Sweden
Japan	Iceland	Switzerland
Singapore	Ireland	United Kingdom
Austria	Italy	Australia
Belgium	Luxembourg	New Zealand

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Comment

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In this provocative paper, Robert Summers and Alan Heston turn from data producers to data users, using their own Penn World Tables (Summers and Heston 1991) to generate "the world distribution of well-being dissected." The authors are careful to note that theirs is essentially a measurement exercise in the level and trend of intercountry inequality, summarized by various measures of inequality as applied to GDP per capita and other related measures of economic well-being. They leave us with few suggestions for further research in this arena, although their concluding sections offer some ideas on concocting broader measures of well-being, for instance, those that include longevity as well as economic well-being.

My comments on this work fall into two areas: first, critical comments on what has been learned here and how it might be improved and, second, a few brief ideas on how to move forward with the issues that are raised in this paper.

Main Findings and Critique

Summers and Heston begin by constructing a set of shares of world output (in constant purchasing power parity-adjusted dollars) generated by the world's various nations and trends in shares of output accruing to various groups of nations. The authors adjust for both number of persons (per capita) and number of equivalent adult units (counting those over age fifteen at 1.0 and those under age fifteen at 0.5). They then show (tables 16.1 and 16.3)

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