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INEQUALITY WITHIN AND AMONG NATIONS

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ABSTRACT:

This paper looks at both within country and among country inequality. In the spirit of Dalton[1920] and Atkinson[1970] this paper reports estimates of the welfare loss arising from inequality. The paper also explores the implications of Duesenberry style interdependent utility functions when a Utilitarian social welfare function is employed and evaluates the appropriateness of the Gini coefficient and the coefficient of variation as possible measures of "depression" or "relative deprivation." The paper reports a variety of measures of inequality for the 82 countries for which comparable data are available from the 1996 *World Development Report*. In 18% of the pair-wise comparisons of inequality in different countries the situation is ambiguous in the sense that neither country Lorenz dominates the other. Shorrocks[1982] Generalized Lorenz curves leave ambiguous 16% of paired welfare comparisons. By a wide variety of alternative measures, inequality among nations is much greater than inequality within countries. The data generated a surprising empirical result: for any utility function satisfying Dalton's Principle of Transfers, the loss of welfare arising from within country inequality is approximately 40% of the loss caused by inequality among nations.

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1. Introduction

This paper looks at within country and among country inequality. A convenient overview is provided by Figure 1 displaying the Lorenz curve for the worldwide distribution of consumption and, for comparison purposes, the Lorenz curves for the United States, the Slovak Republic, and Brazil. It is clear from the graph that inequality is much greater when considered from a global perspective than it is within the United States. Indeed, on a worldwide basis, inequality is slightly higher than in Brazil, the country with the most inequality of all 82 countries for which data is readily available. The global Gini coefficient is calculated in this paper to be 65.5%.

The Lorenz curves on Figure 2 suggest that worldwide inequality results primarily from among country rather than from within country inequality. Removing within country inequality (setting consumption at the average level in each country so as to leave only inequality among countries) would lead to only a slight shift toward equality in the position of the world's Lorenz curve and reduces the Gini coefficient to 56.7;[1] In contrast, removing differences in consumption among countries but leaving within country inequality unchanged (setting each country's average level of income equal to the world average), leads to a substantial shift toward equality and causes the Gini to drop dramatically to 37.7%.

Figure 1: Lorenz Curves

Figure 2: Within versus Among Country Inequality

The next section of this paper reports on a variety of measures of income inequality for the 82 countries for which comparable data are readily available. Pair-wise comparisons of the United States' Lorenz curve with those of the other 81 countries yield 25 cases in which the U.S. curve dominates that of the other country, 24 cases in which the U.S. is dominated, and 32 ambiguous cases where the Lorenz curves cross. About 18% of the 3,321 pair-wise comparisons of inequality between the 82 countries turn out to be ambiguous in the sense that their Lorenz curves cross, neither country Lorenz dominating the other. Section 3, which considers several alternative concepts of income dominance, reports that 16% of welfare comparisons remain ambiguous when Shorrocks's concept of generalized Lorenz dominance is invoked. Section 4, in the spirit of Dalton[1920] and Atkinson[1970], presents social welfare comparisons of inequality. Then Atkinson's concept of "equally distributed equivalent income" is applied in estimating the welfare loss generated by inequality within and among nations. Section 6 directs attention to the implications of Duesenberry style interdependent utilities when a Utilitarian social welfare function is employed and evaluates the appropriateness of both the Gini coefficient and the coefficient of variation as possible measures of "depression" or "relative deprivation."

2. Measuring Inequality: "Objective" Measures

This paper relies upon the compendium of evidence on how the distribution of income varies among countries that is provided by the *World Development Report*, a publication of the World Bank. Table 1 presents data from the 1996 *Report* on the distribution of income by fractiles. Also included are Penn World Table estimates of purchasing power parity adjusted GNP per capita, private consumption as a fraction of GDP, and population. These data are available for 82 countries constituting about 85% of the world's population. The United States appears in the bottom row of the table because the countries are listed in order of purchasing power parity GNP per capita; by this measure, the United States is the most prosperous nation in the World.[2] The technical limitations of the data, documented in the

[1] H. Theil[1989] presented estimates of among country inequality (which he called international inequality) for 116 countries, but he did not present estimates of world inequality encompassing both within and among country inequality. R. Summers, I. B. Kravis, and A. Heston[1984] also estimated among country inequality.

[2]When the comparison is based on exchange rates (referred to as the "Atlas Method" by the World Bank) rather than the more precise Penn World Tables purchasing power parity calculations, the United States ranks behind Norway, Denmark, Japan and Switzerland.

Report, suggest that while the data on the distribution of income may be useful for illustrative purposes, the estimates are subject to more serious qualifications than the data with which economists usually work.[3]

Table 1: World Report Data

The data on Table 2 are derived from the *World Report* data on Table 1. Each country's per capita consumption is estimated by multiplying per capita GNP by the consumption share of GDP. Per capita consumption for each country (Y) is followed by per capita consumption in each fractile (Y_i).[4] To obtain the estimate of consumption in fractile i, let s_i denote the share of total consumption received by that fractile, n the population of the country, and p_i the proportion of the population in the fractile (10% or 20%). Then letting $n_i = p_i n$ denote the number of people in the ith fractile, we have $s_i = n_i Y_i / nY = p_i Y_i / Y$ and so we calculate for the ith fractile $Y_i = s_i Y / p_i$.

Table 2: Inequality Measures

As a first step in examining this evidence it is helpful to note that while Figure 1 revealed unambiguously that income is more equally distributed in the Slovak Republic than in the United States but that there is more income inequality in Brazil than in the United States, the evidence on Figure 3 is ambiguous; we cannot say that the distribution of income in the United States is either more or less egalitarian than the distribution for India because their Lorenz curves cross, neither dominating the other.[5] While the very poor receive larger shares in India than the poor in the United States, the gap between the rich and the very rich is larger in India. Each row of Table 3 asks whether the Lorenz curve of the selected country dominates that of all the others. A plus in the jth column of the ith row signifies that the Lorenz curve of the ith country dominates (i.e., lies above) that of the jth country; a minus indicates that the ith country is dominated by the jth, and a question mark indicates that the pair-wise comparison is ambiguous because the Lorenz curves cross. Thus in the row for the United States we have a "+" for Brazil, a "-" for the Slovak Republic, and a "?" for India. The frequency of each of these three outcomes is reported at the beginning of each country's row: Thus the tally of 25 at the beginning of the United States' row reveals that the U.S. income distribution Lorenz dominates that of 25 countries. The tally of 24 minus signs for the same row reveals that there are 24 countries with Lorenz curves dominating that of the United States. There are 32 question marks indicating ambiguous cases where the Lorenz curves cross — in more than one-third of the cases a comparison of Lorenz curves does not unambiguously reveal whether the distribution in the U.S. is more or less egalitarian than that of the other country. The summary at the

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[3] The Technical Notes to the 1996 *World Development Report*, pp 227-8, explain that several factors limit the comparability of the data, including the following: For the majority of low and middle income countries the fractile data is based on consumption expenditure, which is typically more equally distributed than income. Also, the data are derived from surveys conducted in various years over the 1985-94 decade. Furthermore, some surveys used the individual rather than the household as the unit of observation; also, sometimes the ranking was based on household income and in other cases on personal income.

Comparison of the data for the United States reported in the *World Development Report* with the evidence presented in the 1994 *Statistical Abstract of the United States* (Table No. 741) reveals considerable ambiguity. The *Statistical Abstract* reported that the 1992 share of money income (excluding capital gains) received by the bottom quintile was 3.8%; the bottom share was 0.9% after subtraction of money transfers but with capital gains; it was, 1.1% after taxes, 4.9% after cash and non cash transfers, and 5.1% with imputed return on equity in owner occupied housing. The *World Development Report* does not specify which income concept they employed in generating their estimate of 4.7% share for the bottom quintile.

The data on GDP per capita are based on the Penn World Tables of Summers and Heston[1991] as presented in the *World Development Report*. While Summers and Heston provide a subjective rating of the quality of the data on Gross Domestic Product per capita for each country in their study, the *Report* does not estimate sampling error or indicate sample size for the data on income distribution.

[4] The data on consumption shares are particularly suspected in that inaccuracies in the estimation of fractile shares are confounded with errors in measuring per capita consumption. It might well be preferable to work with an alternative measure of well-being that would take account of non-private consumption. Ideally, one would like to have Eisner estimates of the Total Income System of Accounts for each country. Unfortunately, the Penn World Table data set's new variable, STLIV: Standard of Living Index (Consumption plus government consumption minus military expenditure as a % of GDP), is available for only about 67 of the 82 countries in our data set. In order to test the sensitivity of the calculations presented in this paper to the choice of income or private consumption, the calculations were also executed using shares of GNP rather than just private consumption. The results were for the most part quite similar to those reported here. The notable exception is that the ranking of several former socialist countries is dramatically reduced when consumption rather than GDP is used as a measure of average well-being, as may be seen from comparing the rankings reported on the right-hand panel of Table 2. Per capita GNP (or GDP) is a far from ideal measure in making among country welfare comparisons for a variety of reasons; in particular, it may distort the comparison because different countries devote substantially different proportions of output to the military. Per capita GNP does include investment, thus focusing less on immediate gratification than a purely consumption measure.

[5] It is quite conceivable, of course, that some cross-overs arise from measurement error.

bottom of the table reports that out of the 3,321 pair-wise comparisons there are 622 ambiguous cases where the Lorenz curves cross — 18.7% of the pair-wise Lorenz curve comparisons are ambiguous.[6]

Figure 3 : Lorenz Curve Ambiguities

Table 3 : Lorenz Dominance

The ambiguity in the Lorenz comparison of inequality cannot be easily resolved because there are so many alternative numerical measures of inequality. Several are reported in the center panel of Table 2: The Gini coefficient may be defined geometrically on a graph of the Lorenz curve as twice the area of the crescent shaped region between the 45^o line representing complete equality and the Lorenz curve.[7] The coefficient of variation is the ratio of the standard deviation of income to its mean. T20/B20, the ratio of the share of the top quintile to that of the bottom quintile, is a frequently employed measure of inequality; T10/B20 is the ratio of the top decile to the bottom quintile. Theil[1989] used as a measure of inequality the $\log_e(Y/Y_g)$, where Y is the arithmetic and Y_g the geometric mean of income. This is followed by Y(1-GINI), which is not an index of inequality *per se* but a commonly used inequality deflated measure of per capita consumption. This measure would equal consumption per capita if income were equally distributed but would equal zero with complete inequality (GINI = 1). The right hand side of the table reports on how the countries rank in terms of the various inequality measures. Note that inequality in the United States ranks 53rd out of 82 countries in terms of the T20/B20 fractile ratio, 38th in terms of the Gini coefficient, 33rd in terms of the coefficient of variation, 44th by Theil's $\log_e(Y/Y_g)$ measure. Clearly, we have an embarrassing variety of alternative inequality measures; but ambiguity is inevitable, in part because Lorenz curves cross and in part because each measure is a scalar that cannot fully summarize the information contained in the Lorenz curve.

All of the inequality indicators are reasonable in that they satisfy two criteria that Hugh Dalton[1920] argued any appropriate measure of inequality might be required to satisfy: First of all, an inequality measure should satisfy the "Principle of Transfers," which is the simple statement that the measure should indicate a decrease in inequality if a small amount of income is transferred from a richer person to a poorer person.[8] Second, Dalton considered the "Principle of Proportional Increases in Income" (or "Proportionality of Transfers"), which is the proposition that a proper measure of inequality should show no change if everyone's income is changed by the same percentage. These two principles imply as an immediate corollary to the "Principle of Equal Additions to Income," which states that the addition of an equal increment to every citizen's income reduces inequality;[9] according to this principle, lump-sum per capita taxes generate increased inequality. The principle of proportionality is particularly helpful in that it facilitates the comparison of inequality among countries without having to know or to compare the levels of income in the countries. This principle is consistent with the concept of proportionate taxation as constituting the dividing line between progressive and regressive taxation. While useful, these principles do not serve to effectively limit the range of inequality measures; in particular, they are satisfied by the Gini coefficient, the coefficient of variation, and the fractile ratios (e.g., T20/B20) reported on Table 2.

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[6] Atkinson reported that 75% of the paired comparisons yielded Lorenz curves that crossed in a study based on 12 countries. Shorrocks reports ambiguities in 60% of paired comparisons based on 20 countries.

[7] The Gini coefficients reported in this paper are calculated under the simplifying assumption that the Lorenz curve is piece-wise linear, the distribution of income being uniform within each fractile, which means that G = - 0.8 1st20% + 0.4(4th20%-2nd20%) + 0.7 9th10% + 0.9 10%10%. This procedure consistently underestimates the Gini Coefficient that would be obtained from ungrouped data; Gastwirth[1972] reports that 1968 ungrouped CPS data yields an U.S. Gini of 0.4014 versus 0.3882 for grouped data. The 1996 *World Development Report* presents Gini coefficients calculated with a non-linear parametric procedure for 61 of the 82 countries in our sample; the non-linear procedure yields a Gini that is 1.66 points on average over the 61 countries above that based on the uniform approximation used in this study for the full 82 country sample.

[8] If marginal utility is smaller on average for those with greater income, in accordance with the principle of diminishing marginal utility, then such a redistribution increases total utility.

[9] As Dalton explained, suppose everyone in the community is awarded the same increment of income. The resulting distribution could have been achieved by a two step process: For the first step, increase everyone's income in proportion to the ratio of the increment of income to average income, which would involve the same total transfer and would not change the status quo level of inequality because of the Principle of Proportionality. For the second step, transfer income from wealthier citizens to poorer citizens until everyone's income is adjusted to that obtained directly by the award of equal dollar increments to income. Since the first step did not change the degree of inequality while the second reduced it, the equivalent shift achieved directly by equal additions of income must result in a reduction in inequality.

For certain purposes the choice among the rich variety of alternative measures of income inequality does not generate much ambiguity. Figure 4, which uses the Gini measure in showing how inequality is related to per capita GDP, suggests that while there is greater variation in the degree of inequality among poorer than among wealthier nations, there is no clear relationship between the level of GDP and the degree of inequality; the evidence does not support Simon Kuznets' hypothesis that inequality rises temporarily during the process of economic development.[10] The other indicators of inequality present essentially the same picture.

Figure 4 : Growth & Inequality — the Kuznet Curve?

Estimates of the worldwide Gini Coefficient and the worldwide coefficient of variation presented at the bottom of Table 2 are based on data for the 82 countries covering 85% of the world population. Observe that by all the measures, worldwide inequality is slightly greater than inequality in Brazil. The next to bottom row shows, in the same spirit as Figure 2, that only a modest reduction in worldwide income inequality would result if inequality within each country were miraculously eliminated but there was no shift toward the equalization of variations among countries in per capita consumption. The bottom row reveals what would happen to the indicators of worldwide inequality if variations in per capita income among countries were eliminated but within country inequality remained at its current level. Clearly, these conceptual experiments show that inequality among countries is much greater than within country inequality. Elimination of variation in income among countries would leave world wide inequality at about the level currently prevailing in the United States.[11]

3. Income by Economic Class, Pareto Dominance and Generalized Lorenz Curves

Greater inequality does not necessarily mean lower welfare because those in the most disadvantaged income classes may be receiving a smaller share of a much larger pie. Examination of the evidence on the left-hand panel of Table 2 reporting the income received by households in different classes for each of the 82 countries suggests that it is better to be in the lowest economic class in the United States than to be in that same class in all but three other countries (the Netherlands, Belgium and Japan); those in the lowest quintile in the United States are much better off than the poor in the vast majority of countries, including many such as Hungary with much more egalitarian income distributions. If, in the spirit of John Rawls we were willing to focus our attention on the *least advantaged*, as approximated by the bottom quintile of the income distribution, the 1st20% column on the left-hand-side of Table 1 provides an unambiguous welfare ranking of the 82 countries.

A quite different concept is helpful if we wish to broaden our perspective by considering other economic classes as well as the least advantaged. We might say that country i *Pareto dominates* country j, given economic class, if each income class in country i has a higher level of income than the corresponding class in country j.[12] Table 4 records a plus for the jth column of row i in the case of this type of dominance, a minus when the situation is reversed, and a question mark when the situation is ambiguous. As is clear from the tally of +, - and ? in the first three columns of numbers on the table, for wealthy countries Pareto dominance given class is somewhat more prevalent than Lorenz dominance, which was reported on Table 3. For example, the United States Pareto dominates 77 of the 82 countries listed on the table but Lorenz dominates only 25. Conversely, poorer countries are much more likely to receive a minus sign, About 23% of the 3,321 paired comparisons turn out to be ambiguous in terms of the Pareto dominance criterion.

Table 4 : Pareto Dominance, Given Class

[10] The Kuznet conjecture is discussed by Sudhir Anand and S. M. R. Kanbur[1993]. Part of the greater heterogeneity among low income countries may be due to higher measurement error

[11] These results are consistent with the Summers, Kravis, Heston[1984] conclusion that among country inequality is greater than within country inequality.

[12] The Pareto argument implicitly assumes that individual satisfaction depends only upon one's own consumption and not the consumption of others, which may be violated if inequality leads to envy or jealousy or feelings of relative deprivation. More will be said about this complication later.

Pareto dominance, given economic class, implies that a household might improve its position in life by migrating to a dominating country, *if* it succeeded in staying in the same income fractile. This may be a more compelling economic case for emigration than is provided by just comparing mean or median incomes. But obviously it is not decisive, for as many emigrants have found to their sorrow, an unanticipated consequence of emigration may be a slippage in economic status. When there is a great difference between the average level of income in two countries, Pareto dominance may be *unambiguous*. To illustrate, the data on fractile incomes on Table 2 suggest that members of a Bangladesh household in the top decile of that country's income distribution could decisively improve their economic situation by emigrating to the United States even if they found themselves slipping into the bottom quintile of the US income distribution. However, such unambiguous dominance is rare. The United States unambiguously Pareto dominates only 17 countries, a number which is exceeded by Japan (21), Belgium (20) and the Netherlands (19). Altogether only 273 of the 3,321 pairwise comparisons yield unambiguous dominance regardless of class. Clearly, prospective emigrants from the upper economic class of the vast majority of countries should worry about the down-side outcome of emigration if they should slip into a lower income class when they attempt assimilation into the United States economy.

A defect in the concept of Pareto Dominance, given economic class, is its failure to take into account Dalton's Principle of Transfers. To see why suppose, as a hypothetical example, that initially Country A Pareto dominates Country B, but then in Country A some income is transferred from citizens in the fourth quintile to those in the third and that as a result fourth quintile citizens in Country A are now worse off than 4th quintilers in Country B. Such a transfer is an improvement in terms of the Principle of Transfers; nevertheless, after the transfer Country A's distribution no longer Pareto dominates that of Country B. The generalized Lorenz curve concept, pioneered by Anthony F. Shorrocks [1982], provides an alternative to the Pareto Dominance ranking that does not suffer from this defect. The generalized Lorenz curves on Figure 5 differ from conventional Lorenz curves, L(p), such as those of Figure 3, in that they are scaled upwards by each country's per capita consumption by plotting the product of per capita consumption times L(p), rather than L(p), on the ordinate; i.e., $L_g(p) = YL(p)$. Note that in contrast to the Lorenz curve ambiguities of Figure 3, the generalized Lorenz curve for the United States is uniformly above that of India, implying unambiguously that welfare is higher in the United States.

Figure 5: Generalized Lorenz Curves

Like the Lorenz curves themselves, generalized Lorenz curves may cross, which means that they also provide only a partial ordering of countries. How frequently generalized Lorenz curves cross for the 82 countries in our sample is revealed by Table 5, which is similar in construction to Table 3 and Table 4. Note that the generalized Lorenz curve comparisons reveal that welfare is unambiguously higher in the United States than in all but three countries: the Netherlands, Belgium, and Japan; no country unambiguously dominates the United States. On the other hand, the Slovak Republic Lorenz dominates every country, indicating that it had greater equality, but it is Generalized Lorenz dominated by 22 countries that have an unambiguous higher level of wellbeing.

Table 5: Generalized Lorenz Dominance

4. Social Welfare and the Measurement of Inequality

As William Vickrey[1960] argued,[13] anticipating Rawls[1971] concept of the *Veil of Ignorance*, that it is useful in thinking about inequality to contemplate the problem of decision making under uncertainty that a potential emigrant confronts:[14]

[13] For an earlier reference, see Vickrey[1945].

[14] Contemplating reincarnation provide still another mental experiment offering guidance both in calculating the degree of inequality and in deciding what to do about it. If we believed in reincarnation, where the position we would assume in our future life would be determined purely randomly rather than by either material success or good works in our present life, how would we like to modify the distribution of income? The answer to this hypothetical question obviously depends upon the "sampling frame," whether we are only willing to contemplate a new life in our own country or whether we are able to suppose that the probability of being reborn in any country is proportional to its population. And the answer would also depend on the nature of our utility function.

> "...imagine a series of communities, each with the same resources, with individuals all having the same tastes, but differing within each community as to talents (but each community enjoying the same distribution of talents). Unequal degrees of talent among individuals would tend to produce corresponding differences in individual incomes; we can imagine that each of the communities adopts some form of redistribution policy, which, however, can be pushed beyond a certain point only at the expense of reducing total output through the effects on incentives. Suppose that different policies are adopted in the different communities, and then consider the choice of a potential emigrant who is making up his mind as to which of the various communities to emigrate to... If...he is quite uncertain as to the role that his talents will enable him to fill in the various communities, he may, if his tastes are the same as those of everyone else, make his decision on the basis of maximizing his expected utility... If we identify the social welfare with the attractiveness of the various communities to this prospective emigrant...[and] if the emigrant is completely ignorant as to what role he will fill in the new community and weighs the role of all individuals equally, we get the Benthamite summation of individual utilities..."

For Vickrey, as for most economists, the Veil of Ignorance leads to the maximization of expected utility rather than Rawlsian maximization of the position of the least advantaged, which is max- min.

In his pioneering contribution Hugh Dalton[1920] cited Bernoulli in assuming that the representative individual's utility (or welfare) equals the log of income,

$$U_i(Y_i) = \log Y_i; \tag{1}$$

in addition, Dalton assumed that the social welfare function is Utilitarian,

$$W = \Sigma U_i. \tag{2}$$

Dalton argued that inequality could be defined by comparing actual social welfare, as specified by equation (2), with the level of social welfare that would be attained if the same total were to be equally distributed so that $Y_i = Y = \Sigma Y_i/n$, which would yield total satisfaction of $W^* = n\,U(Y) = n \log_e(Y)$. Specifically, Dalton argued that if we followed Bernoulli in assuming that $U_i(Y_i) = \log_e(Y_i)$ it made sense to define inequality as the ratio $W^*/W = \log_e(Y)/\log_e(Y_g)$, where Y_g is the geometric mean; i.e., for Dalton inequality is the ratio of the $\log_e$ of the arithmetic mean to the $\log_e$ of the geometric mean.[15] Several interesting features about Dalton's analysis deserve note:

1. Since the distribution of Y is often approximately log-normal, $U_i(Y_i) = \ln Y_i$ suggests that utility is approximately normally distributed and $\mu_Y = e^{\mu_u + \sigma_u^2/2}$.
2. If Y is log-normally distributed then $\log_e(Y_{median}) = \mu_u$; i.e. median Y equals the geometric mean of Y. Then Theil's inequality measure, $\log_e(Y/Y_g)$ reported on Table 3, equals $\log_e(Y/Y_{median})$, which is of special interest because Y_{median}/Y is the tax price paid by the median voter for public goods.[16]
3. Dalton's inequality measure, which is close although not identical to Theil's inequality ratio, equals the ratio $\log_e(Y)/\log_e(Y_{median})$ if Y is log normally distributed.

Anthony Atkinson[1970] extended Dalton's line of advance by introducing the concept of *equally distributed equivalent income*, Y_{ede}. This is the level of per capita income which, *if it were equally distributed*, would give the same level of social welfare as is currently realized with actual income as currently distributed; i.e., Y_{ede} is that level of per capita income for which $W = nU(Y_{ede}) = \Sigma U(Y_i)$; or

$$Y_{ede} = U^{-1}[\Sigma U(Y_i)/n]. \tag{3}$$

For example, if $U(Y_i) = \log_e(Y_i)$ then $Y_{ede} = Y_g$. But Atkinson considered a broader class of utility functions

[15] Dalton also considered an alternative utility function, which generated the ratio of the arithmetic to the harmonic mean as the corresponding measure of inequality.

[16] Lovell[1978] and Greene[1982] used a median voter model derived from public choice theory in empirical studies showing that the higher this index the more a community will allocate to the provision of such public goods as education, other things being equal.

$$U(Y_i) = \alpha + \beta Y_i^{(1-\varepsilon)} / (1-\varepsilon), \qquad \varepsilon \geq 0, \tag{4}$$

which has $U_i(Y_i) = \ln Y_i$ as the limiting case as ε approaches 1. The parameter ε can be referred to as the elasticity of marginal utility with respect to Y because marginal utility is $MU = dU/dY_i = \beta Y_i^{-\varepsilon}$ and $dMU/dY = -\varepsilon\beta Y_I^{-(\varepsilon+1)}$, which yields ε = dMU/dY Y/U. Atkinson emphasized that this function constitutes the class of utilty functions for which the Principle of Proportionality of Transfers is valid.[17]

Atkinson also introduced a new measure of inequality, defined as the percentage reduction in income that would just suffice, if equally distributed, to yield the same total satisfaction as is actually realized with actual Y and the existing level of inequality.:

$$I_A = (Y - Y_{ede})/Y. \tag{5}$$

This is the proportion of Y that is lost because income is not equally distributed. Atkinson's measure clearly depends on the utility function; in particular, I_A would necessarily equal zero, regardless of how income were distributed if ε = 0 in (4) so that the marginal utility of income is constant. Atkinson emphasized that (4) constitutes the class of utility functions for which Dalton's Principle of Proportionality of Transfers is valid; i.e., I_A is invariant with respect to equal percentage increases in Y_i.

There is a subtle distinction between the Dalton and Atkinson approaches to the welfare function concept. Dalton assumed that the individual's utility of income equaled the $\log_e$ of income; he coupled this assumption with the simplest of social welfare functions, assuming like Bentham that welfare was the simple sum of individual utilities. Atkinson, in contrast, made income of individual citizens the argument of the social welfare function. While Atkinson's approach makes the parameter ε a characteristic of the social welfare function, Dalton focuses on the properties of the representative citizen's utility function, which provides some hope for empirical support. For example, the parameters of individual utility functions (e.g., ε) might conceivably be measured by observing the behavior of decision makers under uncertainty. And the provocative study of van Pragg[1978] suggests that something in this direction might conceivably be achieved through the use of survey research data.[18]

Of course, even if there were consensus on the use of a particular functional form for utility we might still disagree on the appropriateness of the Benthamite social welfare function. Sen[1973, pp 17-18] objects that this social welfare function leads to the equalization of all individual marginal utilities, which is quite different from equalizing either income or utility when individual utility functions differ.

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[17] Atkinson observed that ε, within the context of decision making under uncertainty, is the Pratt[1964]-Arrow coefficient of relative risk aversion. Atkinson stressed the parallels between the concepts he was developing for the analysis of distribution with analogous concepts in the theory of decision making under uncertainty: Equation 4 displays Pratt-Arrow constant relative risk aversion and Y_{ede} is the analogue of certainty equivalence; further, Dalton's principle of transfers anticipated the mean-preserving-spread of Rothschild-Stiglitz. In the context of Vickrey's emigrant metaphor, the correspondence observed by Atkinson[1970] between key concepts he was developing for the analysis of distributional issues and related concepts in the theory of decision making under uncertainty takes on additional force. When contemplating emigration and its inherent risks, there is more than an interesting correspondence between certainty equivalence and Y_{ede} and between Dalton's principle of transfers and the Rothschild-Stiglitz mean preserving spread. And the parameter ε of equation (4) simultaneously measures both Pratt-Arrow risk aversion and Atkinson constant inequality aversion. The task of choosing the appropriate level of inequality for a hypothetical emigrant comparing alternative communities is a problem of decision making under uncertainty.

[18] It is interesting to note that Dalton's restrictive assumption that individual utility depends on the $\log_e$ of income ($\varepsilon \rightarrow 1$) can not only be justified by appeal to the Bernoulli precedence. Since a log scale is used in measuring many phenomena, including both the volume and pitch of sound and severity of earthquakes, why not the utility of income? And Lewis F. Richardson[1960] used the $\log_e$ of the cumulated total number of fatalities to measure the magnitude of wars and other "deadly quarrels." As Davis[1941] explained in his *Theory of Econometrics*, the logarithmic form may have a psychological basis in the concept of "just-noticeable-difference:" The famous Weber-Fechner Law of Psychophysics, a fundamental psychological law dating from the 19th century, states that at least to a first approximation the strength of a sensation is equal to the logarithm of the strength of the stimulus. For a recent discussion of Psychophysics, see Henry Gleitman[1991]'s introductory psychology text.

5. Interdependent Utility: Depression and Relative Deprivation

Both Dalton and Atkinson assumed that utilities are "individualistic," the utility enjoyed by each person being totally unaffected by what others are consuming. That this assumption may at times be violated is suggested by the Robert Shiller et. al.[1991] report that only 55% of the 361 Moscow residents responding to a telephone survey in May, 1990, supported the following Pareto improving change:

> "Suppose the government wants to undertake a reform to improve the productivity of the economy. As a result, everyone will be better off, but the improvement in life will not affect people equally. A million people (people who respond energetically to the incentives in the plan and people with certain skills) will see their incomes triple while everyone else will see only a tiny income increase, about 1 percent. Would you support the plan?"

Shiller et. al. found that the Pareto improving change was even less palatable to Americans than to residents of Moscow — a 62% majority of New York city residents polled at the same time rejected the Pareto improving reform! Shiller et. al. attribute the difficulty of the Pareto proposition to envy. Their surprising result casts doubt on the conventional assumption that utility depends only upon one's own income rather than being influenced by how much others receive, perhaps because of notions of horizontal equity or jealousy.

In considering issues of inequality and the problem of comparing the level of well-being in different countries, it may prove useful to consider a particular type of asymmetric interdependence, originally analyzed by James Duesenberry [1952, p 101], where "low-income groups are affected by the consumption of high-income groups but not vice versa."[19] We may readily modify Atkinson's utility function to take into account the possibility of interdependent preferences by appending an additional interactive term:

$$U(Y_i) = \alpha + \beta Y_i^{(1-\varepsilon)} / (1-\varepsilon) - \gamma \sum_j \max[(Y_j - Y_i),0] / n. \qquad (6)$$

With this Duesenberry style interdependence of utility complication, the sum-total of satisfaction over all citizens will involve the double sum $\sum_i \sum_j \max[(Y_j - Y_i),0]$.

Professor Amartya Sen[1973, p 33] has pointed out a remarkable fact about this type of interdependence:

> "In any pair-wise comparison the man with the lower income can be thought to be suffering from some depression on finding his income to be lower. Let this depression be proportional to the difference in income. The sum total of all such depression in all possible pair-wise comparisons takes us to the Gini coefficient."

Sen is asking us to suppose that the depression that individual i feels toward individual j is proportional to the income gap,

$$D_{ij} = \max(Y_j - Y_i, 0), \qquad (7)$$

so that the total depression suffered by our ith individual is

$$D_i = \sum_j D_{ij} = \sum_j \max[(Y_j - Y_i),0], \qquad (8)$$

which is from the right-hand side of (6). Then the total depression of all members of the community is

$$D_\Sigma = \sum_{i=1}^{n} D_i = \sum_i \sum_j \max[(Y_j - Y_i),0] \qquad (9)$$

Per capita depression is obviously:

[19] Duesenberry[p 102] explained that this assumption implies that a progressive tax on potential income is necessary for allocative efficiency.

$$\overline{D} = D_{\Sigma} / n = \sum_i \sum_j \max[(Y_j - Y_i),0] / n. \quad (10)$$

Dividing by Y yields a unit free depression index, independent of both Y and n:

$$D = D_{\Sigma} / nY = \sum_i \sum_j \max[(Y_j - Y_i),0]) / nY. \quad (11)$$

Observe that if income were equally distributed we would have D = 0; on the other hand, if one citizen received all income D = 1; therefore, we have $0 \leq D \leq 1$. Sen's proposition is that depression, defined as D in (11), is equal to the Gini coefficient; D = G![20] Thus we might interpret the Gini coefficient as a crude measure of "depression" or perhaps "envy" or "jealousy."

There is an alternative interpretation: the Gini might equally well be regarded as a measure of the discomfort, compassion or guilt suffered by the more well-to-do who do not enjoy their own consumption bundle to its full potential because of concern for those less fortunate than themselves. If the discomfort is proportional to the gap between one's own income and that of individuals with lower incomes, the total discomfort for the ith individual is

$$D_i^* = \sum_j \max[(Y_i - Y_j),0] \quad (8^*)$$

When summed over all i individuals this again leads to the Gini coefficient because it only involves the reversal of the sums in equation (9). This alternative approach yields the same total utility loss due to inequality, but its burden is distributed differently: because it further reduces the utility of the poor, envy or depression suffered by the less fortunate leads to greater variation in utility than when compassion or discomfort lowers the enjoyment of the well-to-do. Indeed, an incongruous implication of the deprivation interpretation of the worldwide Gini coefficient is that it implies that the sum total of utility for poorer countries may well be negative, the utility derived from consumption being substantially less than the disutility of envy.

Substitution of the Gini coefficient measure of interdependence into (6) yields with (2):

$$W = n\alpha + \beta \sum Y_i^{(1-\varepsilon)} / (1-\varepsilon) - \gamma nYG, \qquad \beta, \varepsilon, \gamma > 0. \quad (12)$$

With this interdependent welfare function a change that appears to be Pareto improving in the sense that it increases the possessions of at least one individual and does not reduce the material well-being of any individual may nevertheless lead to a reduction in total welfare, once the generation of the envy externality is taken into account. This may explain why so many of the respondents to the Shiller et al. surveys rejected the hypothetical Pareto improving change.

Yitzhaki[1979] and Hey and Lambert[1980] have argued that the Gini coefficient can be regarded as synonymous with *Relative Deprivation*, a technical social-psychology concept. Alternatively, the Coefficient of Variation rather than the Gini Coefficient might well be taken as the measure of aggregate relative deprivation if we are willing to assume that depression is proportional to the square of the income gap rather than the absolute value of the gap; this follows from the demonstration of Kendall and Stuart [1963, p I-45] (and independently by Kakwani[1980]) that $E(x_i - x_j)^2 = 2s_x^2$. With this square-distance measure of depression, large differences in income receive much greater emphasis than they do with the Gini coefficient. But both the Gini Coefficient and the coefficient of variation are poor measures of relative deprivation as that concept has been defined by social psychologists. It is incompatible with the stress that W. G. Runciman[1966] and others placed on the concept of the salient reference group in formulating the concept of relative deprivation. Runciman[1966, p 11] emphasized that relative deprivation involves a comparison of one's own position with the "situation of some other person or group- ... the 'comparative reference group.'" The Gini measure, in contrast, treats everyone equally rather than focusing on each individual's reference group, which makes the unweighted sum used in calculating depression in equation

[20] Sen's proposition makes sense intuitively in the light of Corrado Gini's remarkable theorem: $2GY = \Sigma\Sigma| Y_i - Y | / n^2$, where the double sum is what statisticians call the "mean difference." Kendall-Stuart[1963, I-49] provide a concise proof that $G = \Sigma\Sigma\max[(Y_j - Y_i),0]/n^2Y$, but attach no significance to this fact other than that it provides a useful procedure for calculating the Gini coefficient.

(8) an inappropriate measure of relative deprivation. A global Gini coefficient can be interpreted as a measure of world wide relative deprivation only if each individual's deprivation is equally influenced by all those with higher incomes, regardless of whether they reside in the same neighborhood, work for the same employer, or live in another country. William Panning[1982] finds that when he makes relative deprivation depend on inequality, but with the tendency to compare mitigated by social distance, the relationship between the Gini coefficient and relative deprivation is no longer monotonic; beyond a point relative deprivation is negatively related to the Gini coefficient. Thus the Gini coefficient and the coefficient of variation can at best be regarded as only very crude measures of relative deprivation.

If the Gini coefficient is to be interpreted as a measure of jealousy or envy, this denigrates the concept of inequality. Thomas Aquinas counted envy as one of the seven deadly sins. And if the problem with inequality is only the loss of well-being arising because the less fortunate experience envy, it would not be an issue of major social concern. Or if the Gini coefficient is interpreted as a measure of "depression," then the appropriate remedy for inequality might be psychiatric counseling rather than an effort at changing the distribution of income. And further, it would behoove anyone who wished to argue that the Gini coefficient is a measure of relative deprivation to show that it is highly correlated with suicide or some other measure of depression, which is manifestly counterfactual.[21]

6. Estimating the Cost of Inequality

It is sometimes argued that per capita output should be deflated to reflect the cost of economic inequality. One such measure, reported on Table 2, is Y(1-G), which deflates per capita output with the Gini coefficient in order to take into account the costs of inequality. This concept, which has been considered by many economists, including Sen[1976], arises as a special case from interdependent utility function (6) if we focus on envy (or "relative deprivation") by assuming that $\alpha = 0$, $\beta = 1$, $\varepsilon = 0$ and $\gamma = 1$:

$$U(Y) = U(Y_{ede}) = Y(1-G). \qquad (13)$$

With a global Gini coefficient estimate of 65.5%, this suggests that total utility is only about one third of its potential. Thus this envy approach suggests that the equal distribution of income, both within and among countries, would increase aggregate welfare if the loss in output resulting from reduced production incentives were less than two thirds.

Quite different estimates of the cost of inequality are obtained by following Dalton in assuming that there is no depression or envy ($\gamma = 0$) and that $\beta = \varepsilon = 1$ so that $U = \log_e(Y)$. Table 6 reports in detail the implications of the assumption that $U(Y) = \log_e(Y)$.

- The first column reports per capita consumption, Y.
- The second column reports per-capita utility actually realized, given the current distribution of income (this is a weighted average of the utilities generated by the consumption reported for each fractiles in Table 2.)
- The third column, labeled Potential U, shows the utility that would be realized if consumption were equally distributed within each country; i.e., Potential $U = \log_e(Y)$.
- The short fall of actual utility below potential is the "lost utility" reported in the 4th column (This is the cost of inequality in terms of the utility that is not realized because income is not equally distributed.)
- The 5th column reports Atkinson's concept of equally distributed equivalent level of income, Y_{ede}. For example, the United States Y_{ede} = \$13,729, which is the level of per capita consumption that would just suffice if equally distributed to maintain currently realized per capita utility of 9.53.
- Column 6th is the Atkinson measure of inequality, $I_A = (Y-Y_{ede})/Y$; this is the extra consumption required because of inequality, relative to current consumption. Thus, for the United States we have (\$17,598 -

[21] Ted Robert Gerr[1970] used an aspiration measure of relative deprivation based on the survey respondent's judgment of the adequacy of their current income relative to their ideal income on a ten-point scale. By this measure relative deprivation was higher in India and Poland than it was in Brazil!

$13,729)/$17,598 = 22% as the estimated loss of output in the United States arising from inequality.[22] By this measure, as with the Gini coefficient, Brazil has by far the highest level of economic inequality; through redistribution Brazil could obtain its current level of total satisfaction with less than half its current aggregate consumption. At the other extreme, the Slovak Republic has an inequality loss of only 5.4%.

- The final columns report the rankings of countries by $Y_{ede,}$ Average Utility, and I_A.

Table 6: On the Costs of Inequality

The bottom section of Table 6 reports estimates of the worldwide welfare sacrifice arising from inequality, averaging over all countries weighted by population, and given the assumption that $U(Y) = \log_e Y$. The equally distributed level of income, Y_{ede} = $1,626, is the level of per capita consumption that would yield, if equally distributed, the same per capita utility as is currently realized with actual per capita consumption of Y = $3,699 as currently distributed. Thus Atkinson's inequality measure is Y_{ede} = 56%, which means that establishing complete equality would yield increased welfare only if the efficiency and incentive losses in output resulting from the redistribution effort were less than 56%. Or to put it another way, a reduction of world Y of 56% could still yield the same degree of average wellbeing if all differences in consumption were eliminated.

The effects of within country inequality and among country inequality are segregated at the bottom of Table 6. Eliminating within country inequality would only raise Y_{ede} to $2,070, holding fixed inequality among nations. Eliminating inequality among nations, but not changing inequality within, would raise Y_{ede} to $2906. Thus the loss from among country inequality is much more serious than the cost of within country inequality. To put it another way, utility lost from within country inequality is only 41.6% as large as the utility lost from among country inequality.

While Dalton's assumption of a logarithmic utility function, $\varepsilon = 1$, may be of particular interest, it is necessary to test the sensitivity of the conclusions to variations in this parameter, which measures the elasticity of marginal utility. The summary statistics presented on Table 7 show, as anticipated that small values of ε (which reduce the curvature of the utility function) generate smaller estimates of the welfare cost of inequality. Nevertheless, it still holds true over a wide range of values for ε that the loss of utility from inequality *among* countries is much greater than the loss of utility arising from *within* country inequality. The bottom row of Table 7 is surprising for it shows that for all reasonable values of ε the loss in wellbeing arising from within country inequality is about 40% of the loss caused by inequality among nations. If the representative utility function satisfies Dalton's Principle of Transfers, then the loss of welfare arising from within country inequality is only about 40% of the loss caused by inequality among nations.

Table 7: Sensitivity Analysis of Inequality Cost Estimates

7. Conclusions

In part because of differences in the degree of inequality, per capita income provides an inadequate yardstick for comparing the levels of wellbeing achieved in different countries. Assistance in making among country comparisons is offered by William Vickrey's suggestion[1960], anticipating Rawls "Veil of Ignorance," that we consider the decision problem confronting an emigrant trying to decide where to migrate. This paper shows that the question of economic class turns out to be of considerable importance in contemplating the possible gain from emigration. Table 4 revealed that the United States Pareto dominates 77 of the 81 other countries for which data are readily available; that is to say, a household emigrating from any one of these 77 countries to the United States will be better off, provided the family is able to avoid sliding into a lower economic class than it was in when it resided in the homeland. However, *unconditional* Pareto Dominance is quite rare: only for 11 countries would a household in the top 10% of the income distribution experience a net gain if it slipped into the bottom quintile of the U.S. distribution after migrating to the United States.

[22]The loss of utility reported in column (4) and the relative loss of income of column (6) are approximately the same because Atkinson's concept is the first term in the Taylor's series expansion of the utility loss; i.e., $\log_e(X) - \log_e(Y) = \log_e(X/Y) = (X-Y)/Y - ½[(x-y)/y]^2 + ...$

If one's position in the new country is to be determined purely randomly, our emigrant faces a problem of decision making under uncertainty. Table 6 revealed that among country differences in income inequality mean that the ordering of countries obtained when ranked by expected utility differs substantially from that generated by per capita consumption, at least when utility happens to be linear in the $\log_e$ of consumption, in accordance with the assumption of Bernoulli and Dalton.

The cost of inequality in terms of unrealized satisfaction depends on the properties of the representative household's utility function. This paper invoked a hybrid utility function, equation (4), which combined the Atkinson class of utility functions for which Dalton's principle of transfers is valid with a Duesenberry style interdependence of utilities function capturing the envy (or relative deprivation) of those with higher incomes.

As a special case of this function, attention focuses on the interdependence of utilities, which according to equations 6 and 8 leads to the Gini coefficient as a measure of envy or relative deprivation. This approach recommends using Y(I-G) as an index of economic wellbeing, in accordance with the analysis of Amartya Sen[1976]. With the worldwide Gini estimate of 65.5% reported on Table 2, this suggests that over half of the world's per capita consumption is lost through inequality. The Gini would drop only slightly, to 56.7% if all inequality within countries were eliminated but the existing degree of inequality remained. It would drop to 37.7% without inequality among nations. These Gini estimates imply that inequality among nations is much greater than inequality within countries.

While the welfare maximizing degree of inequality cannot be determined without information on the reduction in output occasioned by redistribution, a variety of measures show that the loss of satisfaction resulting from inequality is substantial. In terms of the Atkinson measure, if utilities are independent and proportional to the log of income, the worldwide loss from inequality is about 58% of output. While the size of the loss in welfare depends on the magnitude to the elasticity of the marginal utility (ε), Table 7 revealed a surprising empirical result: over a reasonable range of values for ε the estimated loss in welfare from within country inequality is about 40% of among country inequality. Clearly, inequality is a global problem that cannot be addressed at only the national level.

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Table 1: World Report Data

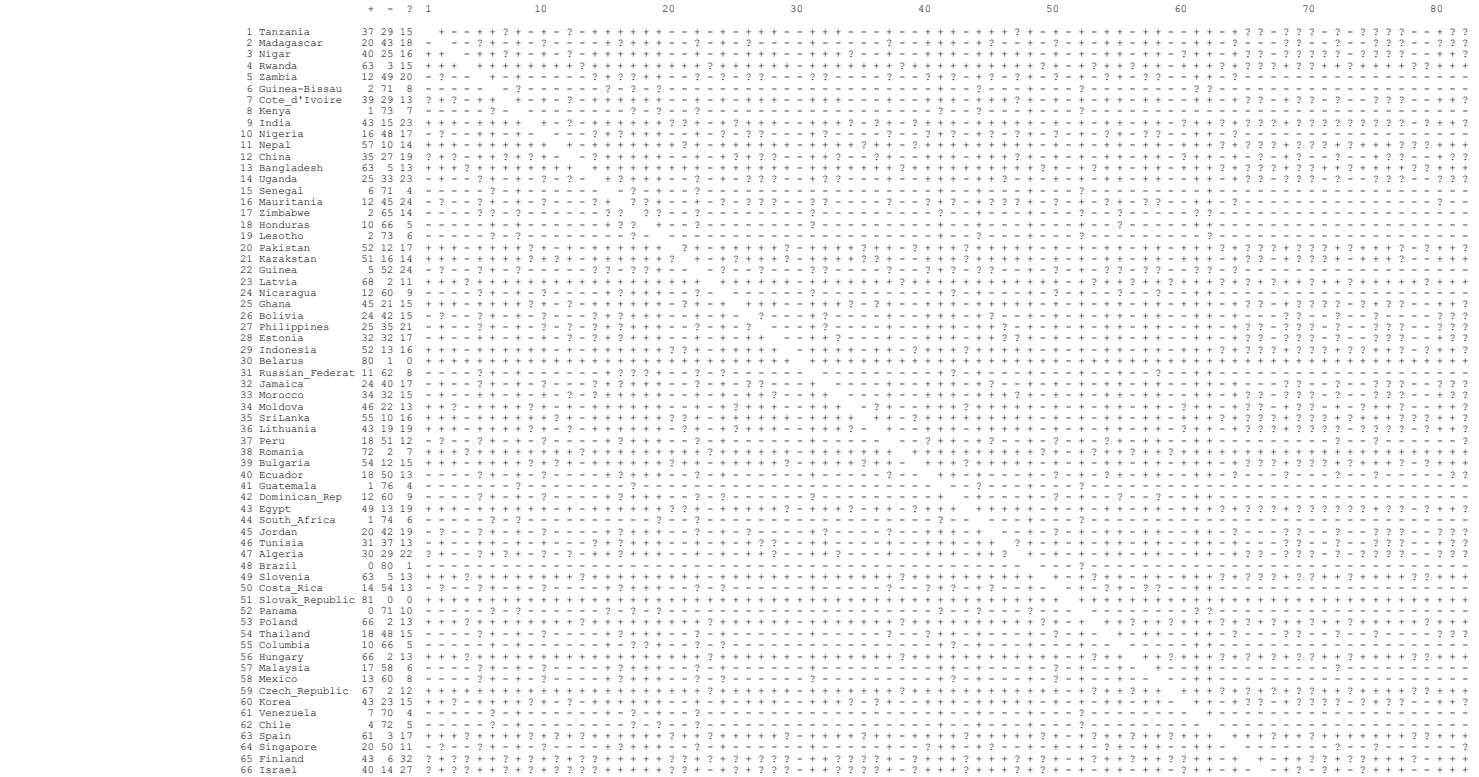
	Country	Fractile Shares (Income or Consumption)						GNP/pc	GNP/n	Con/GDP	Population
		1st20%	2nd20%	3rd20%	4th20%	5th20%	10th10%	(Atlas)	ppp	(percent)	(million)
1	Tanzania	6.9	10.9	15.3	21.5	45.4	30.2	140	620	88	28.8
2	Madagascar	5.8	9.9	14.0	20.3	50.0	34.9	200	640	91	13.1
3	Rwanda	9.7	13.2	16.5	21.6	39.1	24.2	80	740	87	7.8
4	Nigar	7.5	11.8	15.5	21.1	44.1	29.3	230	770	82	8.7
5	Guinea-Bissau	2.1	6.5	12.0	20.6	58.9	42.4	240	820	90	1.0
6	Zambia	3.9	8.0	13.8	23.8	50.4	31.3	350	860	84	9.2
7	Nigeria	4.0	8.9	14.4	23.4	49.3	31.3	280	1,190	79	108.0
8	Nepal	9.1	12.9	16.7	21.8	39.5	25.0	200	1,230	78	20.9
9	India	8.5	12.1	15.8	21.1	42.6	28.4	320	1,280	68	913.6
10	Kenya	3.4	6.7	10.7	17.0	62.1	47.7	250	1,310	62	26.0
11	Bangladesh	9.4	13.5	17.2	22.0	37.9	23.7	220	1,330	85	117.9
12	Cote d'Ivoire	6.8	11.2	15.8	22.2	44.1	28.5	610	1,370	58	13.8
13	Uganda	6.8	10.3	14.4	20.4	48.1	33.4	190	1,410	85	18.6
14	Mauritania	3.6	10.6	16.2	23.0	46.5	30.4	480	1,570	80	2.2
15	Senegal	3.5	7.0	11.6	19.3	58.6	42.8	600	1,580	79	8.3
16	Lesotho	2.8	6.5	11.2	19.4	60.1	43.4	720	1,730	86	1.9
17	Nicaragua	4.2	8.0	12.6	20.0	55.2	39.8	350	1,800	95	4.2
18	Honduras	3.8	7.4	12.0	19.4	57.4	41.9	600	1,940	73	5.8
19	Zimbabwe	4.0	6.3	10.0	17.4	62.3	46.9	500	2,040	64	10.8
20	Ghana	7.9	12.0	16.1	21.8	42.2	27.3	410	2,050	84	16.6
21	Guinea	3.0	8.3	14.6	23.9	50.2	31.7	520	2,061	82	6.4
22	Pakistan	8.4	12.9	16.9	22.2	39.7	25.2	430	2,130	71	126.3
23	Bolivia	5.6	9.7	14.5	22.0	48.2	31.7	770	2,400	79	7.2
24	China	6.2	10.5	15.8	23.6	43.9	26.8	530	2,510	43	1,190.9
25	Philippines	6.5	10.1	14.4	21.2	47.8	32.1	950	2,740	71	67.0
26	Kazakstan	7.5	12.3	16.9	22.9	40.4	24.9	1,160	2,810	60	16.8
27	Moldova	6.9	11.9	16.7	23.1	41.5	25.8	870	3,002	79	4.3
28	Sri Lanka	8.9	13.1	16.9	21.7	39.3	25.2	640	3,160	76	17.9
29	Latvia	9.6	13.6	17.5	22.6	36.7	22.1	2,320	3,220	53	2.5
30	Lithuania	8.1	12.3	16.2	21.3	42.1	28.0	1,350	3,290	76	3.7
31	Jamaica	5.8	10.2	14.9	21.6	47.5	31.9	1,540	3,400	69	2.5
32	Guatemala	2.1	5.8	10.5	18.6	63.0	46.6	1,200	3,440	86	10.3
33	Morocco	6.6	10.5	15.0	21.7	46.3	30.5	1,140	3,470	68	26.4
34	Indonesia	8.7	12.3	16.3	22.1	40.7	25.6	880	3,600	61	190.4
35	Peru	4.9	9.2	14.1	21.4	50.4	34.3	2,110	3,610	70	23.2
36	Egypt, Arab Rep.	8.7	12.5	16.3	21.4	41.1	26.7	720	3,720	81	56.8
37	Dominican Rep	4.2	7.9	12.5	19.7	55.7	39.6	3,080	3,760	80	7.6
38	Romania	9.2	14.4	18.4	23.2	34.8	20.2	1,270	4,090	62	22.7
39	Jordan	5.9	9.8	13.9	20.3	50.1	34.7	1,440	4,100	75	4.0
40	Ecuador	5.4	8.9	13.2	19.9	52.6	37.6	1,280	4,190	70	11.2
41	Belarus	11.1	15.3	18.5	22.2	32.9	19.4	2,160	4,320	51	10.4
42	Bulgaria	8.3	13.0	17.0	22.3	39.3	24.7	1,250	4,380	64	8.4
43	Estonia	6.6	10.7	15.1	21.4	46.3	31.3	2,820	4,510	48	1.5
44	Russian Federation	3.7	8.5	13.5	20.4	53.8	38.7	2,650	4,610	50	148.3
45	Tunisia	5.9	10.4	15.3	22.1	46.3	30.7	1,790	5,020	62	8.8
46	South Africa	3.3	5.8	9.8	17.7	63.3	47.3	3,040	5,130	59	40.5
47	Columbia	3.6	7.6	12.6	20.4	55.8	39.5	1,670	5,330	75	36.3
48	Brazil	2.1	4.9	8.9	16.8	67.5	51.3	2,970	5,400	61	159.1
49	Poland	9.3	13.8	17.7	22.6	36.6	22.1	2,410	5,480	64	38.5
50	Algeria	6.9	11.0	15.1	20.9	46.1	31.5	1,650	5,628	57	27.4
51	Panama	2.0	6.3	11.6	20.3	59.8	42.2	2,580	5,730	61	2.6
52	Costa Rica	4.0	9.1	14.3	21.9	50.7	34.1	2,400	5,774	60	3.3
53	Hungary	9.5	14.0	17.6	22.3	36.6	22.6	3,840	6,080	72	10.3
54	Slovenia	9.5	13.5	17.1	21.9	37.9	23.8	7,040	6,230	55	2.0
55	Slovak Republic	11.9	15.8	18.8	22.2	31.4	18.2	2,250	6,580	53	5.3

56	Thailand	5.6	8.7	13.0	20.0	52.7	37.1	2,410	6,970	55	58.0
57	Mexico	4.1	7.8	12.5	20.2	55.3	39.2	4,180	7,040	70	88.5
58	Venezuela	3.6	7.1	11.7	19.3	58.4	42.7	2,760	7,770	72	21.2
59	Malaysia	4.6	8.3	13.0	20.4	53.7	37.9	3,480	8,440	53	19.7
60	Chile	3.5	6.6	10.9	18.1	61.0	46.1	3,520	8,890	63	14.0
61	Czech Republic	10.5	13.9	16.9	21.3	37.4	23.5	3,200	8,900	58	10.3
62	Korea, Republic of	7.4	12.3	16.3	21.8	42.2	27.6	8,260	10,330	53	44.5
63	Spain	8.3	13.7	18.1	23.4	36.6	21.8	13,440	13,740	63	39.1
64	Israel	6.0	12.1	17.8	24.5	39.6	23.5	14,530	15,300	61	5.4
65	New Zealand	5.1	10.8	16.2	23.2	44.7	28.7	13,350	15,870	60	3.5
66	Finland	6.3	12.1	18.4	25.5	37.6	21.7	18,850	16,150	57	5.1
67	Sweden	8.0	13.2	17.4	24.5	36.9	20.8	23,530	17,130	55	8.8
68	United Kingdom	4.6	10.0	16.8	24.3	44.3	27.8	18,340	17,970	64	58.4
69	Australia	4.4	11.1	17.5	24.8	42.2	25.8	18,000	18,120	63	17.8
70	Italy	6.8	12.0	16.7	23.5	41.0	25.3	19,300	18,460	62	57.1
71	Netherlands	8.2	13.1	18.1	23.7	36.9	21.9	22,010	18,750	61	15.4
72	Germany	7.0	11.8	17.1	23.9	40.3	24.4	25,580	19,480	58	81.5
73	France	5.6	11.8	17.2	23.5	41.9	26.1	23,420	19,670	61	57.9
74	Denmark	5.4	12.0	18.4	25.6	38.6	22.3	27,970	19,880	52	5.2
75	Canada	5.7	11.8	17.7	24.6	40.2	24.1	19,510	19,960	61	29.2
76	Norway	6.2	12.8	18.9	25.3	36.7	21.2	26,390	20,210	52	4.3
77	Belgium	7.9	13.7	18.6	23.8	36.0	21.5	22,870	20,270	62	10.1
78	Japan	8.7	13.2	17.5	23.1	37.5	22.4	34,630	21,140	58	125.0
79	Singapore	5.1	9.9	14.6	21.4	48.9	33.5	22,500	21,900	40	2.9
80	Hong Kong	5.4	10.8	15.2	21.6	47.0	31.3	21,650	22,554	59	6.1
81	Switzerland	5.2	11.7	16.4	22.1	44.6	29.8	37,930	25,150	59	7.0
82	United States	4.7	11.0	17.4	25.0	41.9	25.0	25,880	25,880	68	260.6
	Average	6.2	10.6	15.3	21.8	46.1	30.7	6,697	7,526	67	57.3
	Stand Deviation	2.3	2.5	2.4	1.9	8.4	8.0	9,620	7,227	12	166.5
	Maximum	11.9	15.8	18.9	25.6	67.5	51.3	37,930	25,880	95	1,190.9
	Minimum	2.0	4.9	8.9	16.8	31.4	18.2	80	620	40	1.0

Table 2: Inequality Measures

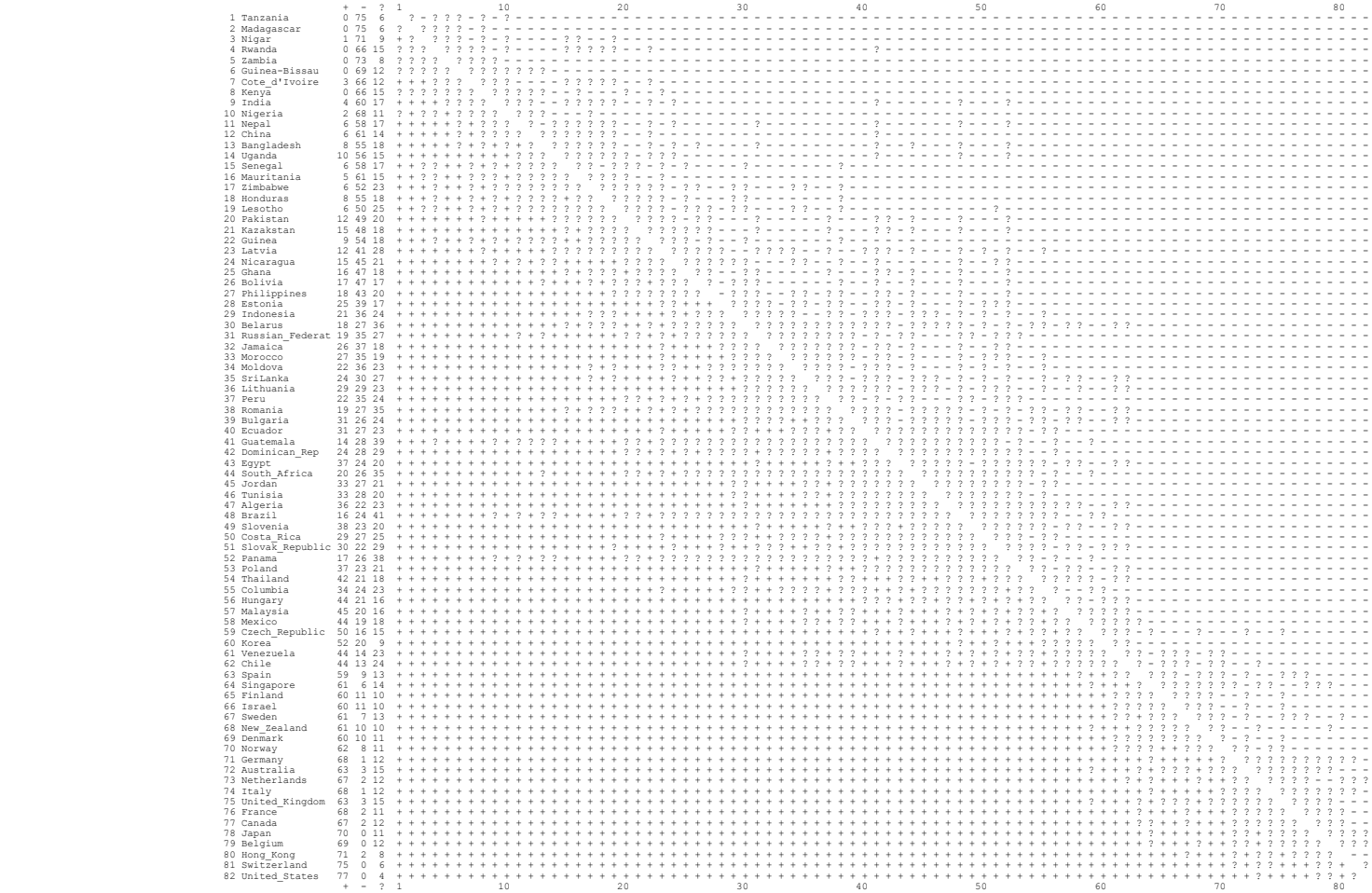
		Consumption							Inequality measures						Ranked by							
Country		Per capita	by fractile						Gini	Coefficient	T20/	T10/	Theil	Y(1-Gini)	Consumption	1st20%	Gini	Coefficient	T20/	T10/	Theil	Y(1-Gini)
			1st20%	2nd20%	3rd20%	4th20%	9th10%	10th10%	Coefficient	of Variation	B20	B20	ratio		per capita		Coefficient	of Variation	B20	B20	ratio	
1	Tanzania	546	188	297	417	587	829	1,648	36.5	75.8	6.6	8.8	22.1	346	1	6	40	44	34	38	38	3
2	Madagascar	582	169	288	408	591	879	2,033	41.5	90.3	8.6	12.0	29.0	341	2	4	57	60	50	54	55	1
3	Rwanda	644	312	425	531	695	959	1,558	27.8	55.8	4.0	5.0	12.3	465	4	17	13	17	9	8	10	7
4	Nigar	631	237	373	489	666	934	1,850	34.5	72.0	5.9	7.8	19.5	414	3	10	35	40	28	32	33	6
5	Guinea-Bissau	738	77	240	443	760	1,218	3,129	53.7	117.4	28.0	40.4	57.7	342	6	1	75	74	79	79	79	2
6	Zambia	722	141	289	498	860	1,380	2,261	44.7	87.3	12.9	16.1	37.1	399	5	3	63	57	64	61	63	5
7	Nigeria	940	188	418	677	1,100	1,692	2,943	43.4	85.4	12.3	15.7	34.5	532	10	5	59	55	61	60	61	9
8	Nepal	959	437	619	801	1,046	1,391	2,399	28.9	58.0	4.3	5.5	13.5	682	11	24	17	19	12	16	16	13
9	India	870	370	527	688	918	1,236	2,472	32.3	68.2	5.0	6.7	16.9	589	9	21	26	36	22	23	23	10
10	Kenya	812	138	272	435	690	1,170	3,874	54.4	130.9	18.3	28.1	53.8	370	8	2	79	80	75	76	76	4
11	Bangladesh	1,131	531	763	972	1,244	1,605	2,679	27.2	53.7	4.0	5.0	11.9	824	13	27	9	14	10	10	8	19
12	Cote d'Ivoire	795	270	445	628	882	1,240	2,265	35.5	71.6	6.5	8.4	20.9	512	7	15	37	39	33	35	36	8
13	Uganda	1,199	407	617	863	1,222	1,762	4,003	39.0	84.8	7.1	9.8	25.1	732	14	22	49	54	40	43	45	17
14	Mauritania	1,256	226	666	1,017	1,444	2,022	3,818	40.7	80.1	12.9	16.9	32.5	745	16	9	54	49	63	63	58	18
15	Senegal	1,248	218	437	724	1,205	1,972	5,342	51.7	116.9	16.7	24.5	48.3	603	15	8	73	73	73	73	73	12
16	Lesotho	1,488	208	484	833	1,443	2,485	6,457	53.7	119.9	21.5	31.0	54.2	689	19	7	74	76	78	78	77	15
17	Nicaragua	1,710	257	684	1,077	1,710	2,633	6,806	49.0	106.6	18.4	26.5	47.4	872	24	12	69	68	76	75	71	20
18	Honduras	1,416	269	524	850	1,374	2,195	5,934	50.3	113.6	15.1	22.1	45.2	704	18	14	71	71	68	70	70	16
19	Zimbabwe	1,306	261	411	653	1,136	2,011	6,123	54.2	129.1	15.6	23.4	52.2	598	17	13	77	78	70	71	75	11
20	Ghana	1,722	680	1,033	1,386	1,877	2,566	4,701	32.6	66.2	5.3	6.9	17.4	1,161	25	33	30	31	24	26	26	25
21	Guinea	1,690	254	701	1,234	2,020	3,127	5,357	45.3	88.2	16.7	21.1	40.6	924	22	11	64	58	72	68	65	21
22	Pakistan	1,512	635	975	1,278	1,679	2,193	3,811	29.8	59.4	4.7	6.0	14.4	1,061	20	32	19	22	20	20	18	22
23	Bolivia	1,896	531	920	1,375	2,086	3,128	6,010	40.5	82.9	8.6	11.3	27.9	1,128	26	26	53	53	49	49	53	23
24	China	1,079	335	567	853	1,274	1,846	2,893	36.4	69.9	7.1	8.6	22.5	687	12	18	39	38	41	37	39	14
25	Philippines	1,945	632	982	1,401	2,062	3,054	6,245	39.1	82.3	7.4	9.9	25.4	1,184	27	31	50	52	43	44	47	26
26	Kazakstan	1,686	632	1,037	1,425	1,930	2,613	4,198	31.5	60.7	5.4	6.6	16.5	1,155	21	30	24	24	25	22	22	24
27	Moldova	2,372	818	1,411	1,980	2,739	3,723	6,119	33.2	64.3	6.0	7.5	18.4	1,585	34	40	33	30	31	31	31	38
28	Sri Lanka	2,402	1,069	1,573	2,029	2,606	3,386	6,052	28.9	58.1	4.4	5.7	13.7	1,708	35	50	16	20	14	17	17	42
29	Latvia	1,707	819	1,160	1,493	1,928	2,492	3,772	26.0	49.9	3.8	4.6	10.9	1,262	23	41	6	4	5	5	6	28
30	Lithuania	2,500	1,013	1,538	2,025	2,663	3,526	7,001	32.2	67.0	5.2	6.9	17.0	1,696	36	48	25	35	23	27	25	41
31	Jamaica	2,346	680	1,196	1,748	2,534	3,660	7,484	39.6	82.1	8.2	11.0	26.5	1,418	32	34	52	51	46	47	50	33
32	Guatemala	2,958	311	858	1,553	2,751	4,852	13,786	56.9	129.9	30.0	44.4	63.8	1,276	41	16	81	79	81	81	81	29
33	Morocco	2,360	779	1,239	1,770	2,560	3,728	7,197	37.7	77.8	7.0	9.2	23.5	1,470	33	38	45	45	38	40	41	35
34	Indonesia	2,196	955	1,351	1,790	2,427	3,316	5,622	30.6	61.1	4.7	5.9	14.9	1,525	29	44	21	25	18	18	20	36
35	Peru	2,527	619	1,162	1,782	2,704	4,068	8,668	43.1	90.5	10.3	14.0	32.2	1,438	37	28	58	61	59	59	57	34
36	Egypt, Arab Rep.	3,013	1,311	1,883	2,456	3,224	4,339	8,045	30.7	63.1	4.7	6.1	15.3	2,088	43	56	22	29	19	21	21	51
37	Dominican Rep	3,008	632	1,188	1,880	2,963	4,843	11,912	48.3	106.8	13.3	18.9	41.0	1,556	42	29	68	69	65	65	67	37
38	Romania	2,536	1,166	1,826	2,333	2,942	3,702	5,122	24.6	45.3	3.8	4.4	10.0	1,913	38	54	3	3	4	3	3	45
39	Jordan	3,075	907	1,507	2,137	3,121	4,736	10,670	41.5	90.0	8.5	11.8	28.9	1,799	45	42	56	59	47	53	54	44
40	Ecuador	2,933	792	1,305	1,936	2,918	4,400	11,028	44.4	98.9	9.7	13.9	33.5	1,630	40	39	62	64	58	58	60	40
41	Belarus	2,203	1,223	1,685	2,038	2,446	2,974	4,274	20.8	39.3	3.0	3.5	7.0	1,745	30	55	2	2	2	2	2	43
42	Bulgaria	2,803	1,163	1,822	2,383	3,126	4,093	6,924	29.5	57.9	4.7	6.0	14.5	1,975	39	53	18	18	21	19	19	48
43	Estonia	2,165	714	1,158	1,634	2,316	3,247	6,776	37.7	79.2	7.0	9.5	23.5	1,349	28	36	44	48	37	42	42	32
44	Russian Federation	2,305	426	980	1,556	2,351	3,481	8,920	47.2	103.3	14.5	20.9	40.7	1,217	31	23	66	66	67	67	66	27
45	Tunisia	3,112	918	1,618	2,381	3,439	4,855	9,555	38.5	78.7	7.8	10.4	25.2	1,914	46	43	47	46	45	45	46	46
46	South Africa	3,027	499	878	1,483	2,679	4,843	14,316	55.9	131.2	19.2	28.7	57.3	1,335	44	25	80	81	77	77	78	31
47	Columbia	3,998	720	1,519	2,518	4,077	6,516	15,790	49.2	107.2	15.5	21.9	43.9	2,031	55	37	70	70	69	69	69	50
48	Brazil	3,294	346	807	1,466	2,767	5,336	16,898	60.6	144.5	32.1	48.9	71.7	1,298	48	19	82	82	82	82	82	30
49	Poland	3,507	1,631	2,420	3,104	3,963	5,085	7,751	26.1	49.9	3.9	4.8	11.1	2,591	53	58	7	5	7	6	7	56
50	Algeria	3,208	1,107	1,764	2,422	3,352	4,684	10,105	37.0	78.9	6.7	9.1	22.7	2,021	47	52	42	47	36	39	40	49
51	Panama	3,495	350	1,101	2,027	3,548	6,152	14,750	54.3	117.7	29.9	42.2	59.7	1,597	52	20	78	75	80	80	80	39
52	Costa Rica	3,464	693	1,576	2,477	3,794	5,751	11,814	44.2	91.1	12.7	17.1	35.5	1,932	50	35	60	62	62	64	62	47
53	Hungary	4,378	2,079	3,064	3,852	4,881	6,129	9,893	25.9	50.3	3.9	4.8	10.9	3,246	56	61	5	6	6	7	5	60
54	Slovenia	3,427	1,628	2,313	2,930	3,752	4,831	8,155	27.1	53.6	4.0	5.0	12.0	2,500	49	57	8	13	8	9	9	54
55	Slovak Republic	3,487	2,075	2,755	3,278	3,871	4,603	6,347	18.7	35.2	2.6	3.1	5.5	2,837	51	60	1	1	1	1	1	59
56	Thailand	3,834	1,073	1,668	2,492	3,834	5,980	14,222	44.4	97.9	9.4	13.3	33.2	2,133	54	51	61	63	54	57	59	52
57	Mexico	4,928	1,010	1,922	3,080	4,977	7,934	19,318	48.2	105.7	13.5	19.1	41.3	2,551	58	47	67	67	66	66	68	55
58	Venezuela	5,594	1,007	1,986	3,273	5,399	8,783	23,888	51.4	116.5	16.2	23.7	47.4	2,718	61	46	72	72	71	72	72	58
59	Malaysia	4,473	1,029	1,856	2,908	4,563	7,068	16,953	46.3	101.2	11.7	16.5	37.3	2,401	57	49	65	65	60	62	64	53
60	Chile	5,601	980	1,848	3,052	5,069	8,345	25,819	53.7	126.4	17.4	26.3	51.9	2,592	62	45	76	77	74	74	74	57
61	Czech Republic	5,162	2,710	3,588	4,362	5,498	7,175	12,131	25.4	51.7	3.6	4.5	10.4	3,849	59	66	4	10	3	4	4	62
62	Korea, Republic of	5,475	2,026	3,367	4,462	5,968	7,993	15,111	32.9	67.0	5.7	7.5	18.0	3,671	60	59	32	34	26	30	29	61
63	Spain	8,656	3,592	5,929	7,834	10,128	12,811	18,871	27.2	51.0	4.4	5.3	12.3	6,300	63	73	10	8	13	13	11	66
64	Israel	9,333	2,800	5,646	8,306	11,433	15,026	21,933	32.6	60.1	6.6	7.8	19.1	6,292	66	68	28	23	35	33	32	65
65	New Zealand	9,522	2,428	5,142	7,713	11,046	15,235	27,328	37.9	74.3	8.8	11.3	25.7	5,912	68	63	46	42	52	48	48	64
66	Finland	9,206	2,900	5,569	8,469	11,737	14,637	19,976	31.0	55.8	6.0	6.9	17.6	6,354	65	69	23	16	30	25	28	67
67	Sweden	9,422	3,769	6,218	8,197	11,541	15,169	19,597	28.1	51.2	4.6	5.2	13.3	6,773	67	75	15	9	17	12	15	68
68	United Kingdom	11,501	2,645	5,750	9,661	13,973	18,976	31,972	38.6	73.6	9.6	12.1	27.6	7,060	75	65	48	41	57	55	52	70
69	Australia	11,416	2,511	6,336	9,989	14,155	18,722	29,452	36.7	68.3	9.6	11.7	26.0	7,231	72	64	41	37	56	52	49	71
70	Italy	11,445	3,891	6,867	9,557	13,448	17,969	28,956	32.9	63.0	6.0	7.4	18.4	7,677	74	77	31	28	32	29	30	74
71	Netherlands	11,438	4,689	7,492	10,351	13,553	17,156	25,048	27.9	51.8	4.5	5.3	13.0	8,248	73	80	14	11	15	14	14	78
72	Germany	11,298	3,954	6,666	9,660	13,502	17,964	27,568	32.3	61.2	5.8	7.0	17.6	7,646	71	78	27	26	27	28	27	73
73	France	11,999	3,360	7,079	10,319	14,098	18,958	31,317	34.8	66.3	7.5	9.3	21.6	7,829	76	71	36	32	44	41	37	75
74	Denmark	10,338	2,791	6,203	9,511	13,232	16,850	23,053	32.6	58.9	7.1	8.3	20.2	6,968	69	67	29	21	42	34	34	69
75	Canada	12,176	3,470	7,184	10,775	14,976	19,603	29,343	33.5	62.1	7.1	8.5	20.4	8,094	77	72	34	27	39	36	35	76
76	Norway	10,509	3,258	6,726	9,931	13,294	16,289	22,280	30.0	53.8	5.9	6.8	16.9	7,360	70	70	20	15	29	24	24	72
77	Belgium	12,567	4,964	8,609	11,688	14,955	18,223	27,020	27.2	50.4	4.6	5.4	12.7	9,147	79	81	11	7	16	15	13	80
78	Japan	12,261	5,334	8,092	10,729	14,162	18,514	27,465	27.7	52.4	4.3	5.1	12.6	8,861	78	82	12	12	11	11	12	79
79	Singapore	8,760	2,234	4,336	6,395	9,373	13,490	29,346	41.5	87.0	9.6	13.1	29.9	5,129	64	62	55	56	55	56	56	63
80	Hong Kong	13,307	3,593	7,186	10,113	14,371	20,892	41,650	39.2	80.5	8.7	11.6	26.5	8,096	80	74	51	50	51	51	51	77
81	Switzerland	14,839	3,858	8,681	12,168	16,397	21,961	44,219	37.2	75.3	8.6	11.5	24.8	9,322	81	76	43	43	48	50	43	81
82	United States	17,598	4,136	9,679	15,311	21,998	29,741	43,996	36.2	66.8	8.9	10.6	24.8	11,233	82	79	38	33	53	46	44	82
	Average	4,647	1,431	2,605	3,757	5,272	7,236	13,108	38.0	78.8	9.6	13.0	27.3	2,977								
	Stand Deviation	4,185	1,353	2,568	3,721	5,090	6,641	10,664	9.6	25.5	6.5	9.8	15.1	2,829								
	Maximum	17,598	5,334	9,679	15,311	21,998	29,741	44,219	60.6	144.5	32.1	48.9	5.5	11,233								
	Minimum	582	77	240	408	591	879	1,558	18.7	35.2	2.6	3.1	71.7	341								
	World	393	744	1,298	2,760	7,169	19,617		65.5	168.7	68	50	82.2	1,606								
	No Among Country Differences	845	1,025	1,337	3,018	9,209	15,239		56.7	127.7	29	18	58.0	2,013								
	No Within Country Differences	1,169	2,007	2,910	4,111	5,807	10,786		37.7	77.1	14	9	24.2	2,893								

Table 3: Lorenz Dominance



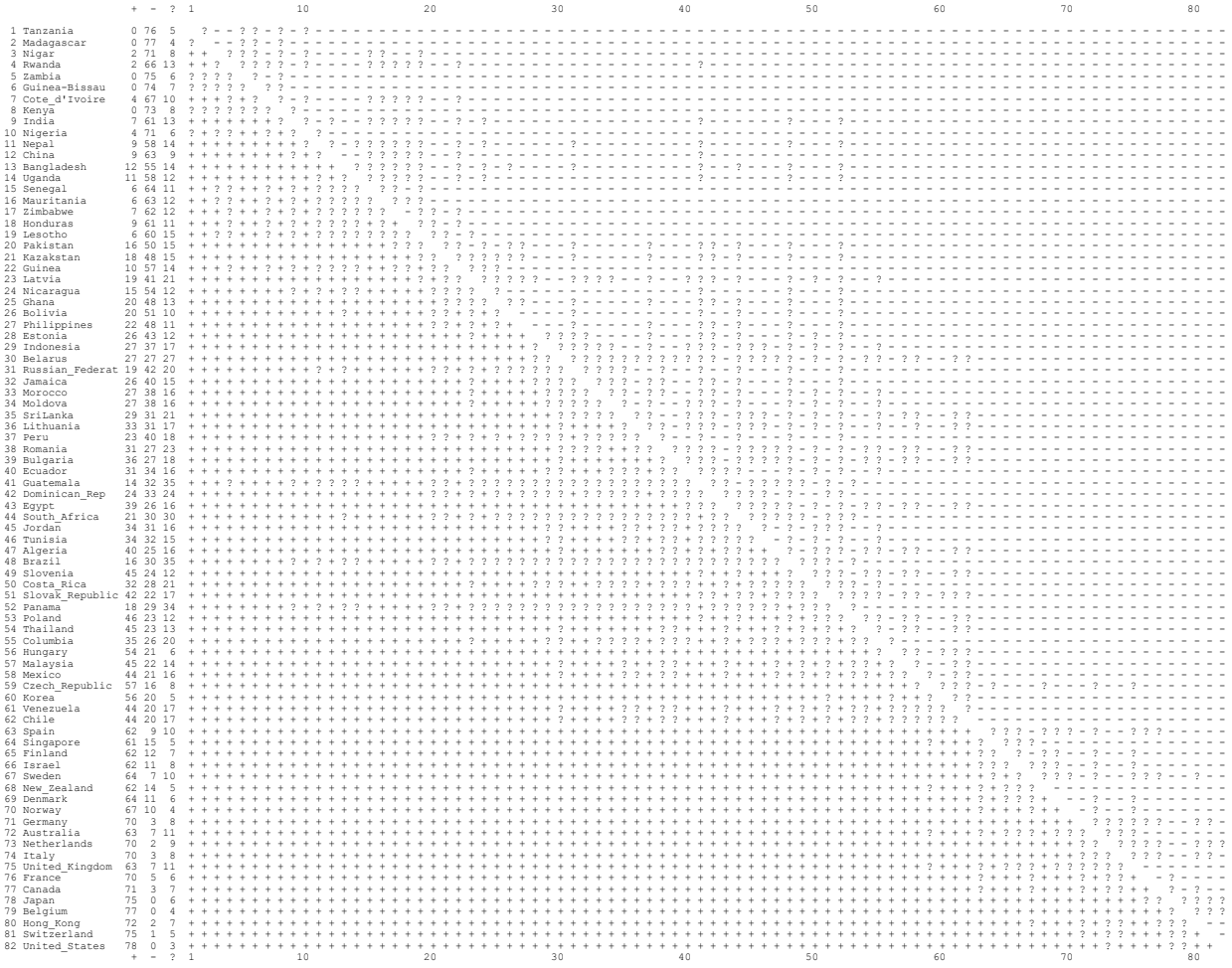
Number of comparisons: 3321; Dominance: 2699; Ambiguities: 622; 18.7% ambiguous

Table 4: Pareto Dominance, Given Class



Number of comparisons: 3321; Dominance: 2572; Ambiguities: 749; 22.6% ambiguous

Table 5: Generalized Lorenz Dominance



Number of comparisons: 3321; Dominance: 2783; Ambiguities: 538; 16.2% ambiguous

Table 6: On the Costs of Inequality ~ $U = \log_e(Y)$

	Country	Y = CON/n (1)	Average Utility (2)	PotentialU U(Y) (3)	Lost Utility (4)=(3)-(2)	Y_{ede} (5)	I_A= $(Y-Y_{ede})/Y$ (6)=[(1)-(5)]/(1)	Ranked by…… Y (8)=Rank(1)	Ave Util (9)=rank(2)	I_A (10)=rank(6)
1	Tanzania	546	6.08	6.30	22.1%	437	19.8%	1	3	38
2	Madagascar	582	6.08	6.37	29.0%	436	25.2%	2	2	55
3	Rwanda	644	6.34	6.47	12.3%	569	11.5%	4	7	10
4	Nigar	631	6.25	6.45	19.5%	519	17.7%	3	6	33
5	Guinea-Bissau	738	6.03	6.60	57.7%	414	43.9%	6	1	79
6	Zambia	722	6.21	6.58	37.1%	499	31.0%	5	5	63
7	Nigeria	940	6.50	6.85	34.5%	666	29.2%	10	9	61
8	Nepal	959	6.73	6.87	13.5%	838	12.6%	11	13	16
9	India	870	6.60	6.77	16.9%	735	15.5%	9	10	23
10	Kenya	812	6.16	6.70	53.8%	474	41.6%	8	4	76
11	Bangladesh	1,131	6.91	7.03	11.9%	1,003	11.3%	13	19	8
12	Cote d'Ivoire	795	6.47	6.68	20.9%	645	18.8%	7	8	36
13	Uganda	1,199	6.84	7.09	25.1%	932	22.2%	14	18	45
14	Mauritania	1,256	6.81	7.14	32.5%	907	27.8%	16	17	58
15	Senegal	1,248	6.65	7.13	48.3%	770	38.3%	15	11	73
16	Lesotho	1,488	6.76	7.30	54.2%	865	41.8%	19	15	77
17	Nicaragua	1,710	6.97	7.44	47.4%	1,065	37.7%	24	20	71
18	Honduras	1,416	6.80	7.26	45.2%	901	36.4%	18	16	70
19	Zimbabwe	1,306	6.65	7.17	52.2%	775	40.6%	17	12	75
20	Ghana	1,722	7.28	7.45	17.4%	1,447	16.0%	25	25	26
21	Guinea	1,690	7.03	7.43	40.6%	1,126	33.4%	22	21	65
22	Pakistan	1,512	7.18	7.32	14.4%	1,309	13.4%	20	22	18
23	Bolivia	1,896	7.27	7.55	27.9%	1,434	24.4%	26	24	53
24	China	1,079	6.76	6.98	22.5%	862	20.1%	12	14	39
25	Philippines	1,945	7.32	7.57	25.4%	1,509	22.4%	27	26	47
26	Kazakstan	1,686	7.26	7.43	16.5%	1,430	15.2%	21	23	22
27	Moldova	2,372	7.59	7.77	18.4%	1,973	16.8%	34	38	31
28	Sri Lanka	2,402	7.65	7.78	13.7%	2,094	12.8%	35	41	17
29	Latvia	1,707	7.33	7.44	10.9%	1,530	10.3%	23	27	6
30	Lithuania	2,500	7.65	7.82	17.0%	2,109	15.7%	36	43	25
31	Jamaica	2,346	7.49	7.76	26.5%	1,799	23.3%	32	33	50
32	Guatemala	2,958	7.35	7.99	63.8%	1,563	47.2%	41	29	81
33	Morocco	2,360	7.53	7.77	23.5%	1,866	20.9%	33	35	41
34	Indonesia	2,196	7.54	7.69	14.9%	1,891	13.9%	29	36	20
35	Peru	2,527	7.51	7.83	32.2%	1,831	27.5%	37	34	57
36	Egypt, Arab Rep.	3,013	7.86	8.01	15.3%	2,585	14.2%	43	51	21
37	Dominican Rep	3,008	7.60	8.01	41.0%	1,997	33.6%	42	39	67
38	Romania	2,536	7.74	7.84	10.0%	2,295	9.5%	38	44	3
39	Jordan	3,075	7.74	8.03	28.9%	2,303	25.1%	45	45	54
40	Ecuador	2,933	7.65	7.98	33.5%	2,098	28.5%	40	42	60
41	Belarus	2,203	7.63	7.70	7.0%	2,055	6.7%	30	40	2
42	Bulgaria	2,803	7.79	7.94	14.5%	2,426	13.5%	39	47	19
43	Estonia	2,165	7.44	7.68	23.5%	1,712	20.9%	28	32	42
44	Russian Federation	2,305	7.34	7.74	40.7%	1,535	33.4%	31	28	66
45	Tunisia	3,112	7.79	8.04	25.2%	2,419	22.3%	46	46	46
46	South Africa	3,027	7.44	8.01	57.3%	1,707	43.6%	44	31	78
47	Columbia	3,998	7.85	8.29	43.9%	2,578	35.5%	55	50	69
48	Brazil	3,294	7.38	8.10	71.7%	1,608	51.2%	48	30	82
49	Poland	3,507	8.05	8.16	11.1%	3,139	10.5%	53	55	7
50	Algeria	3,208	7.85	8.07	22.7%	2,556	20.3%	47	49	40
51	Panama	3,495	7.56	8.16	59.7%	1,924	45.0%	52	37	80
52	Costa Rica	3,464	7.80	8.15	35.5%	2,429	29.9%	50	48	62
53	Hungary	4,378	8.28	8.38	10.9%	3,926	10.3%	56	60	5
54	Slovenia	3,427	8.02	8.14	12.0%	3,040	11.3%	49	53	9
55	Slovak Republic	3,487	8.10	8.16	5.5%	3,301	5.3%	51	57	1
56	Thailand	3,834	7.92	8.25	33.2%	2,751	28.2%	54	52	59
57	Mexico	4,928	8.09	8.50	41.3%	3,261	33.8%	58	56	68
58	Venezuela	5,594	8.16	8.63	47.4%	3,482	37.8%	61	59	72
59	Malaysia	4,473	8.03	8.41	37.3%	3,080	31.1%	57	54	64
60	Chile	5,601	8.11	8.63	51.9%	3,333	40.5%	62	58	74
61	Czech Republic	5,162	8.44	8.55	10.4%	4,650	9.9%	59	62	4

62	Korea, Republic of	5,475	8.43	8.61	18.0%	4,571	16.5%	60	61	29
63	Spain	8,656	8.94	9.07	12.3%	7,654	11.6%	63	65	11
64	Israel	9,333	8.95	9.14	19.1%	7,711	17.4%	66	66	32
65	New Zealand	9,522	8.90	9.16	25.7%	7,367	22.6%	68	64	48
66	Finland	9,206	8.95	9.13	17.6%	7,722	16.1%	65	67	28
67	Sweden	9,422	9.02	9.15	13.3%	8,250	12.4%	67	68	15
68	United Kingdom	11,501	9.07	9.35	27.6%	8,725	24.1%	75	70	52
69	Australia	11,416	9.08	9.34	26.0%	8,802	22.9%	72	71	49
70	Italy	11,445	9.16	9.34	18.4%	9,523	16.8%	74	74	30
71	Netherlands	11,438	9.21	9.34	13.0%	10,043	12.2%	73	77	14
72	Germany	11,298	9.16	9.33	17.6%	9,479	16.1%	71	73	27
73	France	11,999	9.18	9.39	21.6%	9,664	19.5%	76	75	37
74	Denmark	10,338	9.04	9.24	20.2%	8,444	18.3%	69	69	34
75	Canada	12,176	9.20	9.41	20.4%	9,928	18.5%	77	76	35
76	Norway	10,509	9.09	9.26	16.9%	8,877	15.5%	70	72	24
77	Belgium	12,567	9.31	9.44	12.7%	11,063	12.0%	79	80	13
78	Japan	12,261	9.29	9.41	12.6%	10,814	11.8%	78	79	12
79	Singapore	8,760	8.78	9.08	29.9%	6,494	25.9%	64	63	56
80	Hong Kong	13,307	9.23	9.50	26.5%	10,205	23.3%	80	78	51
81	Switzerland	14,839	9.36	9.60	24.8%	11,580	22.0%	81	81	43
82	United States	17,598	9.53	9.78	24.8%	13,729	22.0%	82	82	44

Per Capita ~ unweighted country averages

Average	4,597	7.76	8.03	27.2%	3,635	23.0%
Stand Deviation	4,184	0.96	0.92	15.0%	3,460	10.8%
Maximum	17,598	9.53	9.78	71.7%	13,729	51.2%
Minimum	546	6.03	6.30	5.5%	414	5.3%

Per Capita, country averages weighted by population

Actual:	3,699	7.39	82.1%	1,626	56.0%
Potential , within country inequality eliminated but among country inequality unchanged:	3,699	7.63	58.0%	2,070	44.0%
Potential, among country inequality eliminated but within country inequality unchanged;	3,699	7.97	24.1%	2,906	21.5%
Potential, worldwide equalization of incomes, both within and among nations:	3,699	8.21	0.0%	3,699	0.0%

Ratio of Y_{ede} without Within Country Inequality to Y_{ede} without Among Country Inequality: 71.2%

Ratio of Utility Lost without Among Country Inequality to Utility Lost without Within Country Inequality: 41.6%

Notes:

Y_{ede} - Consumption that would yield actual average utility if equally distributed = U-1(average utility)

I_A = %Ylost = $(Y-Y_{ede})/Y$

Table 7: Global Inequality Costs - Sensitivity Analysis

	\Elasticity of MU(ε).....								
	0.25	0.50	0.75	**1.00**	1.50	2.00	2.50	3.00	4.00
Actual									
Y_{ede}	2993.6	2413.6	1962.8	1626.1	1196.8	955.0	804.4	804.4	562.3
$I_A = 1-Y_{ede}/Y$	19.1%	34.8%	46.9%	56.0%	67.6%	74.2%	78.3%	78.3%	84.8%
Within country inequality eliminated; among country inequality unchanged (everyone in the same country has the same consumption)									
Y_{ede}	3,177	2,726	2,358	2,070	1,688	1,471	1,340	1,340	1,147
$I_A = 1-Y_{ede}/Y$	14.1%	26.3%	36.3%	44.0%	54.4%	60.2%	63.8%	63.8%	69.0%
Among country inequality eliminated; within country inequality unchanged (all countries have same per capita consumption)									
Y_{ede}	3,483	3,279	3,086	2,906	2,577	2,287	2,030	2,030	1,431
$I_A = 1-Y_{ede}/Y$	5.8%	11.4%	16.6%	21.5%	30.3%	38.2%	45.1%	45.1%	61.3%
Worldwide equalization, both within and among countries (everyone has the same consumption options)									
$Y_{ede} = Y$	3,699	3,699	3,699	3,699	3,699	3,699	3,699	3,699	3,699
Ratio of Y_{ede} without Within Country Inequality to Y_{ede} without Among Country Inequality:	91.2%	83.1%	76.4%	71.2%	65.5%	64.3%	66.0%	66.0%	80.2%
Ratio of Utility Lost without Among Country Inequality to Utility Lost without Within Country Inequality:	40.9%	41.4%	41.6%	41.6%	41.3%	40.8%	40.7%	40.7%	50.0%

Figure 1: Lorenz Curves

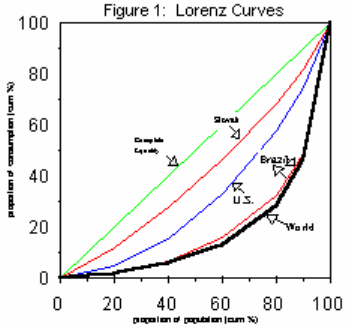


Figure 2: World Inequality

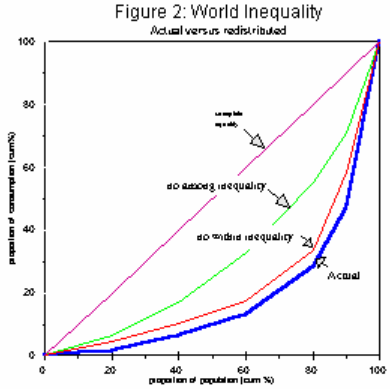


Figure 3: Lorenz Ambiguities

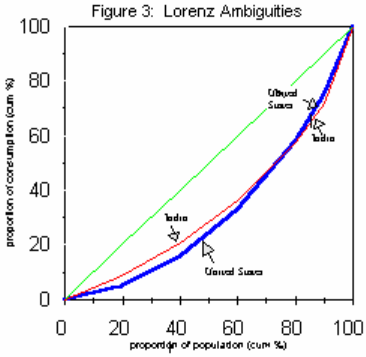


Figure 4: The Kuznet Curve

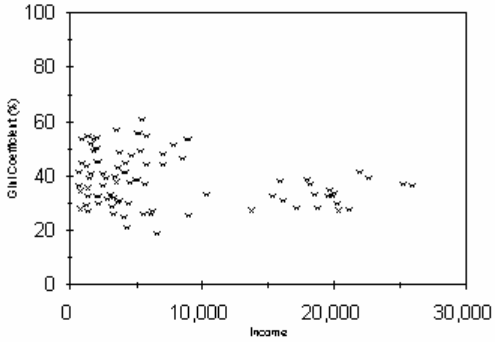


Figure 5: Generalized Lorenz Curves