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Abstract

This paper provides a set of sufficient conditions under which the preferences of an egalitarian social decision-maker accord with majority voting. We show that an additive and concave utilitarian social evaluation function is consistent with the outcomes of majority voting if we restrict the class of income distributions to those that are symmetric under strictly increasing and concave transformations. A particular example is the lognormal distribution. We confirm that the required symmetry condition is generally accepted using an illustration for a panel of 116 countries. Moreover, the proposed methodology provides the inequality aversion parameter that is useful in practice and shows that median income is a good proxy for social welfare.

Keywords: majority voting; social welfare; symmetric distribution; inequality aversion parameter.
JEL classification: D31, D63, H30, P16.

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1. Introduction

Arrow's impossibility theorem demonstrates that if the decision-making body has at least two members, and at least three options to decide among, then it is impossible to design a social welfare function that satisfies *unrestricted domain* (*universality*), *non-dictatorship*, *Pareto efficiency*, and the *independence of irrelevant alternatives* (Arrow, 1950).[2] To deal with Arrow's paradox, we must therefore eliminate or weaken one of these criteria. Among others, the extant literature explores two main proposals: majority voting and social evaluation functions.

Majority voting breaks up with universality by imposing a restricted domain of preferences among voters. For example, if preferences are single-peaked, the majority rule meets Arrow's remaining axioms and society commits to the median voter's preference (Black, 1948). This result has proven useful in many fields. In public economics, for example, the median voter theorem has been applied to the analysis of the demand for redistribution. Romer (1975), Roberts (1977), and Meltzer and Richards (1981), for instance, sought the conditions for progressive taxation as a voting equilibrium outcome. More particularly, they applied the median voter theorem to linear tax schedules.

Subsequently, Gouveia and Oliver (1996) generalized the analysis to two-bracket, piecewise linear tax functions, Cukierman and Meltzer (1991), Roemer (1999) and De Donder and Hindriks (2003) to quadratic tax functions and Carbonell-Nicolau and Klor (2003) to all piecewise linear taxes. In addition, Marhuenda and Ortuño (1995) showed that if the median voter lies below the mean, then any progressive proposal prevails

[2] The original criteria proposed by Arrow were *unrestricted domain*, *nondictatorship*, *monotonicity*, *nonimposition*, and *independence of irrelevant alternatives*. The most recent version is stronger—that is, it has weaker conditions—as nonimposition and Pareto efficiency, and the independence of irrelevant alternatives together do not imply monotonicity.

over a regressive proposal. In the income inequality and growth literature, Alesina and Rodrick (1994) and Persson and Tabellini (1994) justified the negative relationship between growth and income inequality on the grounds of the median voter theorem.

A different strategy to aggregate individual preferences is to assume a social evaluation function. Here, we abandon the axiom governing the independence of irrelevant alternatives. The adoption of a particular social evaluation function relies on a set of generally accepted ethical principles transmitted from society to policymakers. Thus, a government should maximize its social evaluation function. In this framework, the concavity of the social evaluation function ensures that an egalitarian principle, the so-call principle of progressive transfers, applies.

In principle, the two alternatives—majority voting and social evaluation functions—are rather different. On one hand, majority voting represents the real-world aggregation of individual preferences. Moreover, majority voting constitutes an ordinal approach that permits only the partial comparability of social states. On the other hand, a social evaluation function is an *ad hoc* methodology based on a set of desirable assumptions to aggregate individual preferences. Moreover, a social evaluation function constitutes an ordinal or cardinal approach that allows for full comparability between social states. It could therefore be fruitful to study the sufficient conditions under which both alternatives are equivalent. Among other advantages, the development of this unified framework would provide a scenario in which there exists an egalitarian social decision-maker whose preferences accord with majority voting. However, as far as we are aware, there has been no attempt to unify these approaches. The consistency between the outcome of majority voting and a social evaluation function is the aim of this paper.

First, we assume that people vote over distributions. In this manner, we can view changes in the distributions as the result of a political process (see Grandmont, 2006). We then prove that majority voting over distributions that are symmetric under strictly increasing transformations align with the median voter's preferences. Note that a particular example of this kind of distribution is the lognormal income distribution. Afterwards, we show that a particular additive and concave utilitarian social evaluation function for a distribution that is symmetric under a strictly increasing and concave transformation is ordinal equivalent to the corresponding median income. It then suffices to connect these results to show that the welfarist and majority-voting approaches are ordinal equivalents under a set of conditions.

Finally, we test the main assumption of the paper, i.e., the symmetry condition of income distributions under strictly increasing and concave transformations. Assuming general power concave transformations, we test the symmetry hypothesis for 116 countries over several years using the World Bank's POVCAL database. The results confirm that the required symmetry condition is generally accepted. Moreover, our empirical application allows us to provide a consistent aversion parameter of relative inequality for this set of countries. We also show that median rather than mean income is a good proxy for social welfare. This finding permits us to deal with complex dimensions of income distributions, say social welfare, in an easy manner that constitutes a good outcome for other fields, like macroeconomics.

The organization of the paper is as follows. In Section 2, we show that the median voter's preferences drive the solution for majority voting under the symmetry condition. In Section 3, we link the social evaluation function of a distribution that is symmetric under a strictly increasing and concave transformation with the corresponding median income. We also deal with the unification of majority voting and the class of social evaluation functions. Section 4 provides an empirical illustration. Section 5 concludes.

2. A result on majority voting

We begin our analysis with some notation and definitions. Assume an odd finite number of individuals, *n*, that decide over income distributions described by the profile:

$$(x_1, x_2, \dots, x_n) \in \mathbb{R}^n_{++},$$

where x_i is the income of individual i, assumed positive.[3] Let $T = \{(x_1, x_2, \dots, x_n) \in \mathbb{R}^n_{++} \ / \ 0 < x_1 \leq x_2 \leq \cdots \leq x_n\}$ be the set of all ordered profiles with increasing order.

When comparing two distributions, $X = (x_1, x_2, \dots, x_n) \in T$ and $Y = (y_1, y_2, \dots, y_n) \in T$, we define the individual *gain function* of passing from *X* to *Y* as $g_i(X, Y) = y_i - x_i$, for all $i = 1, 2, \dots, n$. We assume that there is no reranking among individuals between *X* and *Y*. For example, if *X* is pre-tax income and *Y* is post-tax income, we guarantee—as do all real-world statutory tax policies—that the ranking of taxpayers is identical. Similarly, we define the individual *voting function* of passing from *X* to *Y* as follows:

$$v_i(X, Y) = \begin{cases} 1 & g_i > 0 \\ 0 & g_i = 0 \\ -1 & g_i < 0 \end{cases}$$

for all $i = 1, 2, \dots, n$.

Consequently, *Y* is weakly preferred to *X* under the majority voting rule, $Y \succsim X$, if and only if $\sum_{i=1}^{n} v_i \geq 0$. Alternatively, *Y* is strictly preferred to *X* under the majority voting

[3] We assume, without lost of generality, that *n* is odd, which ensures that the median income exists. Moreover, our discrete framework converges to the continuous case as *n* tends to infinity.

rule, $Y \succ X$ if and only if $\sum_{i=1}^{n} v_i > 0$. Finally, Y is indifferent to X under the majority voting rule, $X \sim Y$ if and only if $\sum_{i=1}^{n} v_i = 0$.

Let $X = (x_1, x_2, \ldots, x_n) \in T$. Then, the quantile function of the profile X, Q_X, is defined as $Q_X: \left\{\frac{1}{n}, \frac{2}{n}, \ldots, 1\right\} \to \mathbb{R}_{++}$, where $Q_X(i/n) = x_i$ for all $i = 1, 2, \ldots, n$. Moreover, the mean and median values of X are μ_X and m_X, respectively.

Let $X^- = (x_1^-, x_2^-, \ldots, x_r^-)$ and $X^+ = (x_1^+, x_2^+, \ldots, x_r^+)$ be the ordered subvector of incomes below and above the median value m_X, respectively. By construction $2r+1 = n$. Then, a profile X is said to be symmetric if it satisfies the following property:

$$D(m_X, x_j^-) = D(x_{m+1-j}^+, m_X)$$

for every $j \in \{1,2, \ldots, m\}$, where D is the Euclidean distance. Let $\mathbb{S}$ be the set of all symmetric profiles.

Now, if $X \in \mathbb{S}$ the quantile function $Q_X(\cdot)$ will verify that:

$$Q_X(p_{m_X} + k) - Q_X(p_{m_X}) = Q_X(p_{m_X}) - Q_X(p_{m_X} - k),$$

for every $k \in \left\{\frac{1}{n}, \frac{2}{n}, \ldots, \frac{n-1}{2n}\right\}$, where $p_{m_X} = \frac{n+1}{2n}$ is the population share up to the median value of the profile X. Note that $Q_X(p_{m_X}) = m_X$.

After presenting some basic definitions, we now show that majority voting over distributions that are symmetric under strictly increasing transformations yields the median voter's preferences. The proof of Theorem 1 is in the Appendix.

Theorem 1

Let $X = (x_1, x_2, \dots, x_n) \in T$ and $Y = (y_1, y_2, \dots, y_n) \in T$ be two distributions of an odd number n of positive incomes. Assume a strictly increasing transformation $f(\cdot)$ that simultaneously generates $X' = (x_1^{'}, x_2^{'}, \dots, x_n^{'}) \in \mathbb{S}$ and $Y' = (y_1^{'}, y_2^{'}, \dots, y_n^{'}) \in \mathbb{S}$, which are symmetric, where $x_i^{'} = f(x_i)$ and $y_i^{'} = f(y_i)$ for all $i = 1, 2, \dots, n$. Then, majority voting over X and Y is fully characterized by the median income, i.e.:

$$X \sim Y \iff m_X = m_Y,$$

$$X \succ Y \iff m_X > m_Y ,$$

$$X \prec Y \iff m_X < m_Y .$$

We offer a simple but illustrative example of this result. Assume that income is lognormally distributed. The lognormal distribution is a general function used traditionally to represent the distribution of income in the economics literature (see, among others, Aitchison and Brown, 1957 and Cowell, 1995). Two reasons justify the general use of the lognormal distribution. First, the product of independent normal distributions converges asymptotically to a lognormal distribution (see Gibrat, 1957). Accordingly, we can view the income generation as the product of multiple factors over time. Second, lognormal distributions capture reasonably well the negative skewness that characterizes income distributions in practice.[4]

Let $X = (x_1, x_2, \dots, x_n) \in T$ and $Y = (y_1, y_2, \dots, y_n) \in T$ be lognormal distributions of income. If we apply the log transformation to the distributions X and Y, we obtain the

[4] The generalized beta, gamma, Sign–Maddala, and Dagum distributions are other parametric distributions widely used to represent income distributions.

symmetric distributions $X_l = \ln X \sim N(\mu_X^l, \sigma_X^l)$ and $Y_l = \ln Y \sim N(\mu_Y^l, \sigma_Y^l)$, respectively, where μ^l and σ^l are the corresponding mean and standard deviation. Note that $m_X = \exp(\mu_X^l)$ and $m_Y = \exp(\mu_Y^l)$ because of the symmetry of the distributions X_l and Y_l, respectively.

Income follows a lognormal distribution, so that the quantile functions associated with any percentile $p \in [0,1]$ are:

$$Q_X(p) = exp\left[\mu_X^l + \Phi^{-1}(p)\sigma_X^l\right]$$

$$Q_Y(p) = exp\left[\mu_Y^l + \Phi^{-1}(p)\sigma_Y^l\right] \qquad (1)$$

where Φ^{-1} (p) is the inverse function of the standard normal cumulative distribution function. This function Φ^{-1} (p) is continuous and takes the following values:

$$\Phi^{-1} = \begin{cases} <0 & p<0.5 \\ 0 & p=0.5 \\ >0 & p>0.5 \end{cases} \qquad (2)$$

for all $p \in [0,1]$.[5]

Assume that $m_X = m_Y$, then it is true that $\mu_X^l = \mu_Y^l$. It is clear from (1) and (2) that if $\sigma_X^l > \sigma_Y^l$, all individuals below (above) the median are better (worse) off under *Y*. That is, if $\sigma_X^l > \sigma_Y^l$, we will have $v(p) = 1$ for all $p < 0.5$ and $v(p) = -1$ for all $p > 0.5$. In the same manner, if $\sigma_X^l < \sigma_Y^l$, we have $v(p) = -1$ for all $p < 0.5$ and $v(p) = 1$ for all $p > 0.5$. In both cases, there is a technical tie under majority voting. Therefore, if (and only if) the median income remains constant, majority voting will be indifferent between *X* and *Y*.

[5] Note that in the continuous case, the population share of the median value exactly equals 0.5.

Now, assume that $m_X < m_Y$ so $\mu_X^l < \mu_Y^l$, and $\sigma_X^l > \sigma_Y^l$. Then, all individuals up to the median will be better off under *Y*, that is, $v(p) = 1$ for all $p \leq 0.5$. However, we can say nothing about individuals above the median. Therefore, society will vote for the profile *Y*. In the same manner, if $m_X < m_Y$ and $\sigma_X^l < \sigma_Y^l$, it is true that $v(p) = 1$ for all $p \geq 0.5$. Yet again, under majority voting we will elect the profile *Y*. Finally, if $m_X > m_Y$, we can prove in an analogous manner that society will elect the profile *X*.

The main assumption in Theorem 1 requires that the profiles over which society has to vote are symmetric under the same strictly increasing transformation. Let $\mathcal{H}$ be the class of distributions such that a function $f(\cdot)$ exists which maps each element of $\mathcal{H}$ into a symmetric distribution. It is obvious that the larger the class $\mathcal{H}$, the less restrictive is the assumption in Theorem 1. Accordingly, we need to test the amplitude of the class $\mathcal{H}$. We answer this question empirically in Section 4. In particular, we test the symmetry of 509 real distributions for a particular class of strictly positive (and concave) transformations (the power transformation). The conclusion is that the assumption is not very restrictive in practice.

Two final remarks about Theorem 1 are worth noting.

Remark 1. Theorem 1 assumes that the transformation $f(\cdot)$ is only strictly increasing. However, we show below that it is worth assuming that the relevant transformation to make the distribution symmetric is not only strictly positive, but also strictly concave.

Remark 2. We can connect our framework with the literature on voting over taxes by assuming that profiles *X* and *Y* are post-tax income distributions from different tax systems. However, this line of research goes beyond the scope of the present paper.

3. An egalitarian social decision-maker whose preferences accord with majority voting

Assume an egalitarian social decision-maker (SDM) with a social utility-of-income function $U(\cdot)$. In this manner, social preferences are disinterested or impersonal. Moreover, we assume that the form:

$$W(X) = F\left[\frac{1}{n}\sum_{i=1}^{n} U(x_i)\right]$$

is the evaluation function of such a SDM, where F is any increasing function. Thus, the SDM evaluates utility in society as a monotone transformation of the average utility. That is, social welfare is an additive utilitarian function (see Kolm, 1969 and Atkinson, 1970). Note that the veil of ignorance (see Harsanyi, 1953) gives another interpretation of the last expression in terms of risk. The adopted evaluation function would represent the way impartial observers evaluate overall welfare according to its expected value.

Now, bearing these assumptions in mind, and assuming the class $\mathcal{W}^o$ of additive utilitarian social evaluation functions, we find the following result.

Theorem 2

Let $X = (x_1, x_2, \dots, x_n) \in T$ and $Y = (y_1, y_2, \dots, y_n) \in T$ be two distributions of positive incomes. Assume a social evaluation function $W \in \mathcal{W}^o$ and a strictly increasing and concave utility function $U(\cdot)$ that simultaneously generates $X', Y' \in \mathbb{S}$ that are symmetric, where $x_i' = U(x_i)$ and $y_i' = U(y_i)$ for all $i = 1, 2, \dots, n$. The social evaluation function is then fully characterized by the median income, i.e.:

$$W(X) = W(Y) \iff m_X = m_Y,$$

$$W(X) > W(Y) \iff m_X > m_Y ,$$

$$W(X) < W(Y) \iff m_X < m_Y .$$

Proof: Given that the utility function $U(\cdot)$ is strictly increasing, $m_{X'} = U(m_X)$. Moreover, we have $m_{X'} = \mu_{X'}$ because the distribution X' is symmetric. Noting that $W(X) = F[\mu_{X'}]$, we arrive at the following result:

$$W(X) = F[U(m_X)].$$

The social evaluation function is a strictly increasing transformation of median income. Therefore, the social evaluation function is ordinal equivalent to median income.

This result shows that we can characterize additive utilitarian social welfare by the median income if we consider the appropriate transformation. In this respect, it is interesting to realize that social welfare, $W(X)$, is by definition average utility, which in turn is $U(x_{ede})$ where x_{ede} is the equally distributed equivalent income, so the median income, m_X, must equal x_{ede}.[6] We illustrate this result later.

We can see that median income can be used as a proxy for social welfare. In this respect, it is worth noting that real national income comparisons are typically based on real per capita income (μ). In this manner, these comparisons explicitly omit distributional considerations. On the contrary, Sen (1976) has proposed the use of

[6] The equally distributed equivalent income is the level of income which, if distributed equally to all individuals, would generate the same welfare as the existing distribution *X*.

$\mu(1-G)$, where G is the Gini coefficient, to permit a welfare interpretation of real income comparisons.[7] We propose instead the use of real median income because it is ordinal equivalent to social welfare (Theorem 2). We contrast this proposal in the empirical exercise (Section 4). Our results show that real median income tracks welfare much better than real mean income and $\mu(1-G)$.

Finally, we obtain the main result of the paper by combining the results in Theorem 1 and Theorem 2. Namely, a particular additive and concave utilitarian social evaluation function is consistent with the outcome of majority voting if the income distributions are symmetric under strictly increasing and concave transformations. In principle, majority voting and social welfare are different alternatives to aggregate individual preferences. The results in Theorems 1 and 2 together provide the sufficient condition under which both approaches are consistent.

We provide an illustrative example of this result. Assume an initial distribution of positive incomes $X = (x_1, x_2, \dots, x_n) \in T$ and the following family of power transformations:

$$f(x_i) = \begin{cases} \dfrac{x_i^{1-\varepsilon}}{1-\varepsilon} & 0 < \varepsilon \neq 1 \\ ln\, x_i & \varepsilon = 1 \end{cases}$$

for all $i = 1, 2, \dots, n$. These transformations are strictly increasing and concave, where the parameter ε is positive to ensure strict concavity. This family of power transformations has been used traditionally to model income distributions. For example, Schwartz (1985) examined the full family of power transformations using several years of US income data. He found that a transformation intermediate between the log

[7] Actually, the $\mu(1-G)$ proposal is a particular case of a more general framework developed by Sen (1976) for real income comparisons.

transformation and no transformation, say $\varepsilon = 2/3$, most closely approximated income distributions in the US.[8]

More importantly, the family $f(\cdot)$ corresponds to the utility function used in Kolm (1969) and Atkinson (1970).[9] In this framework, the parameter ε represents the relative aversion to inequality (see Pratt, 1964, and Arrow, 1965) and the additive and utilitarian social evaluation function is:

$$W(X) = \begin{cases} \frac{1}{n}\sum_{i=1}^{n} \frac{x_i^{1-\varepsilon}}{1-\varepsilon} & 0 < \varepsilon \neq 1 \\ \frac{1}{n}\sum_{i=1}^{n} ln\, x_i & \varepsilon = 1. \end{cases}$$

We now show that this social welfare function is an increasing transformation of median income (see Theorem 2). Owing to the symmetry of $X' \in \mathbb{S}$, we have:

$$m_X = f^{-1}[\mu_{X'}],$$

where $\mu_{X'} = \frac{1}{n}\sum_{i=1}^{n} f(x_i)$. Moreover, we know:

$$f^{-1}(x_i) = \begin{cases} [(1-\varepsilon)x_i]^{\frac{1}{1-\varepsilon}} & 0 < \varepsilon \neq 1 \\ \exp(x_i) & \varepsilon = 1. \end{cases}$$

Therefore, the median income m_X is as follows:

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[8] Note that the well-known Box-Cox transformation (Box and Cox, 1964):

$$g(x_i) = \begin{cases} \frac{x_i^{1-\varepsilon}-1}{1-\varepsilon} & 0 < \varepsilon \neq 1 \\ ln\, x_i & \varepsilon = 1 \end{cases}$$

is an affine transformation of the power function. Consequently, both transformations obtain symmetry for the same ε, median income, and equally distributed equivalent income, x_{ede}.

[9] By assuming this utility function, both authors imposed homotheticity on the social evaluation function.

$$m_X = \begin{cases} \left[\frac{1}{n}\sum_{i=1}^{n} x_i^{1-\varepsilon}\right]^{\frac{1}{1-\varepsilon}} & 0 < \varepsilon \neq 1 \\ exp\left[\frac{1}{n}\sum_{i=1}^{n} ln(x_i)\right] & \varepsilon = 1. \end{cases}$$

It is clear from the above that the social welfare function *à la* Kolm-Atkinson is an increasing transformation of median income. Note also that the median income equals the equally distributed equivalent income, x_{ede}. Therefore, we can conclude that under majority voting, society will vote for the income distribution that maximizes income for the median voter which, in turn, is the income distribution that provides greater social welfare (*à la* Kolm-Atkinson).

4. Empirical exercise

We illustrate these results with data drawn from the World Bank's POVCAL database.[10] This database provides data on household disposable income (I) or consumption (C) per person for 116 countries over several years (see Table 1). Income values are in purchasing power parity (PPP)-corrected monthly US dollars. In addition, the distributions are population weighted and based on the estimated Lorenz curves.

First, we apply the power transformation specified in Section 3 to this data. For this transformation, we consider that $\varepsilon \in [0, 3]$ within two decimal points of accuracy. We then formally test each transformed distribution for symmetry using the consistent nonparametric kernel-based test developed by Ahmad and Li (1997). This intuitively

[10] See *http://iresearch.worldbank.org/PovcalNet/povcalSvy.html* for detailed information on the structure of this data.

appealing test directly deals with the symmetry issue over the entire domain of the relevant density function. The procedure used tests the hypothesis that a distribution is symmetric about the median. Suppose we have a random sample of n i.i.d. observations of income X_i, $i = 1,\ldots, n$, drawn from the distribution X and ordered such that $X_1 \leq X_2 \leq \cdots \leq X_n$. We know from Ahmad and Li (1997) that $n\sqrt{h}\,\hat{I}_{2n}$ converges to a normal distribution with mean 0 and variance $4\sigma^2$, where h is the smoothing parameter and the statistic $\hat{I}_{2n}$ is as follows:

$$\hat{I}_{2n} = \frac{1}{n^2 h}\sum_{i=1}^{n}\sum_{j\neq i}^{n}\left[K\left(\frac{X_i - X_j}{h}\right) - K\left(\frac{X_i + X_j}{h}\right)\right],$$

where $K(\cdot)$ is the kernel function; in our case, the Gaussian density. We estimate the variance σ^2 according to the following term:

$$\hat{\sigma}^2 = \frac{1}{2\sqrt{\pi}}\,\frac{1}{n^2 h}\sum_{i=1}^{n}\sum_{j=1}^{n} K\left(\frac{X_i - X_j}{h}\right).$$

The chosen smoothing parameter is $h = sn^{-\frac{1}{\alpha}}$, where s denotes the standard deviation of the sample data. In simple density estimation $\alpha = 5$, but for the above Ahmad and Li (1997) suggest a larger value. We provide the results for $\alpha = 6$. This test is one sided as the alternative hypothesis states that the statistic $\hat{I}_{2n}$ is positive. Therefore, assuming a 5% level of significance, the critical value is 1.645.

For each distribution, we compute for the inequality aversion parameter ε the interval $[\varepsilon_{min}, \varepsilon_{max}]$ where symmetry is not rejected (see columns ε_{min} and ε_{max} in Table 1). In Table 1, we reject symmetry when the values ε_{min} and ε_{max} are unspecified. We can see that symmetry is not rejected for 92.14% of cases (469 of the 509 cases), so we can state with little margin of error that the symmetry condition is generally accepted. Note that we could reject the symmetry condition in even fewer cases if a more general class than the power transformation had been used.

After testing for symmetry, we check the amplitude of the class of distributions $\mathcal{H}$ (see Section 3). Recall that the larger the class $\mathcal{H}$, the less restrictive is our assumption in Theorems 1 and 2 (the invariance of the $f(\cdot)$ or $U(\cdot)$ function). For this task we look for the range $[\varepsilon_1, \varepsilon_2]$ that is contained in the majority of intervals $[\varepsilon_{min}, \varepsilon_{max}]$. In particular, we compute the number of intervals $[\varepsilon_{min}, \varepsilon_{max}]$ that contain a particular aversion parameter ε. Graph 1 presents the results in relative terms. Considering the number of distributions that are symmetric under an increasing and concave transformation (469), we find that the range [0.95, 1.06] is contained by the 80% or more of intervals $[\varepsilon_{min}, \varepsilon_{max}]$. In the same manner, the range [0.89, 1.14] is contained by the 70% or more of intervals $[\varepsilon_{min}, \varepsilon_{max}]$. This means that any of the aversion parameters in the range [0.95, 1.06] allow us to rank at least 80% of the cases in our sample. In other words, an egalitarian social decision-maker with an aversion parameter in the range [0.95, 1.06] could make a decision that is consistent with the median voter result over more than 80% of distributions. It is worth noting that the value $\varepsilon = 1$ is inside 81.02% of intervals $[\varepsilon_{min}, \varepsilon_{max}]$. That is, 380 distributions out of 469 could be ranked by the aversion parameter $\varepsilon = 1$. The conclusion is that the assumption is not very restrictive in practice.

Now we check the use of median income as a proxy for social welfare. For this task, we first compute for each interval $[\varepsilon_{min}, \varepsilon_{max}]$ the "optimal" value ε^* as the most probable

ε for which symmetry is not rejected.[11] In Graph 2 we show that the optimal parameter ε^* generally ranges from 0.8 to 1.2. Accordingly, we can say that the optimal inequality aversion parameter moves in the neighborhood of the log transformation ($\varepsilon = 1$). Then, we compute the level of welfare (W) for such an optimal inequality aversion parameter, the median income (m), the mean income (μ), the Gini coefficient (G) and the value of $\mu(1-G)$ (see Table 1). We observe in Table 1 and Graphs A1, A2, and A3 (see the Appendix) that the median income tracks welfare very well, while the mean income and $\mu(1-G)$ exaggerate and shorten welfare, respectively. Thus, the coefficient of determination R^2 is 0.999 for median income, while it is 0.956 and 0.969 for mean income and the term $\mu(1-G)$, respectively.[12] Moreover, the slope of the regression is almost one (0.998) for the median income, while it is larger than one (1.164) for the mean income and lower than one (0.791) for the term $\mu(1-G)$. In sum, the use of the median value could be of great interest to other fields like macroeconomics, where academics usually apply the mean income to represent an income distribution, and by doing so, only consider the size of the distribution.

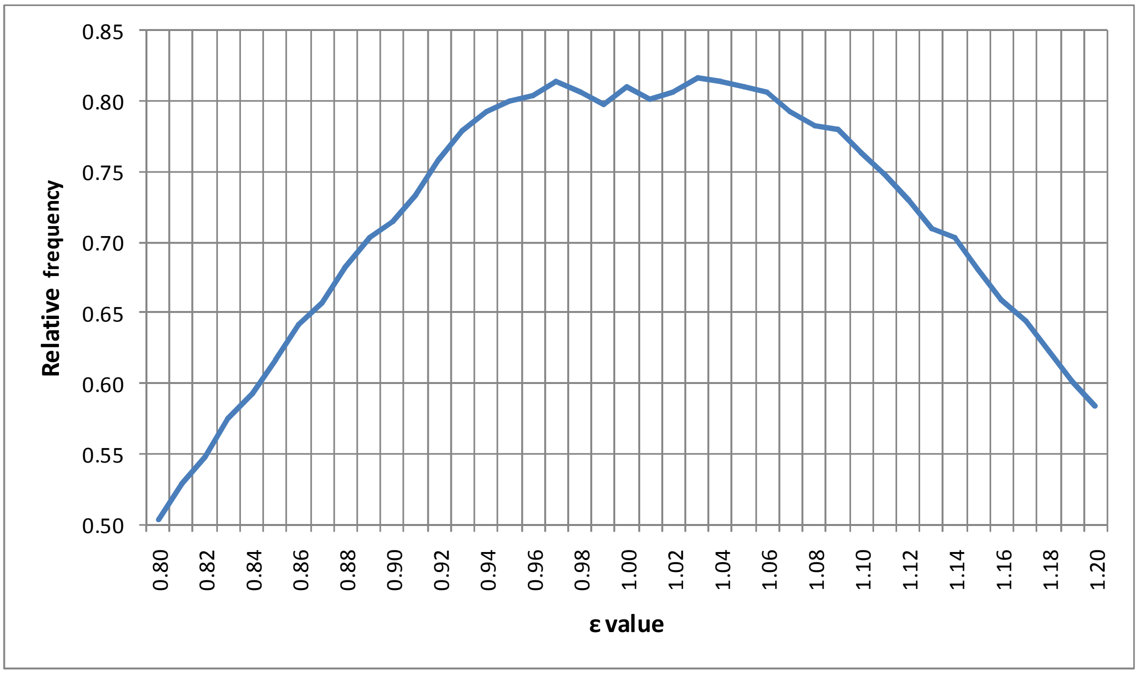
Once we have computed for each country the "optimal" inequality aversion parameter, we can contrast the relationship between ε^* and the national level of income. In this respect, Frisch (1959) argued that we should expect higher ε^*'s in poorer countries, while Atkinson (1970) and Lambert et al. (2003), among others, remarked that people become more concerned about inequality when the general level of income rises. In Graph 3 we show the regression between ε^* and mean income for the POVCAL database. We observe that the inequality aversion parameter ε^* is uncorrelated with the

[11] Though we show the parameter ε^* for all countries, the empirical exercises that follow in this section are carried out only for those countries whose income distribution is symmetric under a power transformation.

[12] Theoretically we should obtain perfect correlation ($R^2=1$). However, the symmetry that is obtained is the result of applying a statistical contrast. Despite this, our result is very close to 1.

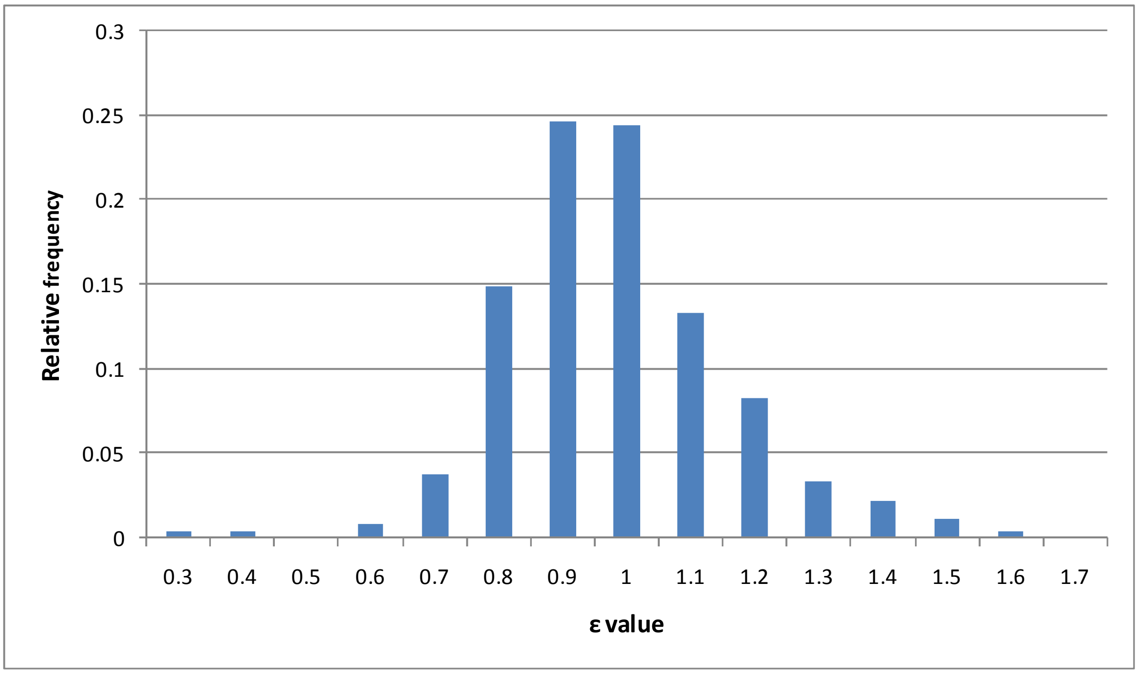
income level of a country (R^2 = 0.052). According to these results the aversion to inequality is neither a normal good nor an inferior good. Nevertheless, we must bear in mind that our database only considers low-income countries. Note also that the ordinate of the regression is close to one (1.074).

Graph 1. Relative frequency of an aversion parameter ε contained in the estimated intervals [ε_{min}, ε_{max}].



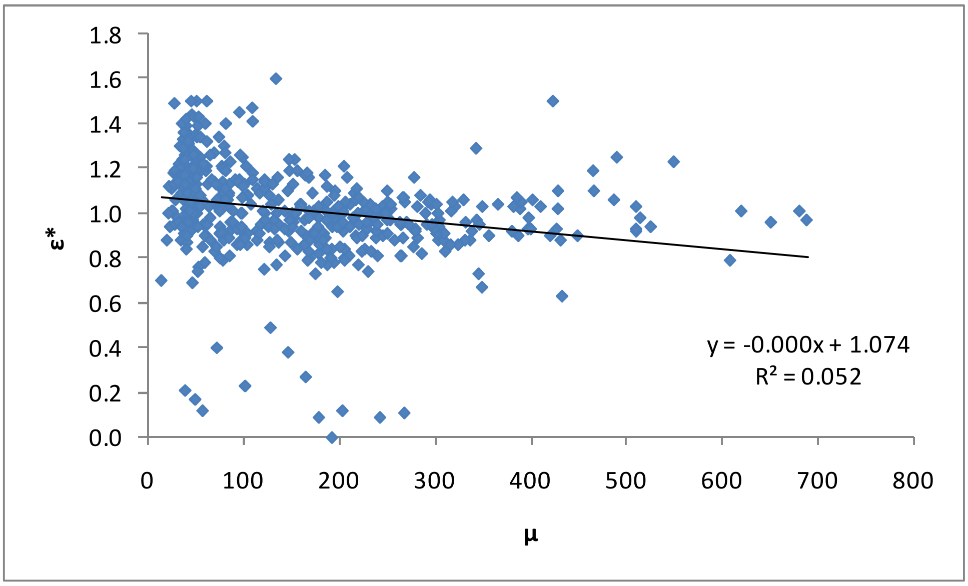
Another interesting issue that can be analyzed from the results in Table 1 is the existing relationship between the propensity to redistribute income (measured by an inequality aversion parameter) and the level of objective inequality. In this respect, Persson and Tabellini (1994) consider that greater inequality increases redistribution, while Perotti (1996) and Lambert et al. (2003) among others conclude that countries with greater levels of objective inequality do not increase their propensity to redistribute. In Graph 4, we show the regression between ε^* and objective inequality measured by the Gini coefficient. We observe that the correlation is negative, though barely significant. Accordingly, countries that are less averse to inequality have slightly higher levels of inequality.

Graph 2. Distribution of the optimal aversion parameter.

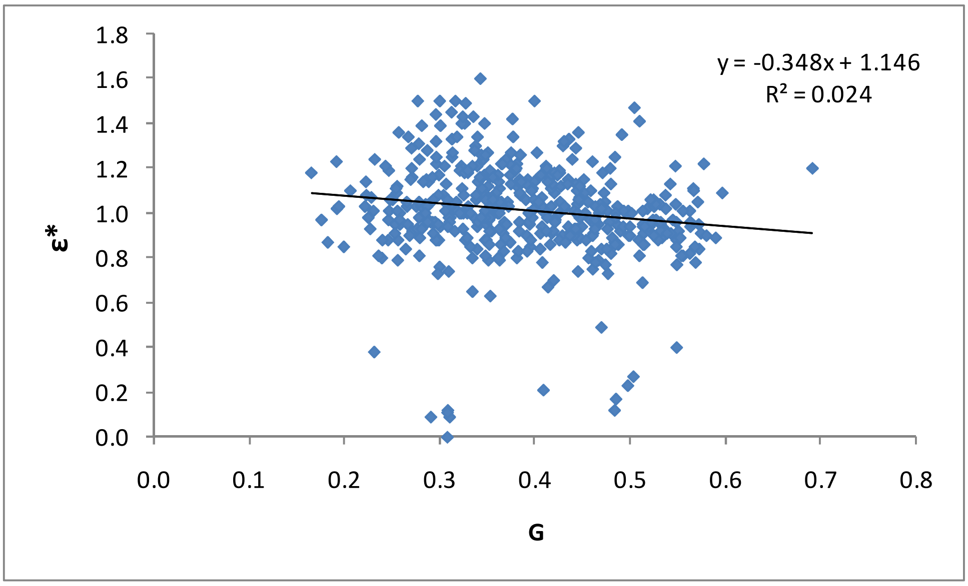


Finally, we test in Table 1 for normality of the transformed distributions at the optimal value of the parameter ε. In particular, we use the Jarque–Bera statistic to measure the difference in the skewness and kurtosis of the series relative to the normal distribution. H = 1 means that normality is rejected, while H = 0 means that normality is not rejected. Note that the rejection of symmetry implies the rejection of normality, but not vice versa. We do not generally accept normality for our transformed data as we reject the null hypothesis of normality for 83.50% of cases (425 of the 509 cases). Therefore, we conclude that the normality assumption is much more restrictive than the symmetry assumption.

Graph 3. Correlation between ε^* and μ.



Graph 4. Correlation between ε^* and G.



5. Concluding remarks

The issue of ranking distributions is implicit in the essence of the political economy literature. In fact, we can view changes in income distributions as the result of a political process, likely a majority voting mechanism. However, income distributions have been traditionally ranked according to a set of axioms, as represented by a social evaluation function, and this constitutes the essence of welfarism. This approach, however, is an *ad hoc* methodology based on a set of "desirable" assumptions or axioms.

This paper attempts to provide a scenario in which there exists an egalitarian social decision-maker whose preferences accord with majority voting. More specifically, we propose a set of sufficient conditions under which a particular additive and concave utilitarian social evaluation function is consistent with the outcome of majority voting. In particular, we restrict our attention to the class of income distributions that are symmetric under strictly increasing and concave transformations, where lognormal distributions are a particular case. In fact, and as shown in the paper, symmetry, monotonicity and concavity are substantially more general assumptions than lognormality.

This consistency result may help us to understand the apparent stability of tax schedules in democratic societies. Tax schemes in democratic economies are commonly viewed as the outcome of a political process, say majority voting. We also observe that tax schedules are stable. One possible explanation for this emerges from the current paper. Our main result states that the outcome of majority voting is consistent with the maximization of a utilitarian social evaluation function. This evaluation function depends on an inequality aversion parameter. Therefore, the stability of a tax system will eventually depend on the stability of the corresponding inequality aversion parameter. It appears reasonable to assume that the inequality aversion parameter in a society is stable throughout time (see Li et al., 1998). In this respect, we observe in Table 1 that, in general terms, this stability requirement is fulfilled. Consequently, the consistency result provides a plausible explanation for the stability of tax schedules in democratic societies. Nevertheless, it is obvious that more research on this issue is needed.

We also provide an alternative method to compute the inequality aversion parameter in a society. One approach in the literature to identify the inequality aversion parameter has been to measure the elasticity of the marginal social utility of income (see, among others, Atkinson, 1980 and Amiel et al., 1999). Another approach has been to derive governmental values of ε from observed policies (Gouveia and Strauss, 1994). On the contrary, Stern (1977) has fitted the equal sacrifice tax model to infer the inequality aversion parameter, while Lambert et al. (2003) have identified such a parameter as the one that equalizes subjective inequality across countries to the so-call "natural rate of subjective inequality". We propose instead the use of the parameter ε proved to be useful under a majority voting process, which measures the departure from symmetry or skewness. Following this method, we measured the inequality aversion parameter for a panel of 116 countries. Our results provide an estimate of the order of magnitude that the aversion parameter can have in practice, and this may be useful for empirical researchers.

Finally, we propose the use of median income as a proxy for social welfare. The advantage of applying median income instead of mean income is that not only efficiency but also "implicit equity" is considered.

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Appendix

Proof of Theorem 1

Provided that $X'$and Y' are symmetrically distributed, that is, X' and $Y' \in \mathbb{S}$, the quantile functions $Q_{X'}(\cdot)$ and $Q_{Y'}(\cdot)$ satisfy:

$$Q_{X'}\left(p_{m_{X'}} + k\right) - Q_{X'}\left(p_{m_{X'}}\right) = Q_{X'}\left(p_{m_{X'}}\right) - Q_{X'}\left(p_{m_{X'}} - k\right), \tag{3}$$

$$Q_{Y'}\left(p_{m_{Y'}} + k\right) - Q_{Y'}\left(p_{m_{Y'}}\right) = Q_{Y'}\left(p_{m_{Y'}}\right) - Q_{Y'}\left(p_{m_{Y'}} - k\right), \tag{4}$$

for every $k \in \left\{\frac{1}{n}, \frac{2}{n}, \dots, \frac{n-1}{2n}\right\}$. Note that $Q_{X'}\left(p_{m_{X'}}\right) = m_{X'}$ and $Q_{Y'}\left(p_{m_{Y'}}\right) = m_{Y'}$.

Moreover, the gain function of passing from *X* to *Y* is as follows:

$$g_i = y_i - x_i = f^{-1}\left(Q_{Y'}(i/n)\right) - f^{-1}\left(Q_{X'}(i/n)\right),$$

for all $i = 1, 2, \dots, n$. Note that the inverse of *f* always exists because the function *f* is strictly increasing. Consequently, we obtain the result of majority voting over *X* and *Y* by the following voting function:

$$v_i = \begin{cases} 1 & f^{-1}\left(Q_{Y'}(i/n)\right) - f^{-1}\left(Q_{X'}(i/n)\right) > 0 \\ 0 & f^{-1}\left(Q_{Y'}(i/n)\right) - f^{-1}\left(Q_{X'}(i/n)\right) = 0, \\ -1 & f^{-1}\left(Q_{Y'}(i/n)\right) - f^{-1}\left(Q_{X'}(i/n)\right) < 0 \end{cases}$$

for all $i = 1, 2, \dots, n$. Equivalently:

$$v_i = \begin{cases} 1 & Q_{Y'}(i/n) - Q_{X'}(i/n) > 0 \\ 0 & Q_{Y'}(i/n) - Q_{X'}(i/n) = 0, \\ -1 & Q_{Y'}(i/n) - Q_{X'}(i/n) < 0 \end{cases}$$

for all $i = 1, 2, \dots, n$.

First, we prove that majority voting ends with a tie if the median incomes are equal, that is:

$$(\text{A})\ m_Y = m_X \Rightarrow \sum_{i=1}^{n} v_i = 0.$$

We know that:

$$m_Y = m_X \equiv f^{-1}\left(Q_{Y'}(p_{m_{Y'}})\right) = f^{-1}\left(Q_{X'}(p_{m_{X'}})\right),$$

or equivalently:

$$m_Y = m_X \equiv m_{Y'} = m_{X'}. \tag{5}$$

Subtracting (3) from (4), we obtain the following expression:

$$\left[Q_{Y'}\left(p_{m_{Y'}} + k\right) - Q_{X'}\left(p_{m_{X'}} + k\right)\right] - (m_{Y'} - m_{X'}) =$$

$$(m_{Y'} - m_{X'}) - \left[Q_{Y'}(p_{m_{Y'}} - k) - Q_{X'}(p_{m_{X'}} - k)\right],$$

for all $k \in \left\{\frac{1}{n}, \frac{2}{n}, \dots, \frac{n-1}{2n}\right\}$. As we assume the median incomes for *X* and *Y* are equal, we can apply expression (5). We obtain the following:

$$Q_{Y'}\left(p_{m_{Y'}} + k\right) - Q_{X'}\left(p_{m_{X'}} + k\right) = -\left[Q_{Y'}(p_{m_{Y'}} - k) - Q_{X'}(p_{m_{X'}} - k)\right], \tag{6}$$

for all $k \in \left\{\frac{1}{n}, \frac{2}{n}, \dots, \frac{n-1}{2n}\right\}$. Expression (6) ensures that for any given *k*, two equidistant (from the median) individuals exist whose votes go in opposite directions. Moreover, the median income does not change from *X* to *Y* according to expression (5), so the median voter votes zero. Accordingly, the number of positive and the number of negative votes are equal, i.e., $\sum_{i=1}^{n} v_i = 0$.

We now prove the majority voting result when median incomes are unequal:

$$\text{(B) } m_Y > m_X \Rightarrow \sum_{i=1}^{n} v_i > 0.$$

We know that $m_X = f^{-1}(m_{X'})$ and $m_Y = f^{-1}(m_{Y'})$. Therefore, the medians of the original distributions X and Y are ordinal equivalents to the medians of the transformed distributions X' and Y', in particular, $m_Y > m_X \equiv m_{Y'} > m_{X'}$.

Given that $m_{Y'} > m_{X'}$, there always exists a symmetric distribution $Y'' \in \mathbb{S}$ such that $m_{Y''} = m_{X'}$, from which Y' is obtained by giving the transfer $t = m_{Y'} - m_{X'}$ to everyone. Consequently, from Y'' to Y', all individuals improve so Y' is strictly preferred to Y'', i.e., $Y' \succ Y''$. However, from X' to Y'', we obtain a technical tie provided that the median value does not change (see the proof of (A)). In this case, the percentage of winners and losers is the same, in particular $\frac{n-1}{2n}$. Accordingly, from X' to Y', an improvement for a percentage $\frac{n-1}{2n}$ of the population is guaranteed. However, the effect for another percentage $\frac{n-1}{2n}$ of the population is ambiguous. The result of majority voting will decisively rely on the median voter. Overall, from X' to Y' more than fifty percent of the population win because the median voter changes his or her vote in favor of the profile Y'. Consequently, the profile Y wins the election, i.e., $\sum_{i=1}^{n} v_i > 0$.

$$\text{(C) } m_Y < m_X \Rightarrow \sum_{i=1}^{n} v_i < 0.$$

The proof is analogous to the proof of (B).

Finally, we prove that the reverse is true, that is:

$$\text{(A') } \sum_{i=1}^{n} v_i = 0 \Rightarrow m_Y = m_X,$$

$$\text{(B') } \sum_{i=1}^{n} v_i > 0 \Rightarrow m_Y > m_X\ ,$$

$$\text{(C') } \sum_{i=1}^{n} v_i < 0 \Rightarrow m_Y < m_X.$$

We know from statement (A) that $\sum_{i=1}^{n} v_i \neq 0 \Rightarrow m_Y \neq m_X$. Moreover, we have $\sum_{i=1}^{n} v_i \leq 0 \Rightarrow m_Y \leq m_X$ from statement (B). Therefore, if we consider statements (A) and (B) together, we obtain statement (C'). In the same manner, we can infer (B') from statements (A) and (C). Finally, we obtain (A') by considering $\sum_{i=1}^{n} v_i \leq 0 \Rightarrow m_Y \leq m_X$ from statement (B) and $\sum_{i=1}^{n} v_i < 0 \Rightarrow m_Y < m_X$ from statement (C'). In an analogous manner, (A') can be also obtained by considering statements (B') and (C).

Table 1

Country	Year		H	ε_{min}	ε_{max}	ε*	W	m	μ	G	μ (1-G)
Albania	1996	C	1	0.74	1.23	0.98	132.0	131.5	150.7	0.2782	108.8
Albania	2002	C	1	0.71	1.28	1.00	119.3	119.0	135.2	0.3246	91.3
Albania	2005	C	0	0.77	1.30	1.04	134.3	134.0	160.7	0.2886	114.3
Algeria	1988	C	1	0.85	1.44	1.15	92.6	93.0	122.7	0.3836	75.6
Algeria	1995	C	1	0.72	1.19	0.95	98.1	97.6	119.0	0.3483	77.6
Angola	2000	C	1	-	-	0.83	35.3	34.5	60.4	0.5702	25.9
Argentina-Urban	1986	I	1	0.74	1.14	0.94	385.6	383.9	526.0	0.5126	256.4
Argentina-Urban	1992	I	1	0.78	1.06	0.92	277.5	275.0	381.2	0.4888	194.9
Argentina-Urban	1996	I	1	0.77	1.04	0.90	248.5	245.5	357.1	0.4332	202.4
Argentina-Urban	1998	I	1	0.79	0.97	0.88	230.9	227.9	337.5	0.4435	187.8
Argentina-Urban	2002	I	1	-	-	0.86	156.2	153.4	237.8	0.4734	125.3
Argentina-Urban	2005	I	1	0.73	0.98	0.86	222.4	220.0	325.0	0.4867	166.8
Armenia	1996	I	0	0.86	1.29	1.08	75.1	75.0	104.9	0.3414	69.1
Armenia	1998	C	1	0.89	1.52	1.21	61.5	61.8	78.0	0.3224	52.9
Armenia	2002	C	1	0.97	1.62	1.30	63.2	63.5	80.5	0.4288	46.0
Armenia	2003	C	1	1.03	1.74	1.40	65.4	65.8	82.1	0.3468	53.7
Azerbaijan	1995	C	1	0.63	1.20	0.92	71.7	71.8	86.4	0.3540	55.8
Azerbaijan	2001	C	0	0.91	1.44	1.18	86.9	86.9	110.4	0.1652	92.1
Azerbaijan	2005	C	1	0.95	2.21	1.60	125.7	125.8	134.6	0.3422	88.5
Bangladesh	1991	C	1	0.78	1.56	1.17	31.4	31.4	35.6	0.2989	24.9
Bangladesh	1995	C	1	1.02	1.73	1.39	33.9	33.9	40.9	0.3005	28.6
Bangladesh	2000	C	0	1.05	1.65	1.36	34.7	34.7	41.9	0.2568	31.2
Bangladesh	2005	C	0	1.13	1.73	1.44	38.4	38.4	46.8	0.2957	33.0
Belarus	1988	I	1	0.47	1.29	0.88	282.8	282.7	304.4	0.2989	213.4
Belarus	1993	I	0	0.61	1.32	0.96	189.1	188.7	203.9	0.2924	144.3
Belarus	1997	I	1	0.65	1.19	0.92	89.5	89.3	98.8	0.2760	71.6
Belarus	1998	I	1	0.64	1.32	0.98	154.7	155.2	179.2	0.2251	138.9
Belarus	2000	C	1	0.71	1.34	1.03	176.0	176.0	204.9	0.2215	159.5
Belarus	2002	C	1	0.62	1.28	0.95	231.6	231.7	265.5	0.2580	197.0
Belarus	2005	C	1	0.55	1.21	0.88	276.9	276.6	309.8	0.2968	217.8
Benin	2003	C	0	0.92	1.41	1.17	39.7	39.6	51.7	0.3736	32.4
Bhutan	2003	C	1	1.03	1.27	1.15	62.8	62.4	92.1	0.4506	50.6
Bolivia	1997	I	1	0.7	0.98	0.84	113.5	112.4	192.9	0.5715	82.7
Bolivia	1999	I	1	-	-	0.70	102.9	100.5	166.5	0.5646	72.5
Bolivia	2002	I	1	0.68	0.97	0.82	103.5	102.5	179.2	0.5616	78.5
Bolivia	2005	I	1	0.68	0.89	0.78	117.4	115.0	195.2	0.5676	84.4
Bosnia and Herz.	2001	C	1	0.67	1.39	1.03	307.7	308.0	350.2	0.2752	253.8
Bosnia and Herz.	2004	C	1	0.73	1.21	0.97	281.6	280.7	344.4	0.3513	223.4
Botswana	1985	C	1	-	-	1.00	56.0	55.3	92.3	0.5286	43.5
Botswana	1993	C	1	1.00	1.22	1.11	62.2	61.7	115.1	0.5652	50.0
Brazil	1981	I	1	-	-	0.93	110.3	108.2	188.1	0.5597	82.8
Brazil	1984	I	1	-	-	0.96	95.7	93.8	167.4	0.5840	69.6
Brazil	1987	I	1	-	-	0.91	119.9	117.4	211.3	0.5716	90.5
Brazil	1990	I	1	-	-	0.87	133.4	130.1	239.2	0.5709	102.6
Brazil	1993	I	1	-	-	0.89	139.2	135.9	243.6	0.5639	106.2
Brazil	1996	I	1	-	-	0.87	155.1	151.0	268.8	0.5408	123.4
Brazil	1999	I	1	-	-	0.90	146.5	143.6	252.9	0.5545	112.7
Brazil	2002	I	1	-	-	0.91	152.3	149.4	261.2	0.5613	114.6
Brazil	2005	I	1	0.86	1.03	0.95	158.7	156.8	264.8	0.5711	113.6
Bulgaria	1989	C	1	0.57	1.39	0.98	472.5	472.5	515.1	0.3361	342.0
Bulgaria	1994	C	1	0.58	1.50	1.04	268.2	269.4	296.8	0.2850	212.2
Bulgaria	1997	C	1	0.82	1.64	1.24	134.9	135.2	154.1	0.2316	118.4
Bulgaria	2001	C	1	0.52	1.09	0.80	175.7	175.5	206.1	0.2392	156.8
Bulgaria	2003	C	1	0.61	1.39	1.00	178.0	178.7	204.6	0.2580	151.8

I: Income; C: Consumption; Herz.: Herzegovina.

Country	Year		H	ε_{min}	ε_{max}	ε*	W	m	μ	G	μ (1-G)
Burkina Faso	1994	C	1	1.06	1.36	1.22	24.6	24.6	38.6	0.3806	23.9
Burkina Faso	1998	C	1	1.06	1.58	1.33	26.5	26.6	39.2	0.4351	22.2
Burkina Faso	2003	C	0	0.93	1.45	1.20	34.5	34.6	45.7	0.4783	23.9
Burundi	1992	C	0	0.84	1.38	1.11	21.3	21.2	25.8	0.3232	17.4
Burundi	1998	C	1	0.67	1.21	0.94	18.1	18.1	23.9	0.4068	14.2
Burundi	2006	C	1	1.35	1.63	1.49	22.6	22.6	28.5	0.3269	19.2
Cambodia	1994	C	0	1.22	1.76	1.50	38.7	38.8	51.8	0.3990	31.1
Cambodia	2004	C	0	1.10	1.52	1.32	45.1	45.0	62.4	0.4299	35.6
Cameroon	1996	C	1	1.06	1.42	1.25	37.4	37.4	55.4	0.4833	28.6
Cameroon	2001	C	1	0.93	1.29	1.12	53.4	53.2	75.1	0.4267	43.1
Cape Verde	2001	C	1	0.94	1.22	1.09	76.5	76.1	117.7	0.5957	47.6
Central Africa Rep.	1993	C	1	-	-	0.89	12.8	12.5	23.8	0.3888	14.6
Central Africa Rep.	2003	C	1	0.84	1.09	0.97	30.4	30.1	41.1	0.5231	19.6
Chad	2002	C	1	0.81	1.23	1.02	31.4	31.2	40.6	0.5172	19.6
Chile	1987	I	1	0.95	1.14	1.04	125.1	123.6	212.1	0.5260	100.5
Chile	1990	I	1	0.89	1.17	1.03	170.5	169.0	282.2	0.5241	134.3
Chile	1994	I	1	0.89	1.17	1.03	195.3	193.6	321.8	0.5244	153.0
Chile	1996	I	1	0.93	1.14	1.04	221.8	219.9	366.5	0.5302	172.2
Chile	1998	I	1	0.91	1.13	1.02	234.3	231.6	389.7	0.5365	180.6
Chile	2000	I	1	0.89	1.20	1.05	236.2	234.7	390.9	0.3708	246.0
Chile	2003	I	1	0.89	1.24	1.07	234.6	234.1	386.2	0.3509	250.7
China-Rural	1981	I	0	0.53	1.23	0.88	19.0	18.9	20.7	0.2457	15.6
China-Rural	1984	I	0	0.62	1.27	0.95	25.8	25.8	28.8	0.2662	21.2
China-Rural	1987	I	0	0.63	1.14	0.88	31.1	31.0	35.3	0.2958	24.9
China-Rural	1990	C	0	0.90	1.53	1.22	28.3	28.3	33.6	0.2962	23.6
China-Rural	1993	C	0	0.91	1.51	1.21	30.3	30.3	36.3	0.3048	25.2
China-Rural	1996	C	0	0.92	1.44	1.18	38.5	38.4	47.3	0.3293	31.7
China-Rural	1999	C	0	0.92	1.41	1.17	37.8	37.7	47.4	0.3464	31.0
China-Rural	2002	C	0	0.96	1.41	1.19	42.1	42.0	54.7	0.3273	36.8
China-Rural	2005	C	0	0.90	1.38	1.14	56.1	55.9	70.3	0.3398	46.4
China-Urban	1981	I	1	0.33	1.41	0.87	39.7	39.8	41.7	0.1825	34.1
China-Urban	1984	I	1	0.43	1.52	0.97	45.5	45.5	47.8	0.1759	39.4
China-Urban	1987	I	1	0.33	1.38	0.85	54.7	54.8	57.9	0.1993	46.4
China-Urban	1990	C	1	0.59	1.31	0.95	53.2	53.2	58.8	0.2531	43.9
China-Urban	1993	C	1	0.69	1.37	1.03	64.0	63.9	73.1	0.2802	52.6
China-Urban	1996	C	0	0.71	1.34	1.03	74.4	74.3	85.4	0.2866	60.9
China-Urban	1999	C	1	0.70	1.28	1.00	84.7	84.6	99.3	0.3106	68.5
China-Urban	2002	C	1	0.75	1.33	1.04	107.8	107.8	129.7	0.4440	72.1
China-Urban	2005	C	1	0.75	1.32	1.04	130.8	130.9	159.9	0.5469	72.5
Colombia	1995	I	1	0.81	1.19	1.01	119.3	120.6	204.4	0.5617	89.6
Colombia	1996	I	1	0.76	1.12	0.94	117.0	117.1	193.4	0.5146	93.9
Colombia	1999	I	1	0.77	1.12	0.94	104.3	104.3	178.5	0.5623	78.1
Colombia	2000	I	1	0.75	1.07	0.91	109.6	109.0	184.5	0.5132	89.8
Colombia	2003	I	1	0.77	1.03	0.90	126.3	124.6	218.0	0.4976	109.5
Colombia-Urban	1980	I	1	0.76	1.07	0.92	116.8	116.5	204.8	0.5373	94.8
Colombia-Urban	1988	I	1	0.74	1.04	0.89	141.5	140.2	219.2	0.5324	102.5
Colombia-Urban	1989	I	1	0.80	1.12	0.96	146.4	145.3	232.3	0.5476	105.1
Colombia-Urban	1991	I	1	0.74	1.04	0.89	159.2	157.8	239.2	0.5887	98.4
Comoros	2004	C	1	0.91	1.24	1.08	41.7	41.8	81.9	0.3038	57.0
Congo Dem. Rep.	2005	C	1	0.01	0.38	0.17	48.8	48.7	50.2	0.4843	25.9
Congo Rep.	2005	C	1	0.01	0.31	0.12	56.8	56.7	58.0	0.4829	30.0
Costa Rica	1981	I	1	0.62	0.88	0.75	89.5	88.5	122.3	0.4600	66.0
Costa Rica	1986	I	0	0.29	0.71	0.49	116.5	116.0	128.9	0.4691	68.4
Costa Rica	1990	I	1	0.63	1.00	0.80	143.1	142.0	192.3	0.4557	104.6
Costa Rica	1993	I	1	0.66	1.01	0.84	150.1	149.6	206.2	0.4691	109.5

I: Income; C: Consumption.

Country	Year		H	ε_{min}	ε_{max}	ε*	W	m	μ	G	μ (1-G)
Costa Rica	1996	I	1	0.67	1.01	0.84	164.0	162.8	227.5	0.3389	150.4
Costa Rica	1998	I	1	0.73	1.04	0.89	198.3	196.6	282.5	0.4468	156.3
Costa Rica	2000	I	1	0.70	1.06	0.88	185.5	184.6	258.5	0.4530	141.4
Costa Rica	2001	I	1	0.75	1.07	0.91	210.8	208.8	310.5	0.4605	167.5
Costa Rica	2003	I	1	0.66	1.01	0.83	216.1	214.2	311.5	0.4585	168.7
Costa Rica	2005	I	1	0.75	1.06	0.91	214.4	212.8	302.4	0.4052	179.9
Côte d'Ivoire	1985	C	1	0.83	1.07	0.95	105.7	104.8	137.7	0.3939	83.5
Côte d'Ivoire	1987	C	1	0.94	1.27	1.11	92.4	92.0	122.4	0.3623	78.1
Côte d'Ivoire	1988	C	1	0.79	1.21	1.00	78.8	78.5	98.1	0.3611	62.7
Côte d'Ivoire	1993	C	0	0.86	1.32	1.09	67.9	67.6	85.7	0.3588	55.0
Côte d'Ivoire	1995	C	0	0.86	1.31	1.09	63.6	63.4	79.9	0.4197	46.4
Côte d'Ivoire	1998	C	0	0.90	1.36	1.13	61.8	61.7	85.9	0.3065	59.6
Côte d'Ivoire	2002	C	1	0.92	1.36	1.15	64.4	64.6	96.4	0.2858	68.8
Croatia	1988	I	1	0.52	1.33	0.92	472.7	472.3	510.9	0.2713	372.3
Croatia	1998	C	1	0.59	1.27	0.93	458.3	458.0	510.8	0.2270	394.8
Croatia	1999	C	1	0.64	1.42	1.03	361.3	362.8	411.1	0.2655	301.9
Croatia	2001	C	1	0.72	1.31	1.02	366.4	366.0	429.1	0.1921	346.7
Croatia	2005	C	1	0.65	1.29	0.97	604.0	603.7	688.9	0.2577	511.4
Czech Republic	1988	I	0	0.66	1.46	1.06	458.6	457.7	487.8	0.2504	365.6
Czech Republic	1993	I	0	1.08	1.89	1.50	363.7	364.4	423.9	0.2998	296.8
Czech Republic	1996	I	1	0.77	1.72	1.25	430.1	433.4	490.7	0.2962	345.4
Djibouti	1996	C	1	0.01	0.59	0.27	158.8	157.3	165.7	0.5027	82.4
Djibouti	2002	C	1	0.01	0.50	0.23	98.7	98.0	102.4	0.4967	51.5
Dominican Rep.	1986	I	1	0.69	1.04	0.87	97.0	96.8	137.4	0.4829	71.0
Dominican Rep.	1989	I	1	0.90	1.17	1.03	105.5	104.5	160.7	0.4860	82.6
Dominican Rep.	1992	I	1	0.88	1.30	1.09	138.6	139.4	216.2	0.4717	114.2
Dominican Rep.	1996	I	1	0.79	1.12	0.95	152.1	150.9	221.3	0.4658	118.2
Dominican Rep.	2000	I	1	0.80	1.09	0.95	189.6	187.9	292.4	0.4852	150.5
Dominican Rep.	2003	I	1	0.83	1.17	1.00	148.6	147.8	230.1	0.3107	158.6
Dominican Rep.	2005	I	1	0.85	1.11	0.98	158.4	156.9	236.7	0.3107	163.2
Ecuador	1987	I	1	0.01	0.30	0.12	200.1	200.0	204.1	0.3083	141.2
Ecuador	1994	I	1	0.01	0.24	0.09	176.8	177.0	179.4	0.3103	123.8
Ecuador	1998	I	1	0.01	0.24	0.00	190.5	190.5	193.1	0.3078	133.7
Ecuador	2003	I	1	0.01	0.28	0.11	263.8	263.4	268.7	0.3080	185.9
Ecuador	2005	I	1	0.01	0.25	0.09	239.6	239.5	243.3	0.2905	172.6
Egypt	1990	C	0	0.96	1.54	1.25	82.2	82.1	99.7	0.3126	68.5
Egypt	1995	C	0	1.08	1.80	1.45	79.9	80.0	96.4	0.3122	66.3
Egypt	1999	C	1	1.10	1.81	1.47	88.1	88.5	109.8	0.5036	54.5
Egypt	2004	C	1	1.03	1.76	1.41	89.6	90.0	110.4	0.5089	54.2
El Salvador	1989	I	1	0.55	0.94	0.73	130.6	129.5	175.8	0.4760	92.1
El Salvador	1995	I	1	0.71	1.09	0.90	113.1	112.8	166.1	0.4598	89.7
El Salvador	1996	I	1	0.73	1.07	0.89	110.1	108.9	167.8	0.4805	87.2
El Salvador	1998	I	1	-	-	0.89	124.2	122.3	189.7	0.5041	94.0
El Salvador	2000	I	1	0.65	0.97	0.81	141.8	141.0	211.1	0.5089	103.7
El Salvador	2002	I	1	0.64	0.95	0.79	138.2	137.2	206.3	0.3624	131.6
El Salvador	2003	I	1	0.62	1.00	0.80	120.2	119.4	169.8	0.3610	108.5
Estonia	1988	I	0	0.30	0.98	0.63	410.9	410.2	433.6	0.3527	280.6
Estonia	1993	I	1	0.80	1.34	1.07	205.6	206.6	268.3	0.2281	207.1
Estonia	1995	C	0	0.57	1.09	0.83	198.3	197.7	224.3	0.3819	138.7
Estonia	1998	C	1	0.86	1.29	1.08	225.0	224.0	285.7	0.2984	200.5
Estonia	2000	C	1	0.71	1.22	0.96	218.5	218.3	271.0	0.3674	171.5
Estonia	2002	C	1	0.72	1.21	0.96	213.6	212.8	264.0	0.2903	187.4
Estonia	2004	C	1	0.70	1.23	0.97	248.6	248.8	305.4	0.2880	217.4
Ethiopia	1981	C	1	0.95	1.68	1.33	30.7	30.9	37.8	0.3126	26.0
Ethiopia	1995	C	1	1.02	1.64	1.34	32.4	32.6	43.7	0.3766	27.2

I: Income; C: Consumption.

Country	Year		H	ε_{min}	ε_{max}	ε*	W	m	μ	G	μ (1-G)
Ethiopia	1999	C	1	0.88	1.65	1.27	35.4	35.6	42.2	0.4015	25.2
Ethiopia	2005	C	1	0.96	1.72	1.35	42.4	42.6	50.7	0.4904	25.8
Gabon	2005	C	0	0.88	1.31	1.10	109.6	109.3	146.9	0.4579	79.7
Gambia	1998	C	1	-	-	0.95	26.6	26.3	39.9	0.3935	24.2
Gambia	2003	C	1	0.86	1.17	1.02	54.2	53.9	78.3	0.3988	47.1
Georgia	1996	C	1	0.59	1.13	0.86	134.1	134.3	164.1	0.3638	104.4
Georgia	1999	C	1	0.64	1.11	0.87	103.7	103.3	128.1	0.3736	80.3
Georgia	2002	C	1	0.67	1.15	0.91	81.7	81.6	104.8	0.4172	61.1
Georgia	2005	C	1	0.65	1.11	0.88	89.5	89.4	114.9	0.3471	75.0
Ghana	1987	C	1	0.71	1.24	0.98	37.6	37.6	45.9	0.3524	29.7
Ghana	1988	C	1	0.76	1.29	1.03	38.4	38.4	47.5	0.3719	29.9
Ghana	1991	C	1	0.81	1.29	1.05	37.6	37.5	47.9	0.4016	28.7
Ghana	1998	C	1	0.77	1.02	0.90	48.3	47.9	62.0	0.3910	37.7
Ghana	2005	C	1	0.73	1.15	0.94	57.3	57.1	76.3	0.5192	36.7
Guatemala	1987	I	1	0.82	1.09	0.95	36.4	36.0	62.7	0.5312	29.4
Guatemala	1989	I	1	0.77	0.96	0.86	53.9	52.7	93.9	0.5140	45.7
Guatemala	1998	I	1	0.78	1.16	0.97	100.2	100.0	164.5	0.5263	77.9
Guatemala	2000	I	1	0.81	1.19	1.01	106.0	106.8	173.9	0.5544	77.5
Guatemala	2002	I	1	0.76	1.06	0.91	106.4	105.5	172.4	0.5734	73.6
Guatemala	2006	I	1	0.83	1.13	0.98	119.9	119.0	191.0	0.3471	124.7
Guinea	1991	C	1	0.66	0.74	0.70	11.1	10.9	14.8	0.4191	8.6
Guinea	1994	C	0	0.91	1.34	1.13	47.9	47.8	63.6	0.5411	29.2
Guinea	2003	C	0	0.88	1.29	1.09	26.2	26.1	36.1	0.4510	19.8
Guinea-Bissau	1991	C	1	0.65	0.95	0.79	49.7	49.1	79.2	0.4660	42.3
Guinea-Bissau	1993	C	1	0.94	1.40	1.18	35.9	36.1	53.4	0.4256	30.7
Guinea-Bissau	2002	C	1	0.78	1.32	1.05	38.7	38.7	47.8	0.4728	25.2
Guyana	1992	I	1	0.83	1.36	1.10	127.1	129.5	196.3	0.5657	85.3
Guyana	1998	I	1	0.63	1.14	0.88	132.5	132.6	177.6	0.5084	87.3
Haiti	2001	I	1	0.76	1.05	0.90	34.5	34.2	60.3	0.4989	30.2
Honduras	1990	I	1	0.81	1.03	0.92	46.8	46.1	79.0	0.5193	38.0
Honduras	1992	I	1	0.79	0.97	0.88	62.0	61.0	98.4	0.5479	44.5
Honduras	1994	I	1	0.78	1.05	0.92	70.3	69.6	114.0	0.5312	53.5
Honduras	1997	I	1	0.74	1.11	0.92	103.6	103.0	161.0	0.5498	72.5
Honduras	1999	I	1	0.72	1.05	0.88	112.9	112.2	170.1	0.5285	80.2
Honduras	2003	I	1	0.88	1.04	0.96	95.7	94.3	152.7	0.5311	71.6
Honduras	2005	I	1	0.71	0.97	0.84	95.6	94.5	156.9	0.2641	115.5
Honduras-Urban	1986	I	1	0.89	1.03	0.96	120.8	119.2	197.7	0.2949	139.4
Hungary	1987	I	1	0.58	1.60	1.10	432.1	432.9	466.8	0.2061	370.5
Hungary	1989	I	0	0.81	1.57	1.19	415.2	414.7	466.0	0.2464	351.1
Hungary	1993	I	1	0.84	1.71	1.29	294.4	296.5	343.7	0.2702	250.8
Hungary	1998	C	1	0.57	1.36	0.97	230.4	230.6	254.0	0.2462	191.5
Hungary	1999	C	1	0.75	1.55	1.16	242.4	243.4	279.0	0.2709	203.4
Hungary	2002	C	1	0.70	1.43	1.06	292.9	292.8	330.6	0.2930	233.7
Hungary	2004	C	1	0.70	1.37	1.03	329.8	329.9	382.8	0.3651	243.0
India-Rural	1977	C	1	1.02	1.76	1.40	28.9	29.2	36.6	0.3258	24.6
India-Rural	1993	C	1	0.92	1.68	1.31	36.9	37.0	43.3	0.2778	31.3
India-Rural	2004	C	1	1.05	1.80	1.43	40.6	40.7	49.1	0.3349	32.7
India-Urban	1977	C	1	0.87	1.45	1.16	35.4	35.5	44.3	0.3444	29.1
India-Urban	1983	C	0	0.90	1.48	1.20	38.9	38.9	47.7	0.3243	32.2
India-Urban	1987	C	0	1.00	1.48	1.24	39.6	39.6	50.1	0.3455	32.8
India-Urban	1993	C	0	0.94	1.44	1.20	43.7	43.7	54.2	0.2704	39.5
India-Urban	2004	C	0	0.97	1.41	1.19	47.6	47.5	61.4	0.3208	41.7
Indonesia-Rural	1984	C	1	0.77	1.46	1.12	31.3	31.4	36.4	0.2551	27.1
Indonesia-Rural	1987	C	0	0.93	1.66	1.30	29.6	29.6	34.4	0.3372	22.8
Indonesia-Rural	1990	C	1	0.90	1.38	1.14	35.5	35.3	40.3	0.2882	28.7

I: Income; C: Consumption.

Country	Year		H	ε_{min}	ε_{max}	ε^*	W	m	μ	G	μ (1-G)
Indonesia-Rural	1993	C	0	0.87	1.64	1.26	34.8	34.7	39.6	0.3844	24.4
Indonesia-Rural	1996	C	0	0.90	1.64	1.28	39.4	39.4	45.7	0.2868	32.6
Indonesia-Rural	1999	C	1	0.76	1.59	1.18	36.6	36.7	41.0	0.3258	27.6
Indonesia-Rural	2002	C	0	0.95	1.71	1.34	45.5	45.5	52.1	0.2670	38.2
Indonesia-Rural	2005	C	1	0.86	1.55	1.21	52.9	53.0	62.2	0.3389	41.1
Indonesia-Urban	1984	C	1	0.79	1.39	1.09	35.0	35.0	42.3	0.2546	31.6
Indonesia-Urban	1987	C	0	0.87	1.44	1.16	32.2	32.2	39.1	0.3441	25.6
Indonesia-Urban	1990	C	1	0.92	1.37	1.15	39.9	39.7	49.3	0.2694	36.0
Indonesia-Urban	1993	C	0	0.98	1.45	1.22	40.0	39.9	50.3	0.3643	32.0
Indonesia-Urban	1996	C	0	0.98	1.43	1.21	46.4	46.2	59.9	0.2430	45.3
Indonesia-Urban	1999	C	0	1.03	1.64	1.34	43.8	43.8	55.7	0.3392	36.8
Indonesia-Urban	2002	C	0	1.02	1.52	1.27	55.8	55.7	70.0	0.3745	43.8
Indonesia-Urban	2005	C	0	0.98	1.46	1.23	65.1	65.0	86.9	0.4596	47.0
Iran	1986	C	1	0.82	1.17	1.00	152.5	152.0	220.3	0.4249	126.7
Iran	1990	C	1	0.77	1.18	0.97	146.2	145.6	198.2	0.4189	115.1
Iran	1994	C	1	0.82	1.21	1.02	168.8	168.0	228.7	0.4307	130.2
Iran	1998	C	1	0.82	1.16	1.00	179.6	179.0	246.7	0.4668	131.6
Iran	2005	C	1	0.77	1.24	1.01	153.5	153.3	194.9	0.4404	109.1
Jamaica	1988	C	1	0.77	1.23	1.01	137.6	138.1	187.1	0.4115	110.1
Jamaica	1990	C	1	0.92	1.21	1.06	161.7	160.5	217.9	0.3899	132.9
Jamaica	1993	C	1	0.66	1.19	0.92	121.6	121.6	147.8	0.4187	85.9
Jamaica	1996	C	1	0.85	1.38	1.12	141.4	141.9	187.8	0.3503	122.0
Jamaica	1999	C	1	0.83	1.27	1.05	181.9	181.6	251.4	0.4259	144.3
Jamaica	2002	C	1	0.93	1.17	1.05	182.4	180.9	269.3	0.3643	171.2
Jamaica	2004	C	1	0.91	1.22	1.07	188.5	187.4	267.0	0.3544	172.4
Jordan	1986	C	1	0.94	1.28	1.11	174.9	173.9	219.0	0.4165	127.8
Jordan	1992	C	0	0.93	1.38	1.16	121.6	121.5	169.0	0.3522	109.5
Jordan	1997	C	0	0.91	1.47	1.19	117.3	117.3	148.8	0.3787	92.5
Jordan	2002	C	1	0.88	1.30	1.09	133.7	133.0	172.7	0.3439	113.3
Jordan	2006	C	0	0.94	1.47	1.21	158.9	159.0	205.7	0.3339	137.0
Kazakhstan	1988	I	0	0.58	1.18	0.88	302.5	301.6	332.2	0.2560	247.1
Kazakhstan	1993	I	1	0.75	0.95	0.85	109.4	108.8	127.8	0.3320	85.4
Kazakhstan	1996	C	1	0.68	1.09	0.88	113.4	112.7	135.9	0.3488	88.5
Kazakhstan	2001	C	1	0.74	1.21	0.98	131.4	130.9	153.2	0.3093	105.8
Kazakhstan	2002	C	1	0.76	1.22	1.00	101.1	100.8	123.0	0.4114	72.4
Kazakhstan	2003	C	1	0.74	1.19	0.97	110.9	110.5	132.7	0.4573	72.0
Kenya	1992	C	1	0.89	1.26	1.08	49.3	49.3	85.1	0.5362	39.5
Kenya	1994	C	1	0.76	1.24	1.01	56.9	56.9	76.0	0.4073	45.0
Kenya	1997	C	1	0.96	1.32	1.14	69.4	69.1	95.1	0.3616	60.7
Kenya	2005	C	1	0.83	1.25	1.04	74.4	74.4	108.4	0.3120	74.6
Kyrgyz Rep.	1988	I	1	-	-	1.52	167.0	167.2	193.7	0.3240	131.0
Kyrgyz Rep.	1993	C	1	0.66	0.93	0.79	109.5	108.1	167.7	0.2557	124.8
Kyrgyz Rep.	1998	C	1	0.84	1.22	1.03	52.1	51.9	64.4	0.3535	41.6
Kyrgyz Rep.	1999	C	0	0.79	1.32	1.06	68.9	68.8	84.2	0.5238	40.1
Kyrgyz Rep.	2002	C	1	0.83	1.29	1.06	48.6	48.4	57.4	0.3379	38.0
Kyrgyz Rep.	2004	C	1	0.87	1.21	1.05	60.8	60.5	72.6	0.3171	49.6
Lao PDR	1992	C	0	0.98	1.64	1.32	35.7	35.7	42.8	0.2959	30.1
Lao PDR	1997	C	1	0.96	1.58	1.28	38.2	38.4	48.1	0.3363	31.9
Lao PDR	2002	C	0	0.97	1.56	1.27	41.2	41.2	50.4	0.3502	32.7
Latvia	1988	I	0	0.41	1.18	0.79	571.1	570.2	608.9	0.3507	395.4
Latvia	1993	I	1	0.83	1.32	1.08	172.8	172.2	195.5	0.2229	151.9
Latvia	1996	I	1	0.48	1.32	0.90	194.3	195.2	224.9	0.2683	164.6
Latvia	1998	C	1	0.63	1.24	0.94	177.8	178.2	211.8	0.3004	148.2
Latvia	2002	C	1	0.71	1.28	1.00	246.6	246.7	303.8	0.3286	204.0
Latvia	2004	C	1	0.69	1.21	0.95	284.4	284.3	347.2	0.5126	169.2

I: Income; C: Consumption.

Country	Year		H	ε_{min}	ε_{max}	ε^*	W	m	μ	G	μ (1-G)
Lesotho	1986	C	1	0.86	0.97	0.91	46.0	45.1	75.7	0.5418	34.7
Lesotho	1993	C	1	-	-	0.92	34.1	33.5	59.8	0.5669	25.9
Lesotho	1995	C	1	-	-	0.79	46.9	45.6	89.4	0.6169	34.3
Lesotho	2002	C	1	0.74	0.92	0.83	46.6	45.8	70.4	0.3668	44.6
Liberia	2007	C	1	0.70	1.31	1.01	21.1	21.3	26.8	0.3183	18.3
Lithuania	1988	I	1	0.46	1.26	0.86	295.6	295.4	317.0	0.3517	205.5
Lithuania	1993	I	1	0.76	1.52	1.14	100.1	101.2	122.8	0.2224	95.5
Lithuania	1996	C	1	0.66	1.32	1.00	205.2	205.9	243.1	0.3223	164.7
Lithuania	1998	C	1	0.62	1.22	0.92	208.9	208.6	239.5	0.3156	163.9
Lithuania	2002	C	1	0.67	1.24	0.95	204.6	204.3	240.5	0.2981	168.8
Lithuania	2004	C	1	0.69	1.20	0.94	250.1	249.7	304.9	0.3391	201.5
Macedonia, FYR	1998	C	1	0.59	1.02	0.80	172.4	172.5	191.6	0.3805	118.7
Macedonia, FYR	2000	C	1	0.56	1.10	0.83	143.0	142.7	168.8	0.3821	104.3
Macedonia, FYR	2002	C	1	0.72	1.15	0.93	222.7	221.5	280.4	0.2761	203.0
Macedonia, FYR	2003	C	1	0.74	1.17	0.95	215.9	214.7	273.4	0.4618	147.1
Madagascar	1980	C	1	-	-	1.34	14.8	14.9	23.6	0.4166	13.8
Madagascar	1993	C	1	0.01	0.46	0.21	38.3	38.1	39.7	0.4084	23.5
Madagascar	1999	C	1	0.86	1.17	1.01	19.5	19.3	25.9	0.4681	13.8
Madagascar	2001	C	1	-	-	1.03	21.2	21.0	30.9	0.3011	21.6
Madagascar	2005	C	1	1.07	1.74	1.42	27.6	28.3	40.9	0.3760	25.5
Malawi	1997	C	1	0.94	1.41	1.18	17.9	18.1	27.7	0.4703	14.7
Malawi	2004	C	0	0.97	1.47	1.22	25.3	25.3	33.3	0.3729	20.9
Malaysia	1984	I	1	0.86	1.21	1.04	157.5	156.9	233.1	0.4680	124.0
Malaysia	1987	I	1	0.88	1.21	1.05	156.2	155.4	226.1	0.4550	123.2
Malaysia	1989	I	1	0.89	1.24	1.07	154.5	153.7	221.2	0.4462	122.5
Malaysia	1992	I	1	0.90	1.15	1.03	168.5	167.3	245.8	0.4627	132.1
Malaysia	1995	I	1	0.88	1.16	1.02	172.9	171.6	255.0	0.4699	135.2
Malaysia	1997	I	1	0.87	1.14	1.01	213.8	212.3	317.8	0.4754	166.7
Malaysia	2004	I	1	0.79	1.14	0.96	161.7	160.5	202.2	0.3928	122.8
Mali	1994	C	1	1.00	1.24	1.12	14.7	14.6	22.8	0.3805	14.1
Mali	2001	C	1	0.85	1.14	1.00	31.7	31.5	41.1	0.4840	21.2
Mali	2006	C	1	0.82	1.24	1.03	37.8	37.6	48.4	0.4304	27.6
Mauritania	1987	C	1	0.60	0.98	0.78	46.2	45.9	60.3	0.4628	32.4
Mauritania	1993	C	1	1.01	1.50	1.26	42.6	43.0	65.9	0.3838	40.6
Mauritania	1995	C	1	0.67	1.15	0.91	63.1	62.9	77.8	0.3663	49.3
Mauritania	2000	C	1	0.81	1.12	0.96	68.9	68.3	87.3	0.4776	45.6
Mexico	1984	C	1	0.88	1.00	0.93	103.1	101.9	143.7	0.4439	79.9
Mexico	1989	I	1	0.81	1.14	0.97	153.8	152.7	250.9	0.4624	134.9
Mexico	1992	C	1	0.87	1.12	1.00	161.5	160.0	246.9	0.4522	135.3
Mexico	1994	C	1	0.92	1.16	1.04	163.1	161.7	254.6	0.5259	120.7
Mexico	1996	C	1	0.82	1.15	1.00	132.8	132.4	195.1	0.4955	98.4
Mexico	1998	C	1	0.79	1.09	0.94	138.1	136.8	201.7	0.4920	102.5
Mexico	2000	C	1	0.82	1.18	1.01	160.8	160.6	249.6	0.4971	125.5
Mexico	2002	C	1	0.85	1.18	1.02	159.4	158.4	238.7	0.4692	126.7
Mexico	2004	C	1	0.71	1.15	0.93	215.6	215.6	300.0	0.4755	157.3
Mexico	2006	C	1	0.87	1.22	1.05	217.4	216.5	319.1	0.3622	203.5
Moldova Rep.	1988	I	0	0.51	1.25	0.88	60.8	60.8	66.1	0.2397	50.3
Moldova Rep.	1992	I	1	0.73	0.89	0.81	73.1	72.7	86.2	0.3477	56.2
Moldova Rep.	1997	C	1	0.67	1.18	0.93	76.1	76.1	93.9	0.3620	59.9
Moldova Rep.	1999	C	1	0.74	1.24	1.00	41.7	41.8	52.0	0.3605	33.2
Moldova Rep.	2002	C	1	0.80	1.21	1.01	72.2	72.0	90.0	0.3473	58.7
Moldova Rep.	2004	C	1	0.81	1.35	1.08	84.9	84.8	105.3	0.3248	71.1
Mongolia	1995	C	1	0.67	1.10	0.88	68.3	68.0	80.1	0.3265	53.9
Mongolia	1998	C	1	0.47	1.06	0.76	47.8	47.7	53.7	0.2996	37.6
Mongolia	2002	C	1	0.66	1.11	0.89	73.1	72.8	85.5	0.3285	57.4

I: Income; C: Consumption.

Country	Year		H	ε_{min}	ε_{max}	ε^*	W	m	μ	G	μ (1-G)
Mongolia	2005	C	1	0.60	1.10	0.85	62.1	61.9	72.4	0.3945	43.9
Morocco	1984	C	1	0.84	1.44	1.15	84.2	84.7	110.2	0.3920	67.0
Morocco	1990	C	0	0.91	1.34	1.13	116.2	115.9	152.5	0.3744	95.4
Morocco	1998	C	1	0.87	1.28	1.08	98.1	97.7	127.6	0.3842	78.6
Morocco	2000	C	1	0.93	1.32	1.13	98.4	98.0	131.0	0.3846	80.6
Morocco	2007	C	1	0.93	1.44	1.19	116.6	116.8	157.0	0.4250	90.3
Mozambique	1996	C	1	0.88	1.37	1.13	20.2	20.2	28.4	0.4422	15.8
Mozambique	2002	C	1	0.94	1.45	1.20	23.5	23.8	34.7	0.6901	10.8
Namibia	1993	I	1	-	-	1.05	44.0	43.5	118.9	0.3620	75.9
Nepal	1995	C	0	1.03	1.55	1.29	28.7	28.7	37.5	0.4422	20.9
Nepal	2003	C	1	1.19	1.58	1.39	35.2	35.2	53.1	0.2809	38.2
Nepal-Rural	1984	I	0	0.88	1.49	1.19	25.0	25.0	29.1	0.3525	18.8
Nepal-Urban	1984	I	1	-	-	1.28	38.0	37.9	48.6	0.4204	28.2
Nicaragua	1993	I	1	0.72	1.00	0.86	63.9	63.1	104.5	0.4834	54.0
Nicaragua	1998	I	1	0.75	1.14	0.94	80.2	80.0	126.7	0.4990	63.5
Nicaragua	2001	I	1	0.79	1.16	0.97	82.2	81.9	123.4	0.5439	56.3
Nicaragua	2005	I	1	0.81	1.20	1.01	91.6	91.9	143.8	0.5123	70.1
Niger	1992	C	1	0.84	1.48	1.17	26.7	26.9	33.8	0.4187	19.6
Niger	1994	C	1	0.85	1.27	1.06	22.3	22.2	29.8	0.3480	19.4
Niger	2005	C	1	0.91	1.40	1.16	28.6	28.7	40.0	0.4033	23.9
Nigeria	1985	C	1	0.84	1.00	0.92	36.1	35.9	45.3	0.3829	28.0
Nigeria	1992	C	1	0.70	0.79	0.74	40.6	40.0	53.0	0.4446	29.4
Nigeria	1996	C	1	0.83	1.29	1.06	26.4	26.5	38.0	0.4453	21.1
Nigeria	2003	C	1	0.73	1.10	0.91	29.3	29.1	38.8	0.2929	27.5
Pakistan	1987	C	1	0.92	1.56	1.24	30.2	30.2	37.2	0.2786	26.8
Pakistan	1990	C	0	0.86	1.46	1.16	31.1	31.0	37.8	0.2920	26.8
Pakistan	1992	C	0	1.13	1.83	1.50	51.4	51.5	62.4	0.2768	45.1
Pakistan	1996	C	0	1.10	1.86	1.50	38.7	38.8	46.1	0.3162	31.5
Pakistan	1998	C	1	1.03	1.74	1.40	48.9	49.1	60.8	0.3230	41.1
Pakistan	2001	C	1	1.05	1.78	1.43	44.5	44.7	53.8	0.3239	36.4
Pakistan	2004	C	1	0.01	0.88	0.40	68.7	67.8	72.8	0.5480	32.9
Panama	1979	I	1	-	-	0.89	154.9	152.5	223.6	0.5347	104.0
Panama	1991	I	1	0.73	0.81	0.77	137.0	133.7	220.7	0.5479	99.8
Panama	1995	I	1	0.71	0.93	0.82	174.5	171.9	287.0	0.4791	149.5
Panama	1996	I	1	0.72	0.89	0.81	164.5	161.6	265.7	0.5545	118.4
Panama	1997	C	1	0.71	0.92	0.81	188.4	185.6	264.8	0.5530	118.4
Panama	2000	I	1	0.75	0.96	0.85	169.8	166.7	278.3	0.5476	125.9
Panama	2002	I	1	-	-	0.86	166.2	163.1	273.0	0.4765	142.9
Panama	2004	I	1	-	-	0.84	179.9	176.2	284.7	0.5564	126.3
Paraguay	1990	I	1	0.76	1.11	0.94	118.7	118.0	151.7	0.5187	73.0
Paraguay	1995	I	1	0.77	1.00	0.89	153.5	151.6	267.4	0.5516	119.9
Paraguay	1997	I	1	0.71	0.83	0.77	117.5	114.7	188.3	0.5482	85.0
Paraguay	1999	I	1	0.69	1.00	0.83	142.5	141.0	234.0	0.3913	142.4
Paraguay	2002	I	1	0.70	1.00	0.85	119.5	118.4	201.5	0.5669	87.3
Paraguay	2005	I	1	0.73	1.06	0.90	156.1	155.2	246.3	0.5239	117.2
Peru	1985	C	1	0.80	1.19	1.00	216.2	215.5	304.0	0.5007	151.8
Peru	1990	I	1	0.85	1.34	1.10	180.3	181.3	250.8	0.4436	139.5
Peru	1994	C	1	0.83	1.10	0.97	135.9	134.9	187.4	0.4203	108.6
Peru	1996	I	1	0.71	1.12	0.91	125.1	125.0	174.6	0.4382	98.1
Peru	2002	I	1	0.79	1.10	0.94	123.2	122.2	198.3	0.4487	109.3
Peru	2005	I	1	0.84	1.12	0.98	139.1	137.8	215.3	0.4464	119.2
Philippines	1985	C	1	1.00	1.30	1.15	50.2	50.0	67.5	0.4343	38.2
Philippines	1988	C	1	-	-	1.15	55.1	54.7	73.7	0.4305	42.0
Philippines	1991	C	1	1.04	1.24	1.14	56.4	56.1	79.0	0.3989	47.5
Philippines	1994	C	1	1.01	1.20	1.11	59.5	59.2	81.8	0.3969	49.3

I: Income; C: Consumption.

Country	Year		H	ε_{min}	ε_{max}	ε^*	W	m	μ	G	μ (1-G)
Philippines	1996	C	1	-	-	1.07	69.9	69.2	97.1	0.4251	55.8
Philippines	1997	C	1	1.03	1.22	1.13	70.3	69.9	101.8	0.4176	59.3
Philippines	2000	C	1	1.06	1.18	1.12	69.4	68.9	100.3	0.4463	55.5
Philippines	2003	C	1	-	-	1.06	71.2	70.7	99.5	0.4305	56.7
Philippines	2006		1	-	-	1.07	69.9	69.2	97.1	0.2713	70.8
Poland	1985		1	0.56	1.35	0.96	301.6	301.9	332.7	0.3102	229.5
Poland	1987		1	-	-	0.33	360.6	350.4	377.7	0.3181	257.6
Poland	1989		1	0.58	1.27	0.93	383.7	383.5	427.7	0.3240	289.1
Poland	1992		1	0.33	1.00	0.65	177.8	177.5	199.0	0.3340	132.5
Poland	1996		1	0.85	1.46	1.16	112.8	112.8	136.4	0.3419	89.8
Poland	1999		0	0.79	1.33	1.06	246.2	245.6	295.5	0.2479	222.3
Poland	2002		0	0.78	1.31	1.05	242.3	241.8	293.8	0.2653	215.9
Poland	2005		0	0.79	1.29	1.04	247.4	246.5	302.3	0.3073	209.4
Romania	1989		1	0.32	1.15	0.73	323.8	324.5	346.3	0.2978	243.2
Romania	1992		1	0.39	1.11	0.74	213.2	213.1	230.9	0.3091	159.5
Romania	1994		1	0.59	1.30	0.94	87.1	87.3	98.6	0.3082	68.2
Romania	1998		1	0.01	0.85	0.38	139.3	137.2	147.3	0.2312	113.2
Romania	2000		1	0.60	1.22	0.91	102.3	102.3	117.2	0.2527	87.6
Romania	2002		1	0.62	1.24	0.93	114.3	114.5	133.1	0.2808	95.7
Romania	2005		1	0.72	1.38	1.05	158.8	159.3	187.8	0.2781	135.6
Russia	1988		0	0.44	1.18	0.81	133.8	133.6	144.0	0.2356	110.1
Russia	1993		1	0.77	1.21	1.00	198.4	200.0	290.8	0.4439	161.7
Russia	1996		1	0.69	1.15	0.92	201.6	202.0	280.3	0.3519	181.6
Russia	1999		1	0.68	1.09	0.89	151.3	150.6	186.3	0.3687	117.6
Russia	2002		1	0.72	1.14	0.93	189.5	188.6	229.9	0.4622	123.6
Russia	2005		1	0.75	1.16	0.95	239.5	238.1	297.7	0.3695	187.7
Rwanda	1984		0	1.04	1.66	1.36	32.6	32.5	38.5	0.4450	21.4
Rwanda	2000		0	0.92	1.35	1.14	22.3	22.3	32.4	0.2825	23.3
Senegal	1991		1	0.85	1.07	0.96	26.8	26.5	43.0	0.5622	18.8
Senegal	1994		1	0.93	1.46	1.21	35.4	35.6	48.2	0.5466	21.9
Senegal	2001		0	1.00	1.45	1.22	41.9	41.8	57.0	0.5763	24.1
Senegal	2005		1	0.76	1.20	0.98	51.6	51.4	65.9	0.3967	39.8
Sierra Leone	2003		1	0.97	1.20	1.09	37.0	36.7	50.2	0.3836	31.0
Slovak Rep.	1988		0	0.65	1.55	1.10	401.9	401.3	429.3	0.3959	259.3
Slovak Rep.	1992		1	0.48	1.63	1.06	377.1	378.1	402.6	0.5206	193.0
Slovak Rep.	1996		1	0.20	1.17	0.67	325.0	324.7	349.8	0.4132	205.3
Slovenia	1987		1	0.64	1.42	1.03	466.7	466.2	510.8	0.1940	411.7
Slovenia	1993		1	0.86	1.59	1.23	468.9	469.4	550.1	0.1916	444.7
Slovenia	1998		0	0.69	1.31	1.01	545.4	544.9	620.7	0.2468	467.5
Slovenia	2002		1	0.65	1.27	0.96	571.5	570.7	651.5	0.2871	464.5
Slovenia	2004		1	0.71	1.32	1.01	582.6	582.0	681.4	0.3057	473.1
South Africa	1993		1	-	-	0.96	90.0	88.9	164.9	0.2326	126.6
South Africa	1995		1	-	-	1.03	87.0	85.9	150.9	0.2843	108.0
South Africa	2000		1	-	-	0.95	83.9	82.9	147.6	0.2799	106.3
Sri Lanka	1985		0	0.84	1.42	1.13	59.9	59.7	72.0	0.3907	43.9
Sri Lanka	1990		1	1.00	1.67	1.34	61.1	61.2	75.1	0.3179	51.2
Sri Lanka	1995		0	1.01	1.51	1.27	64.5	64.4	81.6	0.3132	56.1
Sri Lanka	2002		0	1.02	1.49	1.26	71.8	71.7	97.3	0.3434	63.9
St. Lucia	1995		1	0.66	1.07	0.86	74.5	74.2	97.2	0.4154	56.8
Suriname	1999		1	0.73	1.00	0.86	117.7	116.2	180.2	0.5128	87.8
Swaziland	1994		1	0.83	1.12	0.98	17.5	17.3	31.6	0.4840	16.3
Swaziland	2000		1	0.89	1.21	1.05	29.6	29.4	45.2	0.5700	19.4
Tajikistan	1999		1	0.65	1.32	1.00	40.8	40.9	47.9	0.3207	32.5
Tajikistan	2003		0	0.76	1.29	1.03	46.7	46.6	55.5	0.3295	37.2
Tajikistan	2004		0	0.80	1.32	1.06	60.5	60.3	73.0	0.3080	50.5

I: Income; C: Consumption.

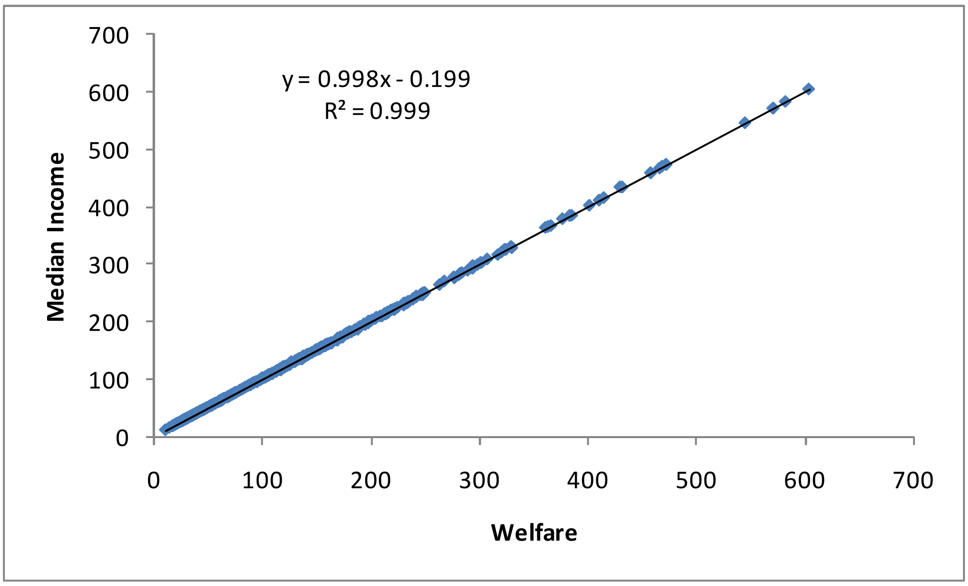
Country	Year	H	ε_{min}	ε_{max}	ε^*	W	m	μ	G	μ (1-G)
Tanzania	1991	1	0.67	1.24	0.96	27.4	27.4	32.8	0.3399	21.6
Tanzania	2000	1	0.74	1.25	1.00	18.4	18.4	22.3	0.3316	14.9
Thailand	1981	1	0.94	1.20	1.07	70.5	69.9	99.4	0.4067	59.0
Thailand	1988	1	1.07	1.34	1.21	73.3	73.0	103.6	0.4111	61.0
Thailand	1992	1	0.00	0.00	1.24	100.1	99.7	148.3	0.4386	83.3
Thailand	1996	1	1.04	1.30	1.17	118.4	117.8	165.2	0.4227	95.4
Thailand	1999	1	-	-	1.15	112.9	112.3	157.6	0.4466	87.2
Thailand	2002	1	1.04	1.32	1.18	122.2	121.6	167.2	0.4197	97.0
Thailand	2004	1	1.01	1.32	1.17	135.1	134.6	186.0	0.4231	107.3
Timor-Leste	2001	1	0.97	1.29	1.14	36.8	36.6	48.4	0.3851	29.7
Togo	2006	1	0.85	1.30	1.08	45.5	45.4	55.6	0.3379	36.8
Trinidad and Tobago	1988	1	-	-	0.95	192.9	193.1	263.5	0.4346	149.0
Trinidad and Tobago	1992	1	0.68	1.09	0.88	144.8	144.0	184.0	0.3951	111.3
Tunisia	1985	1	0.85	1.27	1.06	100.0	99.7	137.2	0.3986	82.5
Tunisia	1990	1	0.75	1.19	0.97	115.3	114.9	149.0	0.4209	86.3
Tunisia	1995	1	0.79	1.18	1.00	114.3	114.1	151.5	0.3928	92.0
Tunisia	2000	1	0.82	1.23	1.03	136.1	135.6	179.2	0.4072	106.2
Turkey	1987	1	0.92	1.40	1.16	150.1	150.3	209.0	0.4139	122.5
Turkey	1994	1	0.80	1.25	1.03	150.4	150.2	199.8	0.4165	116.6
Turkey	2002	1	0.83	1.27	1.05	152.8	152.6	207.2	0.4033	123.6
Turkey	2005	1	0.74	1.18	0.96	170.0	170.6	229.7	0.4203	133.2
Turkmenistan	1988	1	-	-	1.54	60.0	60.2	70.1	0.2596	51.9
Turkmenistan	1993	1	-	-	0.89	31.1	30.9	37.5	0.3979	22.6
Turkmenistan	1998	1	0.86	1.25	1.06	62.0	61.8	82.0	0.3553	52.9
Uganda	1989	1	0.76	1.12	0.94	26.5	26.3	36.1	0.4344	20.4
Uganda	1992	1	0.89	1.43	1.17	26.6	26.8	36.6	0.4058	21.8
Uganda	1996	0	0.92	1.41	1.17	30.6	30.5	39.1	0.3607	25.0
Uganda	1999	1	0.89	1.38	1.14	31.6	31.7	43.6	0.4130	25.6
Uganda	2002	0	0.97	1.43	1.20	33.3	33.3	48.1	0.4118	28.3
Uganda	2005	1	0.93	1.32	1.13	37.5	37.4	51.4	0.4337	29.1
Ukraine	1988	1	0.49	1.29	0.89	94.7	94.7	102.4	0.2789	73.8
Ukraine	1992	0	0.53	1.09	0.81	221.0	220.3	240.8	0.2784	173.8
Ukraine	1996	1	0.71	1.29	1.01	138.0	138.7	169.2	0.2304	130.2
Ukraine	1999	1	0.67	1.33	1.01	105.8	105.8	121.1	0.2554	90.2
Ukraine	2002	1	0.64	1.30	0.98	149.1	149.1	169.2	0.3433	111.1
Ukraine	2005	1	0.67	1.30	1.00	219.3	219.2	248.9	0.2847	178.1
Uruguay	1981	1	0.71	1.15	0.93	295.3	295.0	397.9	0.4408	222.5
Uruguay	1989	1	0.74	1.21	0.98	298.9	298.6	398.6	0.4123	234.2
Uruguay-Urban	1992	1	0.69	1.12	0.90	321.0	320.2	421.1	0.4281	240.8
Uruguay-Urban	1996	1	0.71	1.08	0.90	289.7	288.2	387.7	0.4402	217.1
Uruguay-Urban	1998	1	0.70	1.05	0.88	317.5	315.5	432.0	0.4250	248.4
Uruguay-Urban	2000	1	0.77	1.10	0.93	294.3	291.6	400.9	0.4420	223.7
Uruguay-Urban	2001	1	0.76	1.03	0.90	330.4	327.6	449.6	0.4362	253.5
Uruguay-Urban	2005	1	0.80	1.05	0.92	248.5	246.0	339.3	0.4113	199.7
Uzbekistan	1988	1	-	-	1.67	145.0	146.0	170.1	0.4364	95.9
Uzbekistan	1998	1	0.59	1.03	0.80	57.3	57.1	76.2	0.3340	50.8
Uzbekistan	2002	1	0.83	1.49	1.16	41.9	42.2	52.0	0.3553	33.5
Uzbekistan	2003	1	0.81	1.40	1.11	39.9	40.1	50.5	0.2539	37.7
Venezuela	1981	1	-	-	0.98	172.3	169.3	287.4	0.4640	154.0
Venezuela	1987	1	-	-	0.94	162.1	159.7	257.9	0.4592	139.4
Venezuela	1989	1	0.71	1.11	0.91	185.8	185.2	251.0	0.5378	116.0
Venezuela	1993	1	0.76	1.16	0.96	155.3	154.7	204.2	0.5212	97.8
Venezuela	1996	1	0.69	1.06	0.87	104.6	104.3	150.3	0.4313	85.5
Venezuela	1998	1	0.60	0.97	0.78	129.7	129.1	181.9	0.4072	107.8
Venezuela	2003	1	0.59	0.97	0.77	98.5	97.7	135.2	0.4733	71.2

I: Income; C: Consumption.

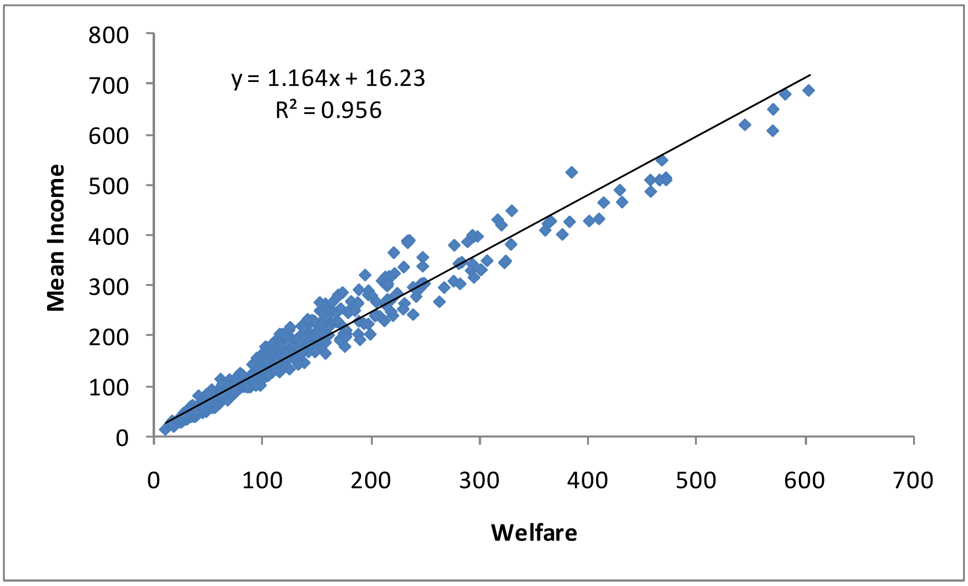
Country	Year	H	ε_{min}	ε_{max}	ε*	W	m	μ	G	μ (1-G)
Venezuela-Urban	2005	1	0.64	1.05	0.84	134.6	134.2	187.7	0.4746	98.6
Vietnam	1992	0	1.01	1.47	1.24	31.1	31.1	39.4	0.3691	24.9
Vietnam	1998	0	1.01	1.51	1.26	38.7	38.7	49.0	0.3475	32.0
Vietnam	2002	1	1.05	1.37	1.22	45.5	45.3	58.8	0.3654	37.3
Vietnam	2004	1	1.04	1.36	1.20	60.0	59.7	79.0	0.3800	49.0
Vietnam	2006	1	0.93	1.29	1.11	63.9	63.5	81.6	0.3440	53.6
Yemen Rep.	1992	1	0.73	1.25	1.00	120.6	120.8	155.2	0.3621	99.0
Yemen Rep.	1998	1	0.69	1.22	0.96	75.2	75.2	89.6	0.3831	55.3
Yemen Rep.	2005	1	0.88	1.49	1.19	63.5	63.9	82.1	0.3291	55.1
Zambia	1991	1	0.62	0.75	0.69	28.1	27.9	47.3	0.5121	23.1
Zambia	1993	1	0.81	0.86	0.84	26.9	26.5	41.0	0.4049	24.4
Zambia	1996	1	0.82	1.18	1.01	29.6	29.5	44.4	0.4924	22.5
Zambia	1998	1	0.76	1.11	0.94	33.7	33.5	53.1	0.5144	25.8
Zambia	2002	1	0.89	1.37	1.13	29.4	29.4	40.0	0.4790	20.8
Zambia	2004	1	0.74	1.06	0.90	28.0	27.8	41.8	0.5792	17.6

I: Income; C: Consumption.

Graph A1. Correlation between median income and welfare.



Graph A2. Correlation between mean income and welfare.



Graph A3. Correlation between $\mu\ (1 - G)$ and welfare.