ECONOMIC GROWTH CENTER

Yale University

Box 1987, Yale Station
New Haven, Connecticut

CENTER DISCUSSION PAPER NO. 212

Equity, Efficiency and Social Welfare:

A Comparison of Latin American Areas

Richard Weisskoff

August 1974

Equity, Efficiency and Social Welfare:

A Comparison of Latin American Areas

by

Richard Weisskoff
Department of Economics
Yale University
New Haven, Connecticut

Equity, Efficiency and Social Welfare:

A Comparison of Latin American Areas[*]

1. The Social Welfare Function--Introduction:

The quest for an index of social welfare is an attempt to formalize

a system for interpersonal comparisons of utility comprehending all of

society. The establishment of standards for such comparisons requires

the explicit statement of rules and principles, by which society may

evaluate the true gains which result from different policies of economic

growth. By making explicit these rules, we seek to compare levels of

social welfare of different geographical areas weighing consideration

of equity along with those of efficiency. Our goal is to apply a

system of measurement which enables us to contrast a society with a

relatively high but unequally distributed income to a poorer area with

more equitably distributed income. Furthermore, we seek to qualify the

nomenclature of "improvement" given to an area experiencing a rising

average standard of living by some penalty for a deterioration in the

distribution of income.[1]

---

[1] It would be pretentious to attempt a summary of the theoretical and empirical developments of welfare economies of the preceding decades. The most current of the periodical "revivals" of interest in social welfare rationale and measurement is occuring in at least two areas. First, interest on the part of public finance practitioners, while long standing, is again sparked by the challenge of negative income experiments and their impolications on welfare, as in Phelps (1973), and by the continued welfare dilemmas posed by project evaluation, as in K. Mera (1967) and Assi and Cox (1973).
(Continued)

The approach adopted here departs from the conventional wisdom on social welfare and individual utility which offers two alternative techniques. The first holds simply that the utility of individuals in society is determined by the absolute level of income of these individuals and that social welfare is simply the aggregate of individual utilites. Therefore, if the incomes of all the individuals rise, regardless of the relative differences in their improvement, the overall social welfare of the community must also rise.

The alternative to this approach specifies that individual utility is not only a function of the individual's own income but also the income of all the other members of society. Thus relative income determines the level of individual well-being, and the aggregate welfare of the society is the summation of these interdependent utilities, as in Thurow (1971).

The philosophy for evaluating social welfare which is followed in this paper combines aspects of both conventional approaches. We maintain, in the tradition of classical demand theory, that the individual's utility

(Footnote 1 Continued)
    Among the development economists, the quest for the grail of growth has led disillusioned practioners into a new-found, although unconvincing, concern for social justice through development, as in Marsden (1969). Younger economists, always suspicious of the growth-first-then-redistribute dictum of the early 1960's, have turned back to the classical writers on social justice and equity, as to Dalton (1920), Gini (1921) and others, and have resuscitated interest in the theoretical properties as in Atkinson (1960)offering more satisfactory measures as in Elteto and Frigyes (1968) and Levine and Singer (1970), and investigating contradictory measures in the cases of growing economies, as in the author's work (1969, 1970).

is determined only by his own income and is independent of his relative position in society. However, social welfare is determined not only by the summation of all the individual utilities but also by the equity implicit in the array of those individual utilities. Our notion of social welfare embodies both the autonomy of the individual's utility and the notion that the welfare of the society is determined by the degree of equity or "social justice" associated with the distribution of those incomes.[2]

Following Dalton (1920) equity is defined as the ratio of the "actual" to "potential," or achievable, social welfare given the current level or quantity of resources.

$$(1) \qquad E = \frac{W}{W^*}$$

W = Actual welfare

W^* = Potential welfare

E = Equity ratio

The equity ratio which should ideally range from unity, as the current distribution of income in a society approximates the egalitarian "ideal," to zero as actual welfare diverges from the maximum potential welfare. Defined for a finite range, equity is unit-free and comparable inter-temporally. This equity ratio is roughly comparable to other "traditional" measures of inequality, such as the Gini ratio, the

---

[2] We thus differ from the Rawlsian emphasis on the absolute state of the poorest member of the society. See Phelps (1973). Atkinson (1969) would abandon the conventional inequality measures in favor of a function by which the "aversion" to inequality may be valued by society and which is sensitive to transfers between income groups.

coefficient of variation or the variance of the logs of income only in appearance and intent.[3]

Potential welfare (W^*) measures the resources available to a society, and may be though of as a measure of efficiency, the conventional ranker of the "welfare" of nations. Maximum potential welfare should be achieved when all the members of society receive identical incomes to express the pure egalitarian ideal.

Actual welfare (W), as the direct measure of the current state of society, may be seen as the product of an equity measure and an efficiency measure, and therefore as an indicator of the distribution and the level of output.

---

[3]

These measures vary from zero for the most equal to unity as the upper bound for the Gini ratio and infinity for the other measures. For a review of standard applications, caveats and interpolation see the references in the author's "Income Distribution . . ." (1970), and A. Figueroa and the author's "Viewing Social Pyramids . . ." (1973).

Although conventional inequality measures do emphasize useful aspects of a distribution, a welfare function composed of one of these measures with an index does not satisfy the theoretical properties of Section 2.

The proliferation of measures of inequality is similar to controversies surrounding measures of concentration of firms in industrial markets. The traditional measure, "the concentration ratio," is useful only in characterizing the upper tail of distributions, and extensive literature has grown up suggesting more comprehensive, single-valued measures which are more sensitive to special characteristics of the distribution. Several summary indicators may be used jointly to describe changing concentration of firms in different industries. See M. Hall and N. Tideman (1967), for a discussion of measures of industrial concentration, and compare the measures and results in C. Kaysen and D. Turner (1965), Chapter II, with J. P. Miller (1955).

Can per capita income alone be used as an index of actual social welfare? Indeed, the usual practice of determining the "success" of a development program or to compare relative levels of "development" is to chart the growth of average incomes. This practice, however, assumes that equity is neutral or does not enter into the calculus of welfare. The adoption of an index of welfare suggested here frees the evaluator from relying on simple efficiency as the lone indicator of improvement.

In contrasting levels and changes in equity and efficiency associated with economic growth, we seek to quantify the loss of welfare due to deteriorating equality with the gains of long-term growth and to qualify the convenient, but narrow-minded practice of using per capita income as the single indicator of welfare.[4]

2. Properties of the Social Welfare Function:

In formulating a cardinal index of social welfare, a function must satisfy several general theoretical properties, and the index of cardinal utility must also satisfy general requirements developed in consumer theory. Mera (1967) and Aigner and Heins (1967) independently review the general properties that an acceptable social welfare function must meet. Both authors require that welfare be: (i) measured in actual units, comparable between countries and regions, discountable over time, transitive, and yield consistent orders; (ii) non-discrimina-tory and indifferent to the ordering of subgroups,[5] (iii) bounded by zero at

---

[4] See Kuznets (1955) and (1963), for the classic statement of the decline of equality in the early stages of development. See Kirman and Tomasini (1969) for the use of national means in U.S. dollars to evaluate inequality between nations.

[5] Non-discriminatory property, (ii):

(N-1) $\quad W(u_1, \ldots, u_j, u_k, \ldots, u_m)$

$\qquad = W(u_1, \ldots, u_k, u_j, \ldots, u_m) \qquad (i = 1, 2, \ldots, m)$

where W = welfare function

$\qquad u_i$ = utility of the ith family.

the lower tail, prohibiting negative values; (iv) continuous and yield

a positive derivative with respect to change in any one individual's

utility.[6]

Mera imposes three further conditions. His welfare function must be

(v) differentiable to the second order; (vi) neutral with respect to

the total population size;[7] and (vii) homogeneous of the first order.[8]

One family of function which satisfies all the criteria takes the

following form:[9]

$$(2) \quad W = \left[\frac{M}{\sum\limits_{i}(u_i)^{-q}} \right]^{\frac{1}{q}} \quad (i = 1, 2, \ldots, m)$$

W = level of social welfare
u_i = utility of the ith family
M = number of families in the society
q = parameter which may range from negative infinity to positive infinity

The function takes on familiar meaning when q has integral values: of

-1, 0, and +1, for any array of cardinal utilities.

---

[6]Marginal welfare property, (iv):

$$(N-2) \qquad \frac{\partial W}{\partial u_i} > 0 \qquad (i = 1, 2, \ldots, m)$$

[7]Neutral size property, (vi):

$$(N-3) \qquad W(u_i) = W(u_i, u_i, \ldots, u_i) \qquad (i = 1, 2, \ldots, m)$$

[8]First-order homogeneity property, (vii):

$$(N-4) \qquad \lambda W = W(\lambda u_1, \lambda u_2, \ldots, \lambda u_m) \qquad \text{for } \lambda > 0 .$$

[9]Mera (July, 1967), p. 36 ff. tests the function for each of the above properties. He notes that the CES production function (p.45, n. 1) is also of this same family of functions. See G. H. Hardy (1959), Chapter II, "Elementary Mean Values," for proofs.

(3) $\qquad W_a = \frac{1}{M} \sum_i u_i$ = arithmetic mean function, when $q = -1$.

(4) $\qquad W_g = (\prod_i u_i)^{\frac{1}{M}}$ = geometric mean function, when $g = 0$.

(5) $\qquad W_k = \dfrac{M}{\sum_i (u_i)^{-1}}$ = harmonic mean function, when $q = 1$.

In addition to the first four (i)-(iv) properties listed above, Aigner also requires that the welfare function be twice differentiable, but that the second derivative with respect to a change in individual utility be negative. Aigner's social welfare function does not satisfy properties (vii)and(viii) above, and therefore will be sensitive to the number of individuals and to the utility scale.

One of Aigner's several functional forms is especially relevant to international comparisons and is representative of a peculiar view of equity which focuses on an arbitrarily-established threshold, such as a minimal poverty line:

(6) $\qquad W_R = \sum_i \left[\dfrac{\theta u_i}{\theta + u_i} \right] \qquad$ (i = 1, 2, ..., M)

where $\quad W_R$ = Aigner's measure of social welfare

$\qquad u_i$ = utility of the ith family

$\qquad M$ = number of families in the society

$\qquad \theta$ = parameter.

The value of the parameter, θ , is set by the evaluator to represent an "acceptable standard" or "subsistence" level of living.[10]

---

[10]Aigner (March 1967), p. 16. Note that:

3. Properties of the Utility Function:

The individual utilities which are the constituents of social welfare must conform to a number of conventional theoretical properties of consumer theory. The utility function must satisfy the properties of (i) uniformity;[11] (ii) cardinality; (iii) non-negativity;[12] (iv) non-satiation or a positive marginal utility of income;[13] (v) second-order differentiability; (vi) diminishing marginal utility with increments in income;[14] and lastly, (vii) constant elasticity of utility

$$W_R' = \sum_i \left[\frac{u_i}{\theta} + 1 \right]^{-2}$$

hence the increment to welfare falls as the levels of utility of additional families rise. Aigner uses $\theta = \$5,000$ for estimating welfare of U.S. states. Our choice of θ is explained in Section 4.

[11] Uniformity, (i):

(N-5) $\qquad\qquad u_i = u(x_i) \qquad\qquad (i = 1, 2, \ldots, M)$

where u_i is the utility of the ith family, and x_i is the absolute income of the ith family. Mera (July 1967), pp. 26-31, uses consumption rather than income, as the determinant of utility.

[12] Non-negativity, (iii):

(N-6) $\qquad\qquad u_i > 0 \qquad\qquad (i = 1, 2, \ldots, M)$

otherwise, first-order homogeneity of the social welfare function, equation (N - 4), would not hold.

[13] Non-satiation, (iv):

(N-7) $\qquad\qquad \dfrac{\partial u_i}{\partial x_i} > 0 \qquad\qquad (i = 1, 2, \ldots, M)$

[14] Diminishing marginal utility of income, (vi):

(N-8) $\qquad\qquad \dfrac{\partial^2 u_i}{\partial x_i^2} < 0$

with respect to income.[15]

One class of utility function which satisfies these conditions is of the form:

$$(7) \qquad u_i = x_i^\eta \qquad (i = 1, 2, \ldots, M)$$

where u_i = utility of the ith family

x_i = income of the ith family

$0 < \eta < 1$. The elasticity of the <u>marginal</u> utility of income is $\eta-1$.

If the utility function given in equation (7) is substituted in the family of functions given in equations (3)-(6), then each of the welfare equations approaches a maximum as all recipient achieve identical incomes.[16] As the actual distribution of income approaches perfect

---

[15] Constant elasticity:

$$(N-9) \qquad \frac{\partial u_i}{\partial x_i} \cdot \frac{x_i}{u_i} = \eta \qquad \text{where } \eta \text{ is a constant.}$$

Many of these properties are objectionable, especially (vii). We would expect, for example, that the elasticity of the utility of income of the poor to be higher than the elasticity of utility of the rich.

Note also that no interdependence between families is permitted in the utility or social welfare functions.

[16] Maximize the social welfare function $W(u_i, \ldots, u_M)$, where $u_i = f(x_i)$ subject to the income constraint that

$$\sum_i x_i = X \, ,$$

where X is the total national income and x_i is the income of the ith family. Setting the first derivative equal to zero yields $x_i = X/M$, for all individuals.

Both Mera (July, 1967), p. 32, and Aigner (March, 1967), p. 14, perform identical proofs. Second order conditions for this maximum are used to specify the utility function.

equality, the equity ratio, E, in equation (1) varies from zero to unity for all of these selected welfare functions.[17]

4. Estimating Equations for Social Welfare:

The use of grouped, rather than continuous distributions requires that each observation be weighted by the frequency of the families in each income bracket. The choice of the arithmetic mean function as a measure of actual social welfare results in an equity index of unity (W_A/W^*) which fails to monitor any change in the income distribution. The practice of ranking countries by their mean income and then equating per capita income to welfare involves the application of a theoretically acceptable welfare function. However, those who prefer to weigh more heavily the dispersion of income will find other forms of the social welfare function more congruent to their intuitive notion of equity.

---

[17] Aigner never places conditions on the utility function but merely enters the value of "untransformed" income directly as utility. He has, therefore, adopted a constant, unit-elastic utility of equation (7) above.

Following this convention, elasticity in the utility calculations undertaken here have been set at unity. While this assumption does violate the bounds on (7), the resulting estimates do yield an upper limit on the value of social welfare.

True, values of the elasticity of the utility of income should vary with income class and country. A complete system of expenditure and price elasticities of demand estimated for different income groups or countries, could yield a "money-flexibility" or its inverse, income elasticities for different income classes. See Frisch (1959).

The geometric mean function is estimated in the form:

$$(8) \qquad W_G = \text{antilog} \left\{ \frac{1}{M} \sum_j f(x_j) \log x_j \right\} \qquad (j = 1, 2, \ldots, N)$$

where M = total number of families

N = total number of income-brackets

$\sum_j f(x_j)$ = sum of weights

x_j = average income of families in the jth income-bracket

$f(x_j)$ = number of families in the jth income-bracket.

Aigner's measure, W_R, of equation (7) deserves additional comment.[18] Like the other measures, W_R^* reaches a maximum when each family receives the statistically average income. Aigner's measure, however, lacks symmetry and is more responsive to changes in the position of poor families whose income is close to the value of "standard of living" parameter, θ, than to changes in the incomes of families comparatively distant from the established parameter. Aigner's measure of welfare is thus a calibrator sensitive to changes at the lower end of the income scale.

---

[18] Estimating equations for the harmonic mean function and Aigner's welfare are as follows:

$$(N-10) \qquad W_H = M \left[\sum_j \frac{f(x_j)}{x_j} \right]^{-1} \qquad (j = 1, 2, \ldots, N)$$

Aigner's welfare function, W_R, of equation (6) is calculated:

$$(N-11) \qquad W_R = \sum_j \left[\frac{\theta \cdot x_j \cdot f(x_j)}{(\theta + x_j)} \right] \qquad (j = 1, 2, \ldots, N)$$

where θ = an arbitrary parameter. For Puerto Rico, θ was set at \$2,000, to represent the "minimum acceptable standard" of living described in the Annual Governor's Report (1964), p. 41 ff. For other countries θ was set at three-fourths the average income in national currency

5. Results

The objective of directly estimating a cardinal social welfare function for an economy, either to evaluate its performance during growth or to compare different economies, may be achieved by simply applying one of the acceptable functions (equations 1-4), and by comparing the ranking of efficiency (the arithmetic mean) and equity (the ratio of actual welfare to efficiency). Ideally, the income of all recipients in the distribution should be deflated to a common year for the purpose of inter-temporal comparisons and then converted by purchasing power equivalents to a common currency if international comparisons are desired. Ideally, the individual or grouped observations, appropriated deflated by a price index relevant for the bundle of goods purchased by that income class and converted at a parity rate appropriate for each class, would then and only then, form the raw materials for the direct estimation of a cardinal welfare function.[19]

---

[19] Dalton (1920) emphasizes the need for domestic purchasing power equivalents as well for domestic comparisons in note 2, p. 356. Changes in money income to different groups may be offset by changing prices. Real purchasing power differences are most important for urban-rural and regional comparisons to welfare.

Dalton favors the use of the ratio of the logs of arithmetic to geometric income instead of the untransformed ratios used here because, he writes, "proportionate additions or subtractions will leave inequality unaffected." He saw an equity ratio of the untransformed means, as "a distinct, and inferior, measure," and, he wrote, "not a mere simplification" of his log-transformation. See Dalton (1920), note 1, p. 356.

The application of the efficiency and equity measures as factors in social welfare are redundant in one sense and, because of the greater range in income, may be unlikely to yield falling values of welfare with growth. If social welfare is directly observed as the geometric mean of a distribution, for example, and efficiency as the arithmetic mean, then only index of equity, the ratio of the two, remains to be estimated. If the arithmetic mean were to rise with growth, and if the distribution were to fly apart, leading to a substantial decline in the geometric mean, then both social welfare and the equity ratio would suffer diminution.

The procedures followed in calculating and comparing efficiency, equity and welfare between countries, regions, sectors and cities reflect the hybridized concepts with respect to time and coverage which lead to more involved application of the straight-forward measures. First, equity is calculated in <u>current prices</u> on the basis of the grouped income data, by simply comparing actual to potential social welfare. Thus the equity index sustains all biases due to distortions in relative prices facing different income classes and is, despite its use for inter-temporal purposes, undeflated for changes in absolute as well as relative prices over time. Once estimated as the denominator of the equity ratio, the efficiency measure is altered in midstream: to facilitate international comparisons, the arithmetic mean is first deflated to 1960 and then converted to U. S. dollar purchasing power equivalents. For the country-wide distributions (Table 1), the <u>per capita</u> G.D.P. value, expressed in U. S. dollars at Latin American

weights and indexed to the U. S. level, represents the country-wide level

of efficiency, just as the equity ratio calculated previously in current

terms, is taken to represent country-wide equity. The product of

these mixed measures is the value of social welfare which is now comp-

arable between countries and years. The practice of mixing equity in

current terms and efficiency in constant is followed in the inter-city

comparisons (Table 2) as well. However, equity and efficiency are

estimated in current terms for intra-country comparisons between urban

and rural zones and between agricultural and non-agricultural sectors

in a number of Latin American economies (Tables 3 and 4). Finally,

actual welfare in current terms for four major sectors is compared

in three countries. We seek sectoral similarities despite major

differences in the overall composition of these economies (Table 5).

FIGURE 1:   Efficiency, Equity and Social Welfare in Six Latin American Economies
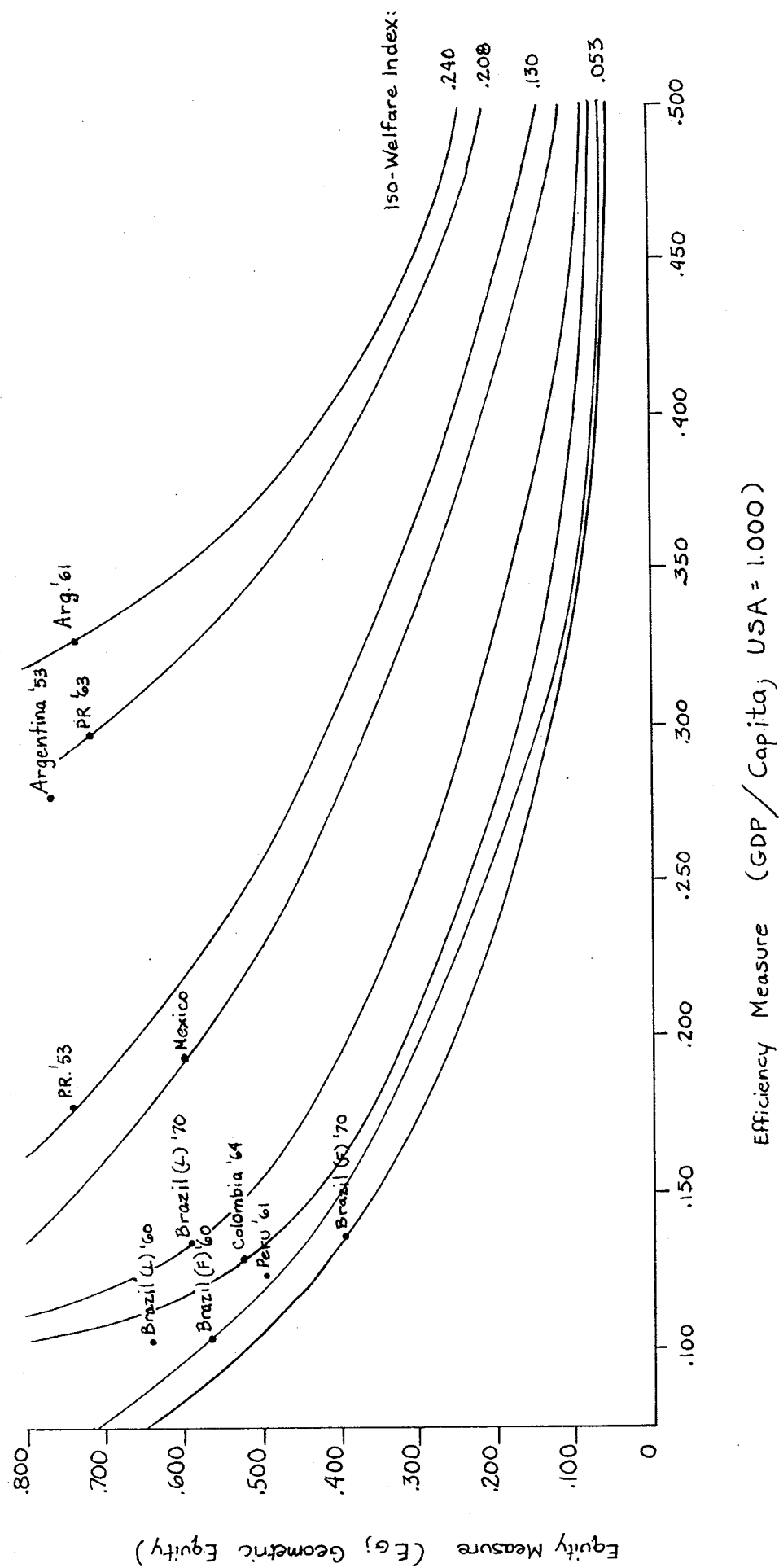
A. Country-Wide Estimates

The country-wide estimates (Table 1) illustrate changes in social welfare for three countries during periods of growth as well as the comparative standing of six Latin American countries relative to each other and to the United States.

The inter-temporal comparisons of Table 1 for three countries indicate that almost all welfare measures are dominated by the gains in efficiency which outweigh the loss in equity during the period. Argentina, for example, experienced gains from $786 to $927 per capita from 1953 to 1961 and losses in equality as measured by the geometric, Aigner and Gini indices. The country registered a net gain, both absolutely and relative to the other countries, in actual social welfare. (Ranked positions for each of columns (2)-(8) appear on the right-hand side of Table 1.) For Puerto Rico and for Brazil the decade results show similar trends with one minor reservation: all efficiency rankings rose; equities fell with the exception of Aigner's Index for the Fishlow data, column 7, lines 3-4, and the welfare indices all rose.

In the cases of Colombia, Mexico, and Peru, the relatively favorable efficiency rankings are all modified somewhat by the lower equity positions to yield a relatively inferior placement on the comparative scale of social welfare. Iso welfare contours for the countries appear in Figure 1.

B. International Comparisons of Cities

The ranking of cities, like the conventional comparison of nations, is generally made on the basis of average incomes alone, thereby taking the arithmetic mean function as the index of social welfare. Four other functions applied to fourteen different Latin American cities (San Juan appears twice) lead to a slight re-ranking in terms of actual welfare.[20]

---

[20]The data for the city studies, reservations about the data, and discussion

Table 1

Efficiency, Equity, and Social Welfare in Six Latin American Economies

Country		Efficiency Index GDP Capita (1960 US $) (1)	Index GDP/Capita (USA = 1,000) (2)	Equity Indices E_G (3)	E_R (4)	(1 - Gini) (5)	Welfare Indices W_G (6)	W_R (7)	W (1 - Gini) (8)	Efficiency (2)	Equity E_G (3)	E_R (4)	E (1 - Gini) (5)	Social Welfare W_G (6)	W_R (7)	W_W (1 - Gini) (8)
Argentina	1953	786	.277	.759	.871	.594	.210	.241	.165	9	11	11	11	10	9	10
Argentina	1961	927	.327	.735	.857	.572	.240	.280	.187	11	9	9	9	11	11	11
Brazil (Fishlow)	1960	289	.102	.561	.789	.476	.057	.080	.049	1*	4	5	6	2	1	2*
Brazil (Fishlow)	1970	383	.135	.393	.818	.361	.053	.110	.049	5*	1	7	1	3	6	3*
Brazil (Fishlow)	1960	289	.102	.637	.814	.506	.065	.083	.052	2	7	6	7	4	2	4
Brazil (Langoni)	1970	383	.135	.565	.763	.438	.077	.103	.059	6*	5	3	4	6	5	6
Colombia	1964	364	.128	.526	.760	.419	.067	.097	.054	4	3	2	3	5	4	5
Mexico	1963	542	.191	.596	.784	.462	.114	.150	.088	8	6	4	5	7	7	7
Peru	1961	353	.124	.491	.715	.384	.061	.089	.049	3	2	1	2	1	3	1
Puerto Rico	1953	502	.177	.737	.865	.577	.130	.153	.102	7	10	10	10	8	9	8
Puerto Rico	1963	842	.297	.703	.853	.553	.208	.253	.164	10	8	8	8	9	10	9
U. S. A.	1960 - 1962	$2,837	1.000	.972	.899	.640	.792	.899	.640	12	12	12	12	12	12	12

RANKINGS

(E_G) = Geometric equity (W_G) = The corresponding welfare measure
(E_R) = Aigner's equity (W_R) = The corresponding welfare measure
1 - Gini) = 1 - Gini coefficient W(1 - Gini) = Corresponding welfare measure
ere Efficiency Index (2) X Equity Index (3 - 5) = Welfare (6 - 8).

(*)appearing in same column indicate identical rankings.

Table 1

Sources and Procedures

Gross domestic product per capita in 1960 U. S. dollars (column 1) is from Braithwaite (1967), Table 21, p. 71. The Brazil figure for 1970 is derived by applying the growth rate of per capita income implicit in Fishlow (1972), p. 392 and 399, to the 1960 Braithwaite base income. Using another set of purchasing power equivalents, the Fishlow per capita figures are $513 in 1960 and $679 in 1970. His parity rates are from ECLA, Economic Bulletin, (October 1963), 203.

Incomes were then indexed on U.S. = 1.000, in order that efficiency, like equity, would vary within theoretically, if not practically, plausible limits.

All country data are referenced in detail in the Source Bibliography Argentina (1.1); Brazil (2.3 and 2.5); Colombia (4.4); Mexico (7.1); Peru (8.2); Puerto Rico (9.1 and 9.2); U.S.A. (11 A, supplement).

Equity indices are calculated from the original, grouped data in local currency. Social welfare is the product of equity and the efficiency index calculated in 1960 U.S. purchasing power equiva-lents.

In the case of the two Brazilian cities, Recife (line A, 1) ranks low in terms of per capita income, relatively high in terms of equity, but still low in all measures of social welfare. São Paulo, the richest city second only to Caracas, also ranks second highest in equity. For the four Colombian cities, interchanges in the welfare rankings occur due to the differential sensitivities of the several measures to the shape of the income distribution. In terms of efficiency uncorrected for regional price levels within the country, arithmetic mean incomes rank Cali the poorest, followed by Barranquilla, Medellín, and finally Bogotá, the capital. All the equity measures concur that Medellín ranks the least equitable, followed by Cali, Bogotá, and Barranquilla (except for the ranking by the Gini measure which interchanges the last two cities). The geometric and harmonic welfare indices rank Cali the lowest and Bogotá the highest, following the efficiency index; however, Medellín is deemed inferior to Barranquilla in social welfare. The two remaining welfare measures interchange Cali and B/quilla as the lowest, agreeing on the relatively high rankings for Medellín and Bogotá.

---

of their biases, appear in Figueroa and this author (1973), Appendix I, pp. 70-75. Here it is important to recall that if the source surveys, by virtue of sampling technique or reporting errors, are biased toward middle income families, then the equity estimates are higher than the true measures. Seasonal variations are corrected in some surveys by repeated sampling throughout the year.

All equity measures are calculated on the basis of the income arrays in local currency of the survey year.

The three step calculation of the efficiency measure (column 1 of Table 2) is explained in the source note accompanying the table. Since purchasing power equivalents are available as county wide rates, differences in price levels within courtries have not been adjusted and probably lead to significant overstatement of the per capita income differences between Recife and São Paulo in the Brazilian case, between Caracas and Maracaibo in Venezuela, and between the Capital District (D.F.) and Monterrey in Mexico. Different internal price levels between the Colombian cities appear to be less pronounced.

Table 2

Efficiency, Equity and Social Welfare in Fourteen Latin American Countries

Coefficients and Rankings:

Country/City	Efficiency Per Capita Income in 1960 US $ Equivalents (1)	Equity			Social Welfare			
		E_G (2)	E_R (3)	E (1 – Gini) (4)	W_G (5)	W_H (6)	W_R (7)	W (1 – Gini) (8)
A. Brazil	1960-1968 (Average)							
1. Recife	.356 (1)	.711 (10)	.849 (10)	.557 (10)	.253 (1)	.192 (1)	.302 (1)	.198 (1)
2. Sao Paulo	.839 (13)	.734 (13)	.861 (1)	.570 (12)	.616 (13)	.482 (13)	.722 (13)	.478 (13)
B. Colombia	1967							
3. Barranquilla	.463 (3)	.708 (9)	.844 (8)	.544 (8)*	.328 (4)	.257 (4)	.391 (3)	.252 (4)
4. Bogota	.575 (5)	.696 (8)	.841 (7)	.544 (9)*	.400 (6)	.294 (8)	.483 (6)	.312 (6)
5. Cali	.461 (2)	.686 (7)	.832 (6)	.527 (6)	.316 (2)	.241 (2)	.383 (2)	.243 (3)
6. Medellín	.494 (4)	.663 (4)	.818 (4)	.510 (4)	.327 (3)	.245 (3)	.404 (4)	.252 (5)
C. Guatemala	1969							
7. Guatemala City	.583 (6)	.740 (15)	.866 (14)	.578 (14)	.431 (10)	.332 (10)	.505 (9)	.337 (9)
D. Mexico	1963							
8. Mexico D.F.	.730 (10)	.641 (3)	.812 (3)	.501 (3)	.468 (11)	.314 (9)	.593 (11)	.366 (11)
9. Monterrey	.603 (8)	.619 (2)	.794 (2)	.473 (2)	.373 (5)	.267 (6)	.479 (5)	.225 (2)
E. Paraguay	1970-1971							
10. Asuncion	.789 (12)	.552 (1)	.760 (1)	.439 (1)	.431 (9)	.264 (5)	.593 (10)	.342 (10)
F. Peru	1968							
11. Lima	.607 (9)	.670 (5)	.829 (5)	.526 (5)	.407 (7)	.285 (7)	.503 (7)	.319 (7)
G. Puerto Rico								
12. San Juan	.743 (11)	.717 (11)	.858 (11)	.577 (13)	.523 (12)	.388 (12)	.637 (12)	.429 (12)
13. San Juan	1.242 (15)	.671 (6)	.845 (9)	.529 (7)	.833 (15)	.684 (15)	1.061 (15)	.657 (15)
H. Venezuela								
14. Caracas	.914 (14)	.737 (14)	.867 (15)	.582 (15)	.674 (14)	.502 (14)	.792 (14)	.532 (14)
15. Maracaibo	.587 (7)	.731 (12)	.859 (12)	.566 (11)	.429 (8)	.338 (11)	.504 (8)	.332 (8)

(*) appearing in the same column indicate identical ranking.

Table 2

Sources and Procedures

Money income in each study for each year was deflated to 1960 prices
using local price indices. When a city index was unavailable, the
country-wide index or the index for a nearby city was applied.
Latin American purchasing parity rates from Braithwaite (1967) were
used to convert each 1960 currency to 1960 U. S. dollars. Average
family size from each city study was then applied to family income
to obtain per capita income, with the exception of the four
Colombian and two Venezuelan cities. For these, a general "urban
family size" from the ECIEL Surveys had to be applied to each of
the constituent cities.

Equity measures are calculated from the grouped data for each city
in current prices of local currency. Welfare is the product of
the equity index and efficiency in 1960 U. S. purchasing power
equivalents.

A. Brazil:

  Fundação Getulio Vargas, Conjuntura Economica, Vol. 26, June, 1972,
  "Regional Economic Indices;" São Paulo, "Cost of Living," p. 132;
  and "all Brazil," p. 128, for Recife.

B. Colombia:

  Departamento Administrativo Nacional de Estadística,
  (DANE). Anuario General de Estadística, (1961), p. 693-4,
  Table 398 for 1960, 1961 and "Obreros," 1964-7, from Vol. 4,
  "Indices y Precios, Trabajo, Producción," p. 13-16, Table 4,
  for Barranquilla, Bogotá, Manizales and Cali.

(Continued)

Table 2

Sources and Procedures

(Cont.)

_____, Banco de la República, Séries Estadísticas y Gráficos, December, 1970, p. 78, Table G - 6, for Medellín.

C. Guatemala:

Dirección General de Estadística, Boletín Estadístico, 1968, Table I-1.

D. Mexico:

Secretaría de Industria y Comercio, Revista de Estadística, November-December, 1966, p. 1236, Table 8.8 for 1964-1965.

E. Paraguay:

Dirección General de Estadística y Censo, Boletín Estadístico del Paraguay, January, 1973, p. 52. General Consumer Index for "Obreros en Asunción." Base = 1964.

Ministerio de Agricultura y Ganadería, Manual Estadístico del Paraguay, 1962-1969, provides the link to complete series 1960-1963. Base: 1958 = 100.

F. Peru:

Ministerio de Industria, Índices de Precios al Consumidor, January, 1971, pp. 14-15. (changing bases from period 1960-1966 and 1967-1971.)

G. Puerto Rico:

Planning Board, Bureau of Economic and Social Planning,

(a) Ingreso y Producto de Puerto Rico, 1959, p. 38, Table 18, for base 1953; 1962 Volume, p. 20, Table 18, for base 1960.

(b) Anuario Estadístico, 1968, p. 109, Table 85 for consumer prices for wage earning families.

H. Venezuela:

Dirección General de Estadística, Anuario Estadístico de Venezuela, 1970, p. 194, for both Caracas, and p. 213, general Venezuela index.

Table 2

Sources of Income Distribution and Data

A. Brazil (2.1 and 2.2)

B. Colombia (11.1)

C. Guatemala (6.3)

D. Mexico (7.1)

E. Paraguay (11.1)

F. Peru (11.1)

G. Puerto Rico (9.1 and 9.2)

H. Venezuela (11.1)

FIGURE 2: Efficiency, Equity and Social Welfare in Fourteen Latin American Cities
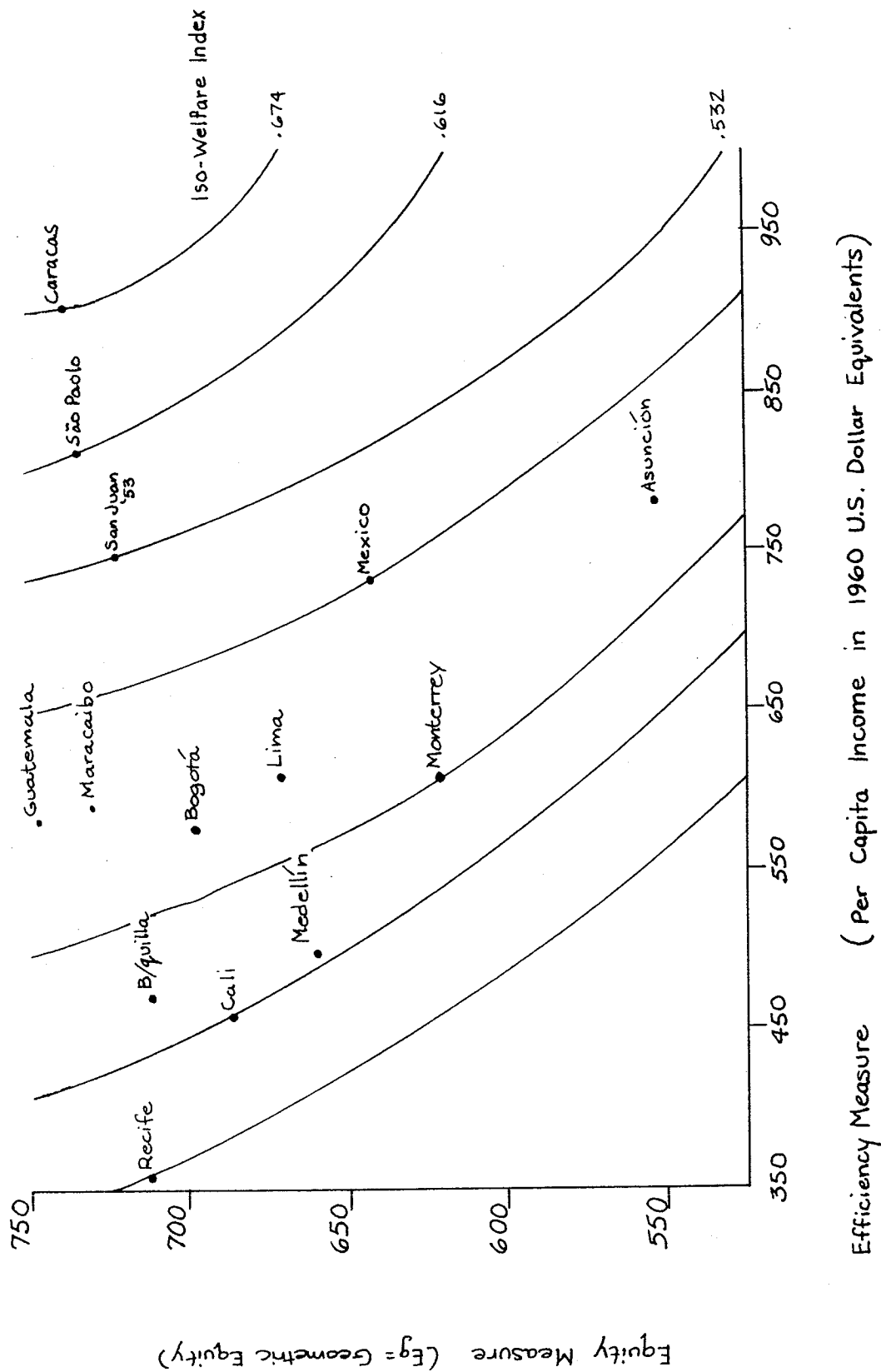
Of the other cities, México D.F. surpasses Monterrey in both efficiency and equity. Asunción, Paraguay, ranks high in _per capita_ income, the lowest of all cities in equity, but high in social welfare. In San Juan, the growth in efficiency offsets the decline in equity and results in higher social welfare. Finally, Caracas ranks high in all three properties, while Maracaibo suffers in a comparatively low placement in social welfare due to low   level of efficiency (See Figure 2)

C.   Intra-Country Comparisons: Rural vs. Urban and A vs. Non-A Zones

Because distinct sets of families are generally associated with different economic activities, it is plausible to contrast levels of equity and social welfare which characterize discrete geographical areas and producing sectors. For all cases in Table 3, the arithmetic mean income in the urban zone is almost or greater than twice the mean income in the rural zone, uncorrected for differences in the price levels. Although the equity measures indicate a more even distribution of incomes in the rural areas, except in the case of urban Colombia, the relative advantage of equity is swamped by the great disparity in the mean levels in the cities.   Thus social welfare in these urban zones is, according to these measures, far superior to welfare in the rural areas.

A second type of comparison may be drawn between welfare levels in major producing sectors, such as agriculture and non-agriculture. The ratio of the arithmetic mean of incomes generated in A to the non-A mean from 29% for Brazil (Fishlow, 1970) to 90% for Argentina, 1953. However, the degree of greater equity in the A sectors is insufficient

TABLE 3

Comparisons of Social Welfare in Rural and Urban Areas

	Efficiency: Index Arithmetic Mean (1)	Equity		Social Welfare	
		E_G (2)	E_R (3)	W_G (4)	W_R (5)
1. Chile, 1967					
a. Total	——	.54	.81	.26	.14
b. Rural	100	.69*	.83*	.17	.09
c. Urban	194*	.67	.82	.32*	.17*
2. Colombia, 1964					
a. Total	——	.53	.76	.44	.45
b. Rural	100	.57*	.76	.36	.36
c. Urban	171*	.53	.78*	.57*	.55*
3. Costa Rica, 1971					
a. Total	——	.79	.89	.93	.45
b. Rural	100	.85*	.93*	.68	.32
c. Urban	215*	.80	.89	1.36*	.65*
4. Mexico, 1963					
a. Total	——	.60	.78	.76	.43
b. Rural	100	.69*	.83*	.51	.26
c. Urban	231*	.62	.80	1.06*	.59*
5. Peru, 1961					
a. Total	——	.49	.71	.23	.14
b. Rural	100	.66*	.83*	.18	.10
c. Urban	267*	.65	.82	.47*	.26*
6. Puerto Rico, 1953					
a. Total	——	.74	.86	1.27	.64
b. Rural	100	.83*	.92*	1.02	.70
c. Urban	181*	.70	.84	1.56*	.88*
7. Puerto Rico, 1963					
a. Total	——	.70	.85	2.30	1.06
b. Rural	100	.71*	.86	1.63	.92
c. Urban	190*	.70	.87*	3.07*	1.19*

*Indicates superior ranking for the geographical zone.
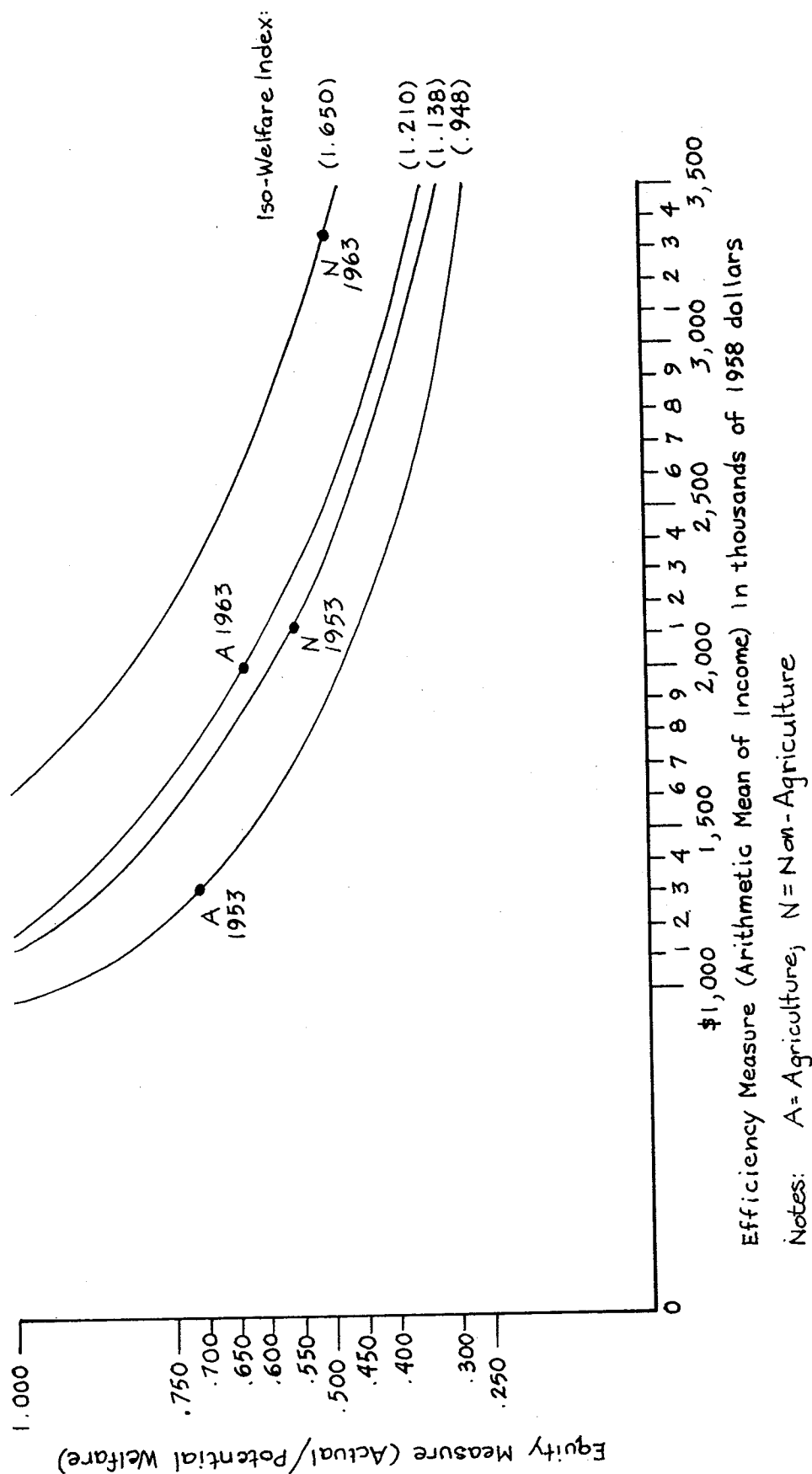
See Bibliography for sources.

Table 4

Intra-Country Comparisons of Welfare in
Agricultural and Non-agricultural Sectors

Country		Arithmetic Mean	Equity		Social Welfare	
			E_G	E_R	W_G	W_R
1. Argentina:						
Agricultural/Non-agricultural	1953	.90	.85	.92	.76 (11)	.82 (11)
	1961	.76	.90	.95	.69 (9)	.72 (9)
2. Brazil – Langoni:						
Agricultural/Non-agricultural	1960	.54	1.13	1.04	.61 (7)	.57 (6)
	1970	.37	1.25	1.10	.46 (1)	.40 (2)
3. Brazil – Fishlow:						
Agricultural/Non-agricultural	1970	.29	1.91	1.30	.54 (3=)	.37 (1)
4. Chile:						
Agricultural/Non-agricultural	1967	.54	1.08	1.02	.58 (6)	.55 (4)
5. Colombia:						
Agricultural/Non-agricultural	1970	.48	1.15	1.08	.55 (4)	.65 (8)
6. Guatemala:						
Agricultural/Urban	1966/1971	N.C.*	1.16	1.07	N.C.	N.C.
7. Mexico:						
Agricultural/Non-agricultural	1963	.51	1.00	.99	.50 (2)	.50 (3)
8. Puerto Rico:						
Agricultural/Non-agricultural	1953	.64	1.15	1.07	.73 (10)	.83 (12)
	1963	.59	1.07	1.01	.63 (8)	.81 (10)
9. U. S. A:						
Farm/Non-farm	1955-1957	.61	.92	.96	.56 (5)	.58 (7)
	1960-1962	.58	.92	.96	.54 (3=)	.56 (5)

*N.C. = Not Comparable.
Sources: See Bibliography and Source Appendix.

FIGURE 3: Actual Social Welfare for Two Major Sectors in Puerto Rico, 1953 and 1963 as Measured by the Harmonic Mean Function (W_H)

Iso-Welfare Index:

(1.650)

(1.210)
(1.138)
(.948)

N
1963

A 1963

N
1953

A
1953

Equity Measure (Actual/Potential Welfare)

1.000
.750
.700
.650
.600
.550
.500
.450
.400
.300
.250

0

$1,000   1,500   2,000   2,500   3,000   3,500

Efficiency Measure (Arithmetic Mean of Income) in thousands of 1958 dollars

Notes: A = Agriculture;   N = Non-Agriculture

to outweigh the greater efficiency in the non-A zone, and as a result,

social welfare in the non-A sector outstrips welfare in the A-sector.

Only in the cases of Argentina and U.S.A., is agriculture characterized

by a _less_ equal income distribution.[21]

A sketch of the relative positions of welfare in the Puerto Rican

A and non-A sector is presented in Figure 3, rendered comparable by de-

flating the efficiency measure to constant 1958 dollars for both years.

The loss in equity of both sectors with growth is evident as each sector

achieves higher levels on the social welfare map.

D. Intra-County Comparisons: Four Major Sectors

Sectoral comparisons on a more disaggregated level for several

countries reveal similar ranking for similar economic activities. The

values of the equity index as measured by the harmonic mean function

(E_H) are compared for the four major sectors of Puerto Rico, Argentina,

and Mexico in Table 5. (Numerical rankings of the sectors according to

degree of equity are given in parentheses.) The sectors have been con-

structed to be as nearly comparable permitted by the differing degrees

of aggregation for each of the three countries.[22]

---

[21]For hypothesized explanations of this observation, see this author's
(1970).
    Since efficiency estimates have not been rendered into comparable
purchasing powers in Tables 3 and 4, international comparisons should be
resisted.

[22]Mining and construction are included in manufacturing. Commerce consists
of retailing, wholesaling, and finance. The service sector encompasses
a broad range of activities, including transport, communications, public
administration, public utilities, and professionals in most of the countries.

Which sectors demonstrate greater inequity? In all three countries, the industrial sector ranks either first or second in the level of equity, reflecting perhaps the impact of unionization in Mexico and Argentina and persistent government intervention in Puerto Rico on narrowing the distribution of earnings.[23] Commerce ranks as the third or fourth <u>least</u> equal sector in all 3 countries. This finding is consistent with the heterogeneous nature of the commercial activities which include petty commerce and high finance.

It is the ranking of the agricultural sectors which demonstrates the least consistency in comparing the 3 countries. In Puerto Rico and Mexico, agriculture ranks close to industry as one of the two most equal sectors, while in Argentina, agriculture is the least equal of all the sectors. The increasing equity within the Argentine agricultural sector may be explained by a rapid mechanization in the wheat and corn-growing areas and the subsequent urban migration of the poorest grades of the rural labor force.

Measures of sectoral efficiency indicate that commerce in all three countries enjoys a substantial margin over agriculture. It is surprising that the relative position of commerce for the later years (1963 and 1961)

---

[23]Minimum wages in Puerto Rico are determined and enforced on the basis of the decision by committees composed of representatives of industry, workers, and government. See Chapter 2, "Wage Determination and Wage Behavior," in Reynolds and Gregory (1965), pp. 41-81. The political support of urban labor had resulted in the strengthening of industrial unions relatively early in the industrialization process. See H. Lansberger, "The Labor Elite: Is it Revolutionary?" in S. M. Lipset and A. Solari (1967), for a brief review of labor organization in Mexico and Argentina.

TABLE 5

Indices of Efficiency, Equity, and Social Welfare for 4 Major Sectors
in Puerto Rico, Argentina, and Mexico,
as Measured by the Harmonic Mean Function (E_H)

	Puerto Rico 1953*	Puerto Rico 1963*	Argentina 1953**	Argentina 1961**	Mexico 1963
Efficiency:					
I. Agriculture	1.331(100)	1.951(100)	1.179(100)	1.153(100)	.819(100)
II. Industry	1.869(140)	3.128(160)	1.139 (96)	1.384(120)	1.434(175)
III. Commerce	2.854(214)	4.459(229)	1.614(137)	2.366(205)	1.713(209)
IV. Services	2.497(188)	4.283(220)	1.459(124)	1.456(126)	1.746(213)
V. All Sectors	1.870(140)	2.992(153)	1.298(110)	1.454(125)	1.277(156)
Equity:					
I. Agriculture	0.712(1)	0.620(2)	0.535(4)	0.548(4)	0.454(2)
II. Industry	0.662(2)	0.658(1)	0.695(1)	0.626(2)	0.479(1)
III. Commerce	0.544(4)	0.527(3)	0.667(3)	0.562(3)	0.345(4)
IV. Services	0.549(3)	0.523(4)	0.683(2)	0.684(1)	0.398(3)
V. All Sectors	0.573	0.505	0.646	0.616	0.399
Social Welfare:					
I. Agriculture	.948(4)	1.210(4)	.631(4)	.632(4)	.372(4)
II. Industry	1.237(3)	2.058(3)	.790(3)	.866(3)	.687(2)
III. Commerce	1.553(1)	2.350(1)	1.077(1)	1.330(1)	.591(3)
IV. Services	1.371(2)	2.240(2)	.996(2)	.966(2)	.695(1)
V. All Sectors	1.071	2.088	.830	.881	.498

NOTES

Efficiency is measured by the arithmetic mean of family income within
the specific sector. (Parentheses indicate sector mean relative to
agricultural mean.)

*Expressed in 1958 dollars.

**Expressed in 1960 pesos.

Social Welfare may be compared between years for any single country.

I. Agriculture: Puerto Rico includes forestry and fishing. Argentina
includes forestry, hunting, fishing, and livestock.
Mexico includes forestry, hunting, fishing, and livestock.

II. Industry: Puerto Rico includes construction, manufacturing. Argentina
includes mining and quarrying; industry; construction.
Mexico includes mining and quarrying; manufacturing,
construction; electricity, water and sanitary services.

III. Commerce: Puerto Rico includes wholesale and retail trade; finance;
insurance and real estate. Argentina includes commerce
and financial institutions. Mexico includes "commerce"
alone.

IV. Services: Puerto Rico includes transportation, communication and
other public utilities; service industries; public adminis-
tration. Argentina includes transport; storage and communi-
cations; general government and other services; domestic
services; services; professionals and independent earners;
retired and pensioners; rentiers. Mexico includes transport,
storage and communication; services.

Sources:

Puerto Rico: from Puerto Rico Department of Labor (1953), Report A-1,
Tables 5 and 6; Puerto Rico (1963), Report 1A, Tables 15-A1,
D1, E1, D2, E2.

Argentina: from Argentina (1965), Volume IV. Each sector was formed
by adding the number of families and their incomes for each
of the 22 income intervals of the following tables:
Agriculture for 1953: tables on pp. 7 and 15; for 1961,
tables on pp. 225 and 263.

NOTES (continued)

        Industry for 1953: tables on pp. 8, 9, and 16; for 1961, tables on pp. 256, 257, and 264.

        Commerce for 1953: tables on pp. 10 and 17, for 1961, tables on pp. 258 and 265.

        Services for 1953: tables on pp. 11-13, 18-22; for 1961, tables on pp. 259-261, 266-270.

Mexico: from Banco de Mexico (1966). Number of families in all sectors appear in table on p. 420; income for all sectors, by income interval appears on table on p. 428.

FIGURE 4: Actual Social Welfare for Four Major Sectors in Puerto Rico, 1953 and 1963, as Measured by the Harmonic Mean Function (W_H)
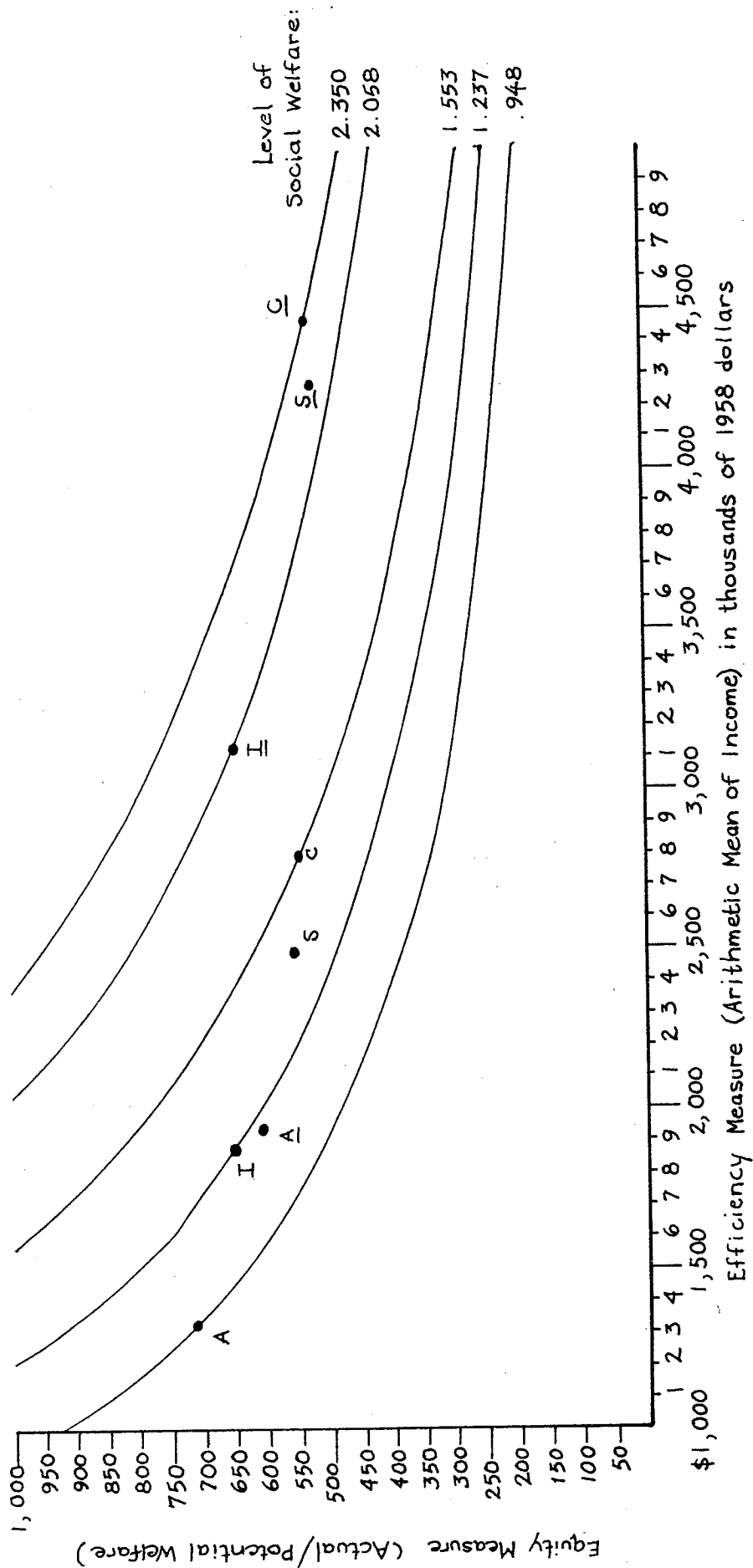
Notes: A = Agriculture; I = Industry; C = Commerce; S = Services for 1953; underlined letters refer to 1963.

are so similar, considering the different levels of development and the disparate composition underlying these sectors.

Since the efficiency indices in Table 5 for Puerto Rico and Argentina have been estimated in constant prices and the equity indices vary from zero to unity irrespective of currency, the resulting sectoral welfare values may be compared between years for any single country.

The rankings for the four sectors in parentheses are stable and consistent across countries. In both Puerto Rico and Argentina, the commerce and services sectors reflect the highest level of welfare; industry ranks third; and agriculture fourth. In Mexico, the service sectors ranks highest and agriculture lowest. In the agricultural sector of all three countries, the low welfare reflects the low efficiency.

The levels of actual social welfare for the four sectors of Puerto Rico in 1953 and 1963 are plotted in Figure 4. The comparison of social welfare on the sectoral level would be more meaningful if the sectors corresponded to major topographical regions within the countries examined. To the extent that the sectoral classification does capture aspects of geographic distribution, as in the agricultural and rural-urban divisions, the comparisons of social welfare do highlight sources of disharmony and stress in a growing economy.

6. Conclusions

Glaring shortcomings deter efforts to apply a system of social welfare functions to compare growth and equity among countries, zones or cities. Both welfare schemes applied here prove relatively insensitive to the deterioration in the equity ratio and allow increases in efficiency to overwhelm considerations of equity in their impact on social welfare.

Second, the estimated forms have incorporated the assumption of a unitary elastic utility of income. A much more realistic assumption would be to apply an array of elasticities which vary by income class and by country. Further estimates of expenditure and price elasticities of demand and knowledge of budget proportions for the countries examined here may allow future investigators to attempt such a quantification.

Although the Mera system of social welfare utilized here had been devised to evaluate the welfare impact of various projects in an economy, the application of the social welfare function to measure changes occurring in a country-wide distribution of income may lead to a more comprehensive evaluation of the gains and the losses which accompany economic growth.

The same question may be attacked in a different way: in the absence of growth, what gain in social welfare could have been accomplished by altering the distribution of income? Implied in the comparison is the notion that countries could have improved their rankings of social welfare simply by turning their attention toward improving equity and away from the single-minded pursuit of growth. Indeed, if international

assistance or credit were awarded to nations for gains in social welfare and not solely growth, a different allocation of resources would surely occur.

In this context, our attention is called to those Latin American courtries, which, for reasons of social revolution and internal reorganization, have failed to grow in recent years. A careful examination of changes in their distribution of income may reveal that, despite the failure to increase per capita income, these countries may have achieved substantial improvements in social welfare.

BIBLIOGRAPHY

Aigner, D. J. and Heins, A. J. "A Social Welfare View of the Measurement of Income Equality," Review of Income and Wealth, XIII, 1 (March, 1967), pp. 12-25.

Atkinson, Anthony B. "On the Measurement of Inequality," Journal of Economic Theory, I, 2 (November, 1969), 244-263.

Azzi, Corry F. and Cox, J. C. "Equity and Efficiency in Program Evaluation," Quarterly Journal of Economics, LXXXVII, 3 (August, 1973), 495-502.

Dalton, H. "The Measurement of the Inequality of Incomes," Economic Journal, XXX, 119 (March, 1920), 348-361.

Elteto, O. and Frigyes, E. "New Income Inequality Measures as Efficient Tools for Causal Analysis and Planning," Econometrica, XXXVI,2 (April, 1968).

Frisch, R. "A Complete Scheme for Computing All Direct and Cross Demand Elasticities in a Model with Many Sectors," Econometrica, 27 (1959), pp. 177-196.

Gini, Corrado. "Measurement of Inequality of Income," Economic Journal, XXXI, 121 (March, 1921), 124-126.

Hall, Marshall and Nicolaus Tidesman. "Measures of Concentration," Journal of the American Statistical Association, LXII, 317 (March, 1967), pp. 162-168.

Hardy, G. H., Littlewood, J. E., and Polya, G. Inequalities, Cambridge: Cambridge University Press, 1959.

Kaysen, C. and Turner, D. "Antitrust Policy," Cambridge: Harvard University Press, 1965.

Kirman, A. and Tomasini, L. "A New Look at International Income Inequalities, Economia Internazionale, XXII, 3 (August, 1969), 3-27.

Kuznets, S. "Economic Growth and Income Inequality," American Economic Review, XLV, 1 (March, 1955).

_____. "Quantitative Aspects of the Economic Growth of Nations: VIII. Distribution of Income by Size," in Economic Development and Cultural Change, XI, 2, Part II (January, 1963).

Levine, Daniel B. and Singer, Neil M. "The Mathematic Relation Between the Income Density Function and the Measurement of Income Inequality," Econometrica, XXXVIII, 2 (March, 1970), 324-330.

BIBLIOGRAPHY

(Cont.)

Lipset, S. M. and Solari, A., ed., <u>Elites in Latin America</u>. New York: Oxford University Press.

Marsden, K. "Towards a Synthesis of Economic Growth and Social Justice," <u>International Labour Review</u>, C, 5 (November, 1969), 389-418.

Mera, Koichi. "Interregional Welfare Equalization in the Dynamic Perspective," Program on Urban and Regional Economics, Discussion Paper No. 13 (multilith), August, 1967.

_____. "A Method of Evaluating Alternative Development Programs," Harvard Transportation and Economic Development Seminar, Discussion Paper No. 44 (multilith), revised July, 1967.

Miller, J. P. "Measures of Monopoly Power and Concentration," <u>Business Concentration and Price Policy</u>, Princeton: NBER, 1955.

Phelps, E. S. "Taxation of Wage Income for Economic Justice," <u>Quarterly Journal of Economics</u>, LXXXVII, 3 (August, 1973), 33-334.

Reynolds, L. G. and Gregory, P. <u>Wages, Productivity and Industrialization in Puerto Rico</u>. Homewood, Illinois: Richard Irwin, Inc., 1965.

Thurow, Lester C. "The Income Distribution as a Pure Public Good," <u>Quarterly Journal of Economics</u>, LXXXV, 2 (May, 1971), 327-336. Comments by C. Brown, et. al., and Response by Thurow in <u>QJE</u>, LXXXVII, 2 (May, 1973), 296-319.

Urquidi, V. "Fundamental Problems of the Mexican Economy," in T. David, ed., <u>Mexico's Recent Economic Growth</u>. Austin: University of Texas, 1967.

Weisskoff, R. "Demand Elasticities for a Developing Economy: An International Comparison of Consumption Patterns," Chapter 14, in H. B. Chenery, ed., <u>Studies in Development Planning</u>, Cambridge: Harvard University Press, 1971.

_____. "Income Distribtuion and Economic Growth: An International Comparison," unpublished doctoral dissertation, Harvard University, May, 1969.

BIBLIOGRAPHY OF DATA SOURCES

1. Argentina:
1.1 Consejo Nacional de Desarrollo. Distribución del ingreso y cuentas nacionales en la Argentina, Investigacion conjunta CONADE - CEPAL, Buenos Aires, 1965, IV, "Distribucion del ingreso por niveles."

2. Brazil:
2.1 Camargo, José Francisco de. "Uma Pesquisa Piloto de Orçamentos Familiares," Problemas Brasileiros, X, 105 (maio 1972), 4-11.
2.2 Calvalcanti Clóvis de Vasconcelos. "A Renda Familiar e por Habitante na Cidade do Recife," Pesquisa e Planejamento Economico, II, 1 (junho 1972), 81-104.
2.3 Fishlow, Albert. "Brazilian Size Distribution of Income," American Economic Review, XLII, 2 (May 1972), 391-402, also "Technical Appendix," by A. Fishlow and A. Meesook (May 1972).
2.4 Fundação I.B.G.E. Tabulacões Avancada do Censo Demografico, VIII, Recenseamento Geral, 1970, "Resultados Preliminares." Rio de Janeiro, julho de 1971.
2.5 Langoni, Carlos. "Distribuição da Renda e Desen volvimiento Economico do Brasil," Estudos Economicos, 2, 5 (outobro 1972), 5-88.
2.6 Tiacci Kirsten, José. Metodología da Construção de Indices de Preços ao Consumidor Custo de Vida. Unpublished doctoral dissertation, Universidad de Sao Paulo, Facultadade de Economia e Administracao, Sao Paulo, 1972.

3. Chile:
3.1 Heskia, Isabel. "Distribucion del Ingreso en Chile." Santiago de Chile: CEPLAN, marzo 1973.
3.2 Mujica Ateaga, Rodrigo, and Fernando Martinez P-C. "Efecto de al Redistribución de los Ingresos en la Demanda por Alimentos: Chile 1970-1980." Serie A: Trabajos de Investigación N 5. Departamento de Economía Agraria, Universidad Católica de Chile, Santiago de Chile: marzo 1973.
3.3 Muñoz, Oscar and Foxley, Alejandro. "Redistribución del Ingreso, Crecimiento Económico y Estructura Social. El Caso Chileno." Santiago de Chile, CEPLAN, marzo 1973.

4. Colombia:
4.1 Berry, Albert. "Farm Size Distribution, Income Distribution and the Efficiency of Agricultural Production: Colombia," American Economic Review, LXII, 2 (May 1972), 403-408.
4.2 _____. "Some Determinants of Changing Income Distribution in Colombia: 1930-1970," Economic Growth Center Discussion Paper No. 137, New Haven, March 22, 1972.
4.3 Departamento Administrativo Nacional de Estadística. Análisis econométrico de distribución de ingresos. (Elaborado bajo la dirección de Polibio Córdova). No date, but apparently circa 1972.
4.4 Urrutia Miguel and Clara de Sandoval. "La Distribución de Ingresos entre los Perceptores de Renta en Colombia - 1964," Revista del Banco de la Republica, 513 (julio 1970), 987-1006.

Bibliography of Sources (Cont.)

5.   Costa Rica
   5.1 Instituto de Investigaciones, Escuela de Ciencias
         Economicas y Sociales. "Costa Rica: la Distribución del
         Ingreso y el Consumo de Algunos Alimentos,'' (Version preliminar).
         Ciudad Universitaria, setiembre de 1972.

                                    1
6. Guatemala
   6.1 Best, Michael. "Class Interests and Taxation Performance in Central
         America," Discussion Paper, Economics Department, University of
         Massachusetts, Amherst, July, 1972.
   6.2 Orellana, René Arturo. Encuesta Sobre Ingreso y Gastos de la
         Familia del Campesino Asalariado de Guatemala, 1966. Guatemala:
         Universidad de San Carlos, Instituto de Investigaciones Económicas
         y Sociales, not dated.
   6.3 _____, and Adolfo e de Leon. Ingresos y
         Gastos de Familias Urbanas de Guatemala. Guatemala: Instituto
         de Investigaciones Económicas y Sociales, 1972.
   6.4 Webb, Richard C. "The Incidence of Government Policy on Poverty in
         Guatemala," A Report Prepared For The World Bank. Draft, April
         6, 1973.

7. Mexico
   7.1 Banco de México, S.A., Oficina de Estudios sobre Proyecciones
         Agrícolas, Encuesta Sobre Ingresos y Gastos Familiares en
         México, 1963. México, D.F., 1966.
   7.2 Navarrete, Ifigenia M. de. "La Distribución del ngreso en México:
         Tendencias y Perspectivas," en Victor L. Urquidi, et.al.,
         El pérfil de México en 1980, Vol. 1. Mexico, D.F.: Siglo
         Veintiuno, S.A., 1970.
   7.3 _____. La Distribución del Ingreso y el
         Desarrollo Económico de México. México, D.F.: Instituto de
         Investigaciones Económicas, Escuela Nacional de Economía, 1960.
   7.4 Puente Leyva, Jesus. Distribución del Ingreso en Un Área Urbana,
         el caso de Monterrey. México, D.F.: Siglo Veintiuno, 1969.

8. Perú
   8.1 Figueroa, Adolfo. "El Impacto de las Reformas Actuales Sobre la
         Distribución del Ingreso en el Peru". Chile: CEPLAN,
         Marzo, 1973.
   8.2 Webb, Richard. "The Distribution of Income in Peru". Discussion
         Paper No. 26, Research Program in Economic Development, Woodrow
         Wilson School, Princeton University, September, 1972.
   8.3 _____. "Government Policy and The Distribution
         of Income in Peru, 1963-1973," Discussion Paper No. 26, Woodrow
         Wilson School, Princeton University, June, 1973.
   8.4 _____. "Tax Policy and The Incidence of
         Taxation in Peru," Discussion No. 27, Woodrow Wilson School,
         Princeton University, September, 1972.

Bibliography of Sources (Cont.)

9. Puerto Rico
   9.1 Department of Labor (1953), Special Economic Studies Division. _Income and Expenditures of Families in Puerto Rico in 1953._ San Juan, not dated.
   9.2 Department of Labor (1963), Special Economic Studies Division. _Income and Expenditures of Families in Puerto Rico in 1963._ San Juan, February, 1967.

10. Other References
    10.1 Adelman, Irma, and Cynthia Taft Morris. An "Anatomy of Income Distribution Patterns in Developing Nations." IBRD, Economic Staff Working Paper No. 116, Washington, 1971.
    10.2 _____. "Who Benefits from Economic Development?"
    10.3 Figueroa, Adolfo. "Distribuição da Renda, Estrutura da Demanda e Emprego," _Pesquisa e Planejamento Econômico,_ II, 2 (dezembro 1972), 227-256.
    10.4 Weisskoff, Richard. "Income Distribution and Economic Growth in Puerto Rico. Argentina. and Mexico." _Review of Income & Wealth,_ also reprinted as Yale University, Economic Growth Center Reprint 162 (1971).

11. ECIEL - Brookings Project
    11.1 Colombia (Barranquilla, Bogotá, Cali, Medellín)
         Paraguay (Asunción)
         Peru (Lima)
         Venezuela (Caracas, Maracaibo)

SOURCES OF DATA USED IN THIS STUDY

1. Argentina

   A. Countrywide: (1.1), 1953 from T. IV-1, p.5; 1961 from T. IV-223,p.253, calculated from 22 intervals.

      1. Agriculture: 1953, T. from pp. 7 & 15; 1961, T. from pp. 225 and 263.

      2. Non-agriculture: 1953, T. from pp 8-13, 16-22; 1961, T. from pp. 131 and 139.

2. Brazil

   A. Countrywide (Fishlow): (2.3) 1960 from T. 1. p. 392; economically active population from (2.4), T. VI, p. XXIX. 1970 from T. 5, p 339, and e.a.p. from (2.4), T. 8, p.6. Nine intervals for 1960 and 1970.

      1. Agriculture and Non-agriculture, 1970, both from TV, p.399.

   B. Countrywide (Langoni): (2.5), 1960 & 1970, Decile shares from T.4, p.14; 1960 e.a.p. from (2.4), T. VI, p. XXIX; 1970 e.a.p. from (2.5), T.8, p. 19; mean incomes from p. 14. Twelve intervals used for all data in both years.

      1. Agriculture (Primario), 1960, Decile shares from T 6, p. 17, 1970 from T on p 14; 1960 e.a.p. from (2.4), T. VI, P XXIX, 1970 e.a.p. from T.8, p. 19.

      2. Non-agriculture (called "urbano" in 2.5), 1960 & 1970 decile shares from T6, p.17

   C. Recife (all years): (2.2), number of families from T. 1 p. 86, average family income from T.2 p.88, frequency distributions from T. 4 , p. 99; quartiles (no interpolation procedure given) appear in T. 5. p. 100. We used his 6 intervals for 1960, nine for 1961, seven for 1967, and eleven for 1968.

   D. São Paulo: (2.1), all data from Tables on p.6. Thirteen intervals used. (2.6), p.46, gives only 4 classes, and therefore could not be used. (2.6) p.46, gives only 4 classes, and therefore could not be used.

3. Chile

   A. Countrywide: Decile shares from (3.1), T. 1, p.6; mean income from p. 11; e.a.p. from (3.3), T. 7, p. 48.

      1. Urban and Rural: decile shares from (3.1), T. 1, p. 6; number of recipients from geographic zones from T. 4, p. 8; mean incomes from T. 11, p.27.

(Continued)

SOURCES OF DATA USED IN THIS STUDY (CONT.)

Chile (Continued)

   2. Agriculture and Non-agriculture: income shares for seven intervals for A and eight intervals for I & S sectors in (3.1) T. 9, p. 21. Weighted averages for each interval to obtain income and recipient share for combined "Non-agriculture." Number of recipients from shares in T. 2, p. 8; mean income from T. 11, p. 27; e.a.p. from (3.3), T. 1, p. 6. Seven intervals used for Agriculture; eight intervals for Non-agriculture.

4. Colombia:

  A. Countrywide (Urrutia, 1964): (4.4) accumulated shares, population total income from T. A-6, p. 1003.

    1. Rural from T. A-5, p. 1002, total income from p. 993. Urban from T. A-3, p. 1001. Twenty-three intervals used for country-wide and rural, 25 intervals for urban.

  B. Countrywide (DANE, 1970): (4.3) from T. 20, p. 70.

    1. Agriculture: from 15 income groups in T. 8, p. 135.

    2. Non-agriculture: number of people, for each interval was found by subtracting agricultural from total, then applying standard interval means to obtain income shares. Total number of e.a.p. from T 4, p. 129; Total Income from T. 5, p. 130.

    3. Urban-Rural from T. 21, p. 71, and T. 22, p. 72.

    4. Bogotá-Non-Bogotá (Heads of Families): Thirteen intervals for Bogotá from T. 19, p. 149; Number of People from T. 28, p. 157. Income Share for Regions given in T. 16. p. 145. Non-Bogotá is calculated by summing Atlántica, Oriental, Central and Pacífico regions, Recipient and Income shares are given on T. 19. p. 149. Distribution of Recipients by Region from T. 28, p. 157; Distribution of Income by Region in T. 16. p. 145.

  C. Medellín, Manizales (1967): from (4.4), Tables A-10, A-11, p. 1005. Twenty-five intervals for Medellin, and 22 for Manizales.

(Continued)

SOURCES OF DATA USED IN THIS STUDY   (CONT.)

5.   Costa Rica

   A.   Countrywide: from (5.1), Appendix T. 4, p. 81, gives shares of persons,
        families, and income for eleven intervals, from which countrywide
        interval means are calculated. These means were then applied to the
        frequency distribution of urban and rural families given in T. 8,
        p. 40, to obtain income shares for each share of recipients. The dif-
        ference from the given total income and the aggregated income by interval
        was distributed across all income classes. The eleven intervals for the
        U-R distribution in T. 8, p. 40, were reconciled by linear interpolation
        with the twelve quite different intervals for the countrywide distribu-
        tions given in T. 4, p. 81.

6.   Ecuador

   A.   Urban only: from (4.3)   accumulated shares from T. 23, p. 73.

7.   Guatemala

   A.   Agriculture only: from (6.2) number of families and mean income is given
        for 22 intervals for all agriculture in T. 31, p. 143, as well as for
        eight major cultivations.

   B.   Five Cities only: from (6.3), number of families and total income for
        each of ten intervals is given in T. 4.0-1, p. 93, for five cities,
        and in T. 40-2, p. 93, for Guatemala City.

8.   México

   A.   Countrywide (1963), Agriculture and Non-agriculture: uncorrected results
        of budget survey distributions are given in (7.1), Series 38, p. 432,
        for sixteen original income intervals. Income shares to each interval
        are calculated for Agriculture and Non-agriculture from Series 36,
        p. 428, and the number of families in each interval from Series 35,
        p. 420.

   B.   Urban-Rural   (1963), calculated from fourteen intervals in (7.1),
        Series 38, p. 429, for rural localities under 2,500, and p. 432, for
        all México.

   C.   México D. F.   (1963), calculated from nine intervals given in (7.1),
        Series 19.1, p. 244.

   D.   Monterrey   (1965), calculated from 22 intervals in (7.4), Appendix T. 1,
        p. 82, accumulated shares of income families before taxes. Universe
        number is given in text on p. 95, and mean family income per month in
        Appendix T. 2, p. 85.

(Continued)